Periodical Payment Orders Working Party

GIRO 2013 Report

24 January 2014

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0.   Introduction

Content

0.1   This report details the findings of the Periodical Payment Orders (PPO) Working Party, including the 2013 industry survey. The work carried out by the PPO Working Party (PPO WP) during the year formed the basis of three presentations at The Institute and Faculty of Actuaries GIRO conference in October 2013, focussing on the industry survey, impaired life mortality, and the impact of PPOs on reinsurance contracts. This paper contains material from the first two of these work streams, and also reports the results of a straw poll of the actuarial community carried out prior to the GIRO conference.

0.2   Members of the 2012-13 working party are:

- Anthony Wright (Chair)
- Peter Saunders (Vice-chair)
- Fiona Annandale
- Clare Barley
- Nick Betteridge
- Antony Claughton
- Rob Davies
- Matt King
- Sarah MacDonnell
- Catherine Pearson
- Emma Potter
- Christina Ruffle
- Tony Stanger
- Gerard Walls

0.3   We also acknowledge gratefully a number of contributors from outside of the Working Party, and would like to thank:

- Associates at Towers Watson – who performed the analysis of the industry survey data, including Aron Bor, Catherine Scullion, Hannah Beckett, Kirsty Gray, Katie Wicks, Patrick Tingay, Laura Hill and Sonia Frade.
- Maria Nicholson – for performing the analysis and contributing to the section on New Zealand mortality experience.
- Dawn McIntosh – for her assistance with the members' survey.

0.4   We welcome your comments on this paper, and your suggestions for the coming year. In addition, members of the working party are happy to share its findings with interested groups in the wider insurance industry. In the first instance please contact Kimberley Hutton at the Institute and Faculty of Actuaries (kimberley.hutton@actuaries.org.uk).

1. Industry Survey Introduction

Release

1.1   This release of the 2013 PPO Working Party survey results supersedes any prior publication of the results, which may feature slight differences in the figures due to data quality improvements and changes in calculations.

1.2   Similar studies were published in 2010 (IFoA, 2010), 2011 (IFoA, 2011) and 2012 (IFoA, 2012). Each year the mix of insurers has changed although many, but not all, of the insurers in this year's survey also contributed to last year's survey. Each year the data provided for previous studies is ignored and the analysis uses a new full historic snapshot from each of the contributors. The data between surveys will not be directly comparable as a different mix of insurers will have contributed to each successive survey.

1.3   The data for this survey was taken as at 31 December 2012.

Contributors

1.4   We have received data comprising 346 Motor Periodical Payment Orders (PPOs) and 42 Liability PPOs. These insurers account for over 90% of the PRA regulated market (based on 2012 gross premium volumes). In addition there are further companies which contribute to the survey but do not appear in the 2012 FSA returns.

1.5   The Motor Insurers' Bureau (MIB) has also contributed to the study for the third year running. MIB Claims account for an additional 111 Motor PPOs. We have presented the results of the MIB survey separately to the Motor insurers, as the two subsets have different characteristics. Section 8 entitled 'MIB Experience' shows the results for the MIB data. All graphs and tables in the other sections will exclude MIB figures unless stated otherwise.

1.6   We are very grateful to all the contributors without whom the quantitative survey would simply not be possible. The following contributors would like to be acknowledged for their participation in the survey, but this list does not include all contributors:

- Admiral
- Ageas (AIL)
- Allianz Insurance
- Aviva
- AXA
- CFS
- Direct Line Group
- esure
- Groupama (AIL)
- Liverpool Victoria
- MMA (Covea)
- NFU Mutual
- Provident (Covea)
- RSA
- Saga
- Zurich Insurance

1.7   We are very grateful to those insurers who also contributed to the qualitative survey.

1.8   In addition we are extremely grateful to the reinsurers who contributed to the qualitative survey. The following contributors would like to be acknowledged for their participation in the survey, but this list does not include all contributors:

- Everest Re
- Liberty SM
- Markel
- QRe
- SCOR
- Swiss Re
- XL Re

2. Number of PPOs and Propensity

Number of PPOs

2.1 The graph below shows the total number of PPOs (Motor and Liability) settled in each quarter from 2005. It shows data up to the end of the final quarter in 2012.

Number of PPOs by Settlement Quarter

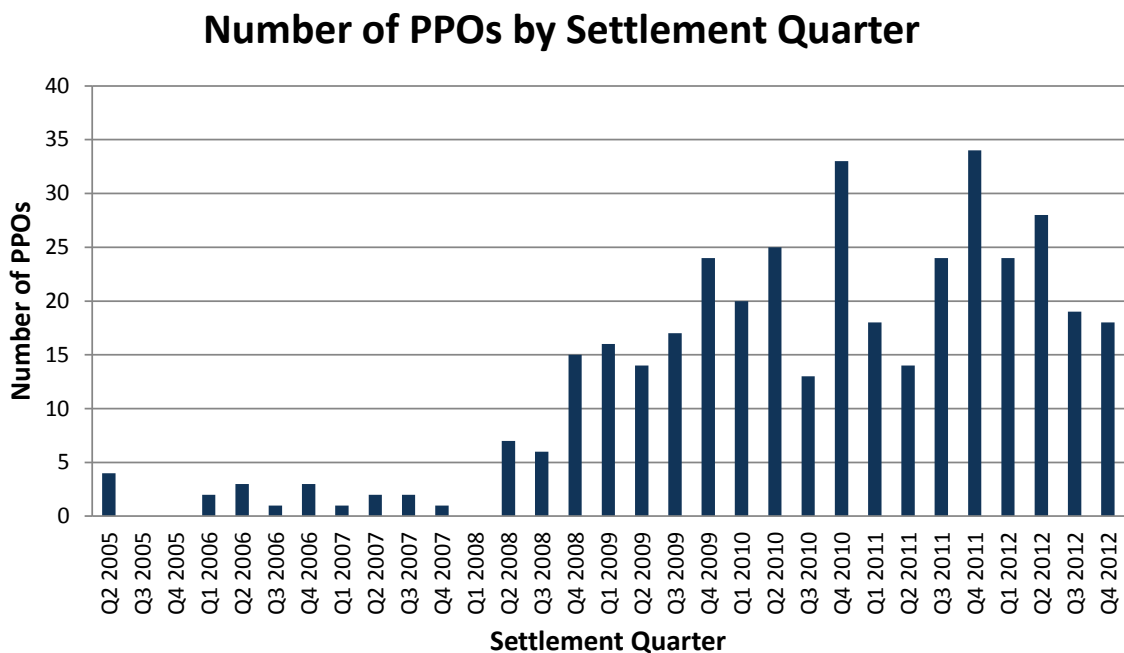*Figure 2.1: Total number of PPOs by Settlement Quarter*

2.2 If we look at these figures on an annualised basis it can be seen that the number of PPOs settled each year appears to have stabilised. However, given the on-going Ogden uncertainty described below and the continuing low interest rate environment, it is not possible to know whether this is a trend that will continue.
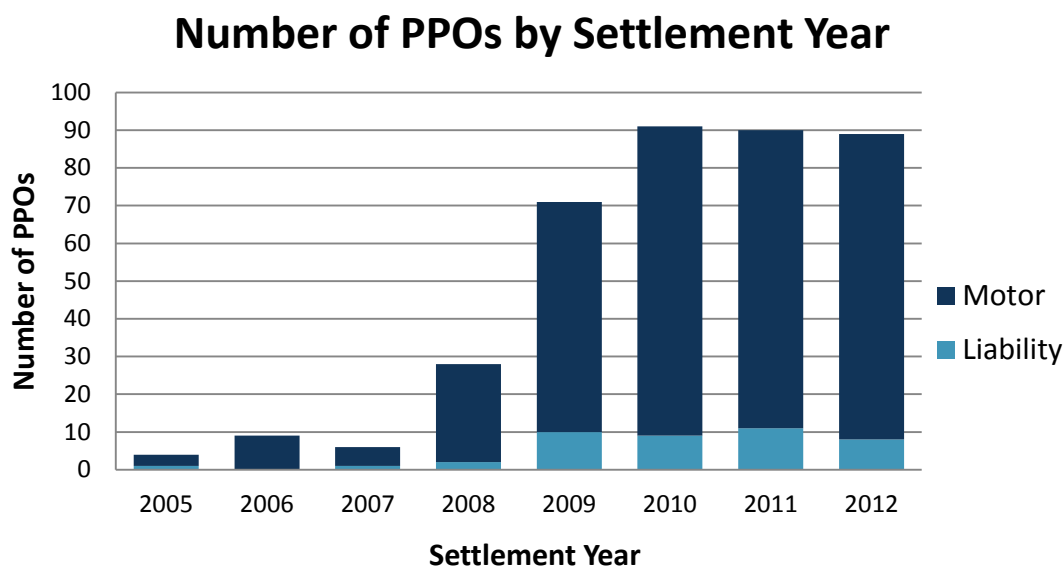
Number of PPOs by Settlement Year

2.3   The Lord Chancellor announced a review of the discount rate used in the Ogden tables in November 2010. It is possible that this announcement may have impacted the settlement for some large claims whilst the outcome of the decision is awaited.

2.4   Further to this, the Ministry of Justice announced a consultation on how the discount rate should be set in August 2012, with the deadline for the consultation being 23 October 2012. This was followed by a second consultation that was announced in February 2013, on the legal parameters governing the way in which the discount rate is calculated and whether there is a case for encouraging PPOs. The deadline for this consultation was 7 May 2013. As at the date of writing this report, the response to these consultations which was due in July 2013 was yet to be published.

2.5   The Ogden 7 tables were published in October 2011. It is possible there may have been a delay in PPO settlements just prior to this date as parties waited until the new tables were available.

2.6   The following graph shows (for each settlement year) the proportion of the year's PPOs that settle in each quarter. This suggests that there may be some seasonality in the settlement of PPO claims, with more PPOs being settled later in the calendar year.

Proportion of PPOs that settle in each Quarter
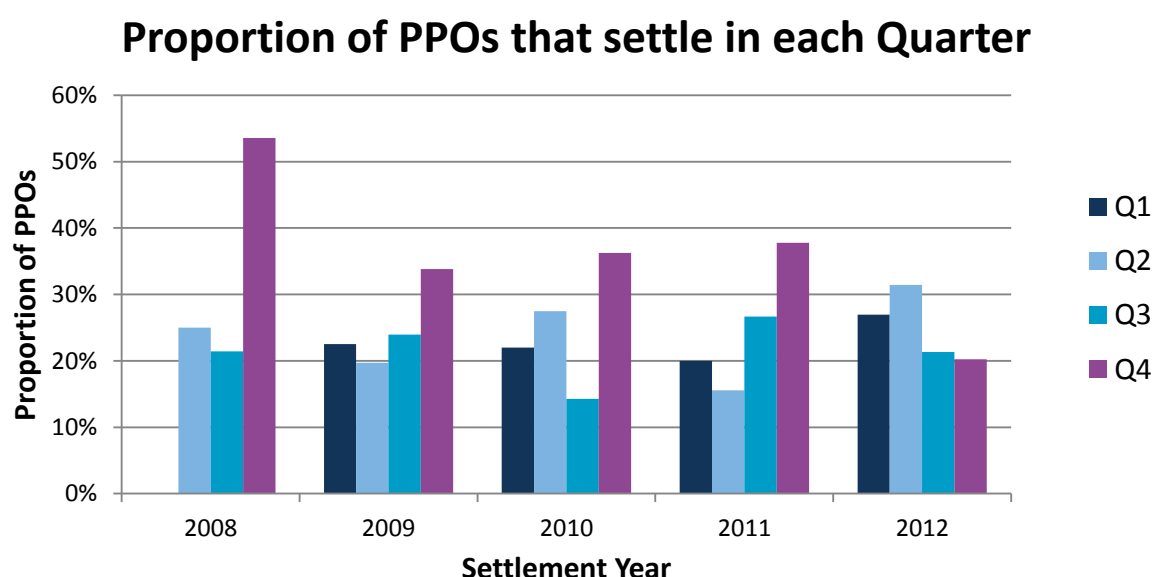
Figure 2.3: Proportion of total PPOs that settle in each Quarter, by Settlement Year

2.7   Figure 2.3 suggests that more claims settle in Q4 than any other quarter. The relatively lower number of PPOs settled in Q4 for 2012 could be due to it being the most recent period, and not all the data regarding PPOs settled in 2012Q4 may have been recorded by the cut-off date for the survey data. Bearing this in mind, 34% of all PPOs settled in 2008 to 2012 were settled in Q4.

2.8   Given that the ASHE index is published during Q4, it is unsurprising that there are more PPOs settled in this quarter, as it ensures that the payments more accurately reflect inflation in ASHE. As such, PPOs that settle outside of Q4 often organise the regular PPO payment to be made after the index is published in Q4. This is shown in Figure 2.4 below.

Proportion of PPOs that start in each Quarter

Figure 2.4: Proportion of total PPOs that are paid in each quarter, by first payment year

PPO Propensity – Motor

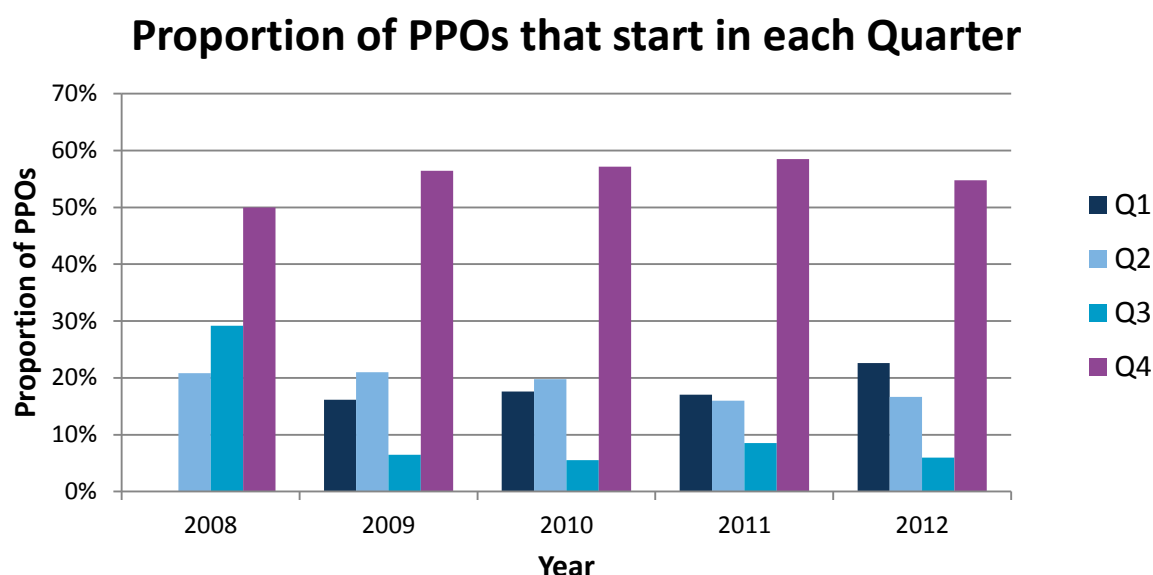2.9   We received data for individual large claims settled since 2008, which has enabled us to investigate the propensity of PPOs as a proportion of large claims. The definition of a large claim is £1 million in 2011 values, indexed at 7% per settlement year.

2.10   Figure 2.5 below shows Motor PPO propensity as a proportion of large claims. It only considers PPOs with a value above £1million (indexed in the same way as the large claims), and these are included in the exposure bars. For the whole of Section 2, PPOs have been valued using a real discount rate of 2.5% (unless stated otherwise) so that the figures are comparable to traditional lump sums that will have been valued using the current Ogden discount rate of 2.5%. More detail on the method used to value the PPOs is given in Section 10.

2.11   The values of the PPOs have been estimated using a consistent basis, so that the effect of different reserving basis for different insurers is removed.
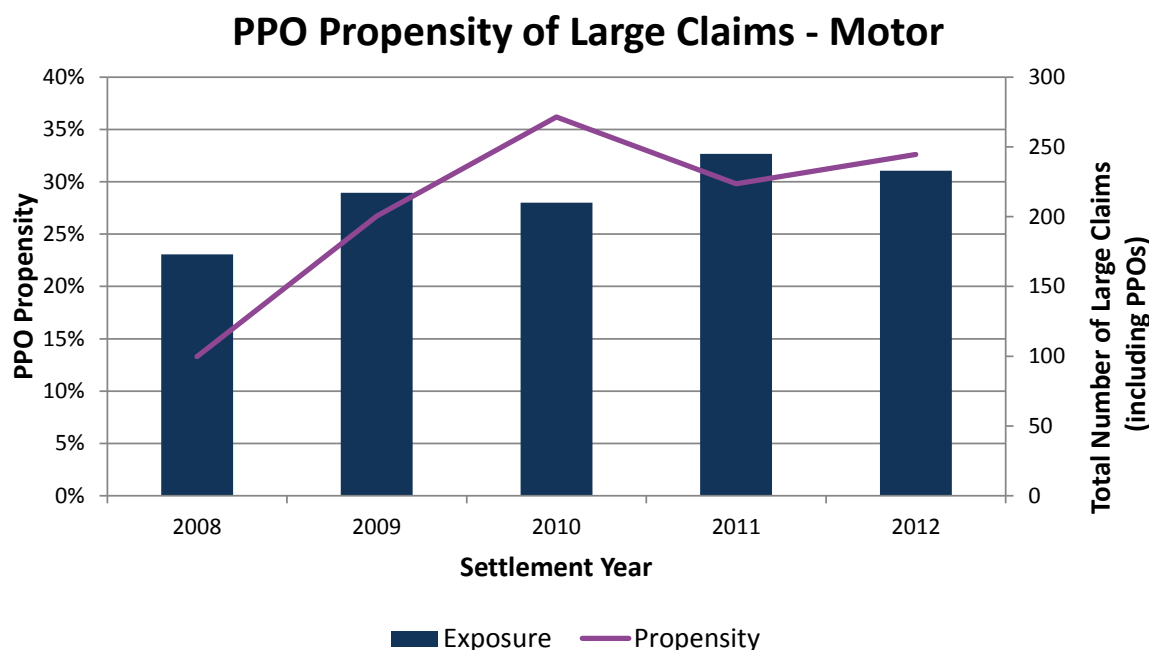
PPO Propensity of Large Claims - Motor

Figure 2.5: Proportion of Motor large claims that settle as a PPO, by Settlement Year

2.12 We noted in the 2011 study that the definition of large claims, as well as the definition of which claims are settled, may not be consistent between all contributors. Further to this we noticed that the large claim count for some insurers was not consistent with that provided last year. This is to be expected to some extent due to the fact that some claims will be reopened, however it is not clear whether the degree of inconsistency is actually greater than that which would be explained by claims being reopened.

2.13 There appears to have been a dip in the overall number of large claims settled in 2010 (and a correspondingly higher PPO propensity for that settlement year). It is possible that the Ogden discount rate review announcement (see Section 2.3) may have led to deferment of settlement for some large claims whilst the outcome of the decision is awaited. Figure 2.2 shows that overall there were the same number of PPOs in 2010 as both the 2011 and 2012 settlement years. This suggests that the higher PPO propensity in 2010 is a result of fewer (non-PPO) large claims in 2010.

2.14 Figures 2.6 to 2.9 below show the PPO propensity at different large claims thresholds for Motor business. As above, the threshold definitions are defined in monetary terms and indexed back at 7% per settlement year. The PPO values have been derived using a real discount rate of 2.5%.

2.15 The graphs below are shown using two different sets of bandings. Figures labelled "(a)" show the same bandings as were used in previous years' surveys, and figures labelled "(b)" use the bandings that correspond to those used in the Third Party Working Party's report. Note there are no large claims above £25 million in the survey.

2.16 Figures 2.6 and 2.7 only consider large claims and PPOs from 2009 settlement year onwards since, as shown in Figure 2.5 above, propensity levels in 2008 were at a much lower level than other settlement years. The number of PPOs dramatically increased at this time following the landmark case of Thompstone vs Tameside (discussed in section 3.3), in which PPO payments were linked to cost of care inflation, as well as the stock market crash which highlighted the risks associated with investing lump sums.

2.17 It can be seen in Figure 2.6(a) below, that the higher the threshold, the larger the PPO propensity is, with around 10% of claims in the £1million to £2million bracket settling as PPOs and over 70% of claims between £5million and £10million settling as PPOs. There are some PPOs which have settled for a value less than £1 million, but since there are very few of these, the probability of a claim less than £1 million to settle as a PPO is deemed insignificant.

PPO Propensity at different Large Claim Thresholds - Incremental thresholds
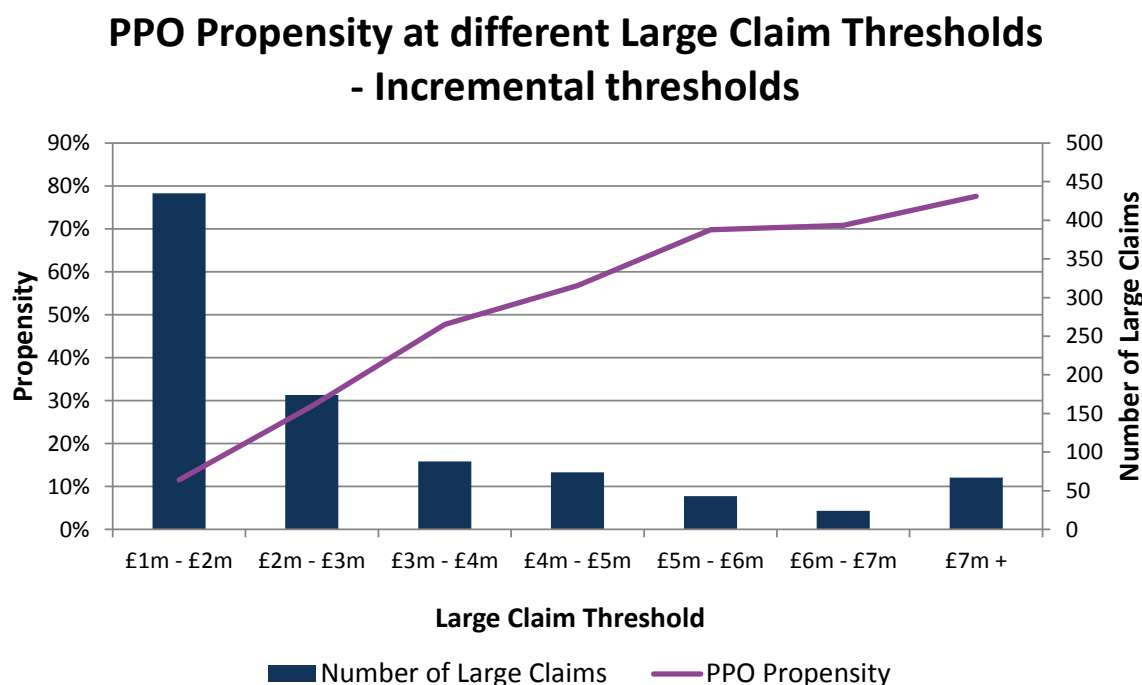
Figure 2.6(a): PPO propensity by large claim threshold bands (claims settled since 2009 only)

PPO Propensity at different Large Claim Thresholds - Incremental thresholds
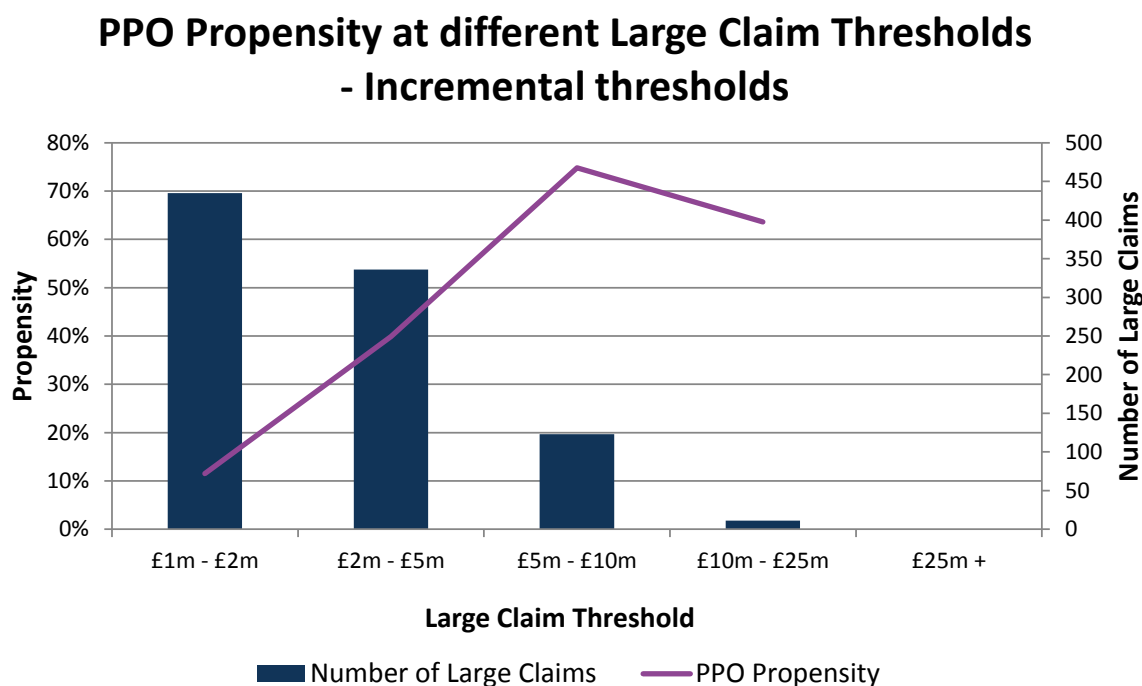
Figure 2.6(b): PPO propensity by large claim threshold bands (claims settled since 2009 only),

2.18 The following graphs in Figure 2.7(a) and (b) show the same information but on a cumulative basis. The propensity for large claims greater than £1million to settle as a PPO (across all settlement years) is approximately 30%, however when considering only claims above £2million the propensity rises to around 50%.

PPO Propensity at different Large Claim Thresholds - Cumulative thresholds
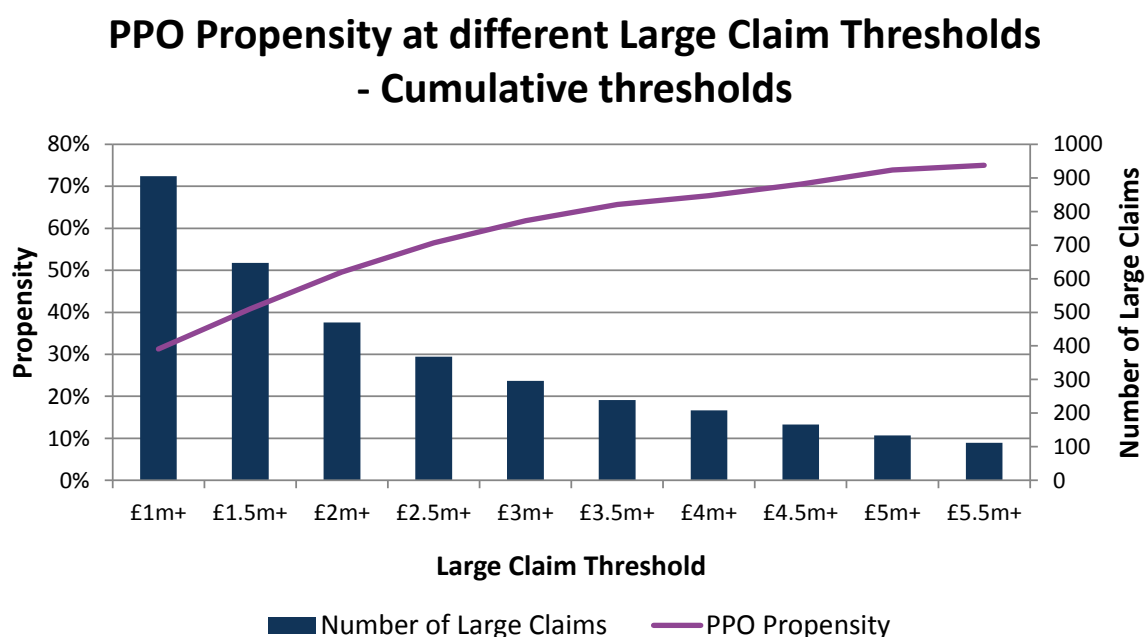
Figure 2.7(a): PPO propensity by cumulative large claim threshold (claims settled since 2009 only)

PPO Propensity at different Large Claim Thresholds - Cumulative thresholds
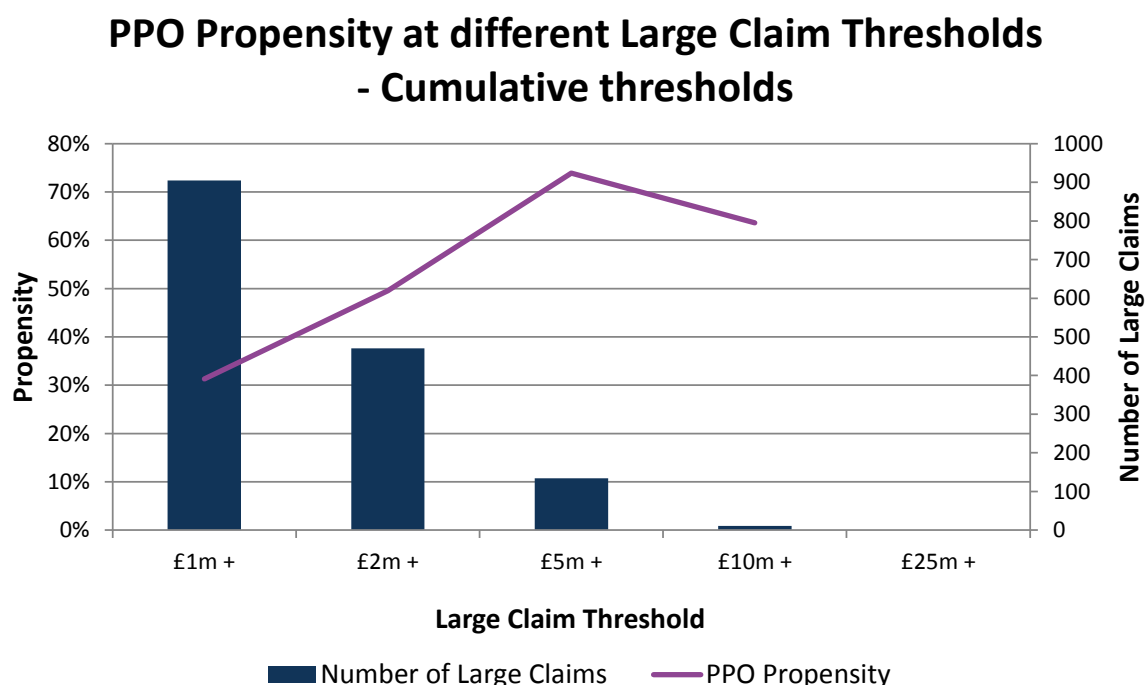
Figure 2.7(b): PPO propensity by cumulative large claim threshold (claims settled since 2009 only)

2.19 Figures 2.8(a) and (b) below show the PPO propensity by threshold size for settled claims, split by settlement year. In 2008 the propensity was significantly lower than that experienced in later years. At larger thresholds there are significantly fewer claims which means there will be more variability in the propensity measure at these thresholds.

PPO Propensity by Settlement Year
- Incremental thresholds

Figure 2.8(a): Large claim propensity by large claim thresholds split by settlement year - incremental

PPO Propensity by Settlement Year
- Incremental thresholds
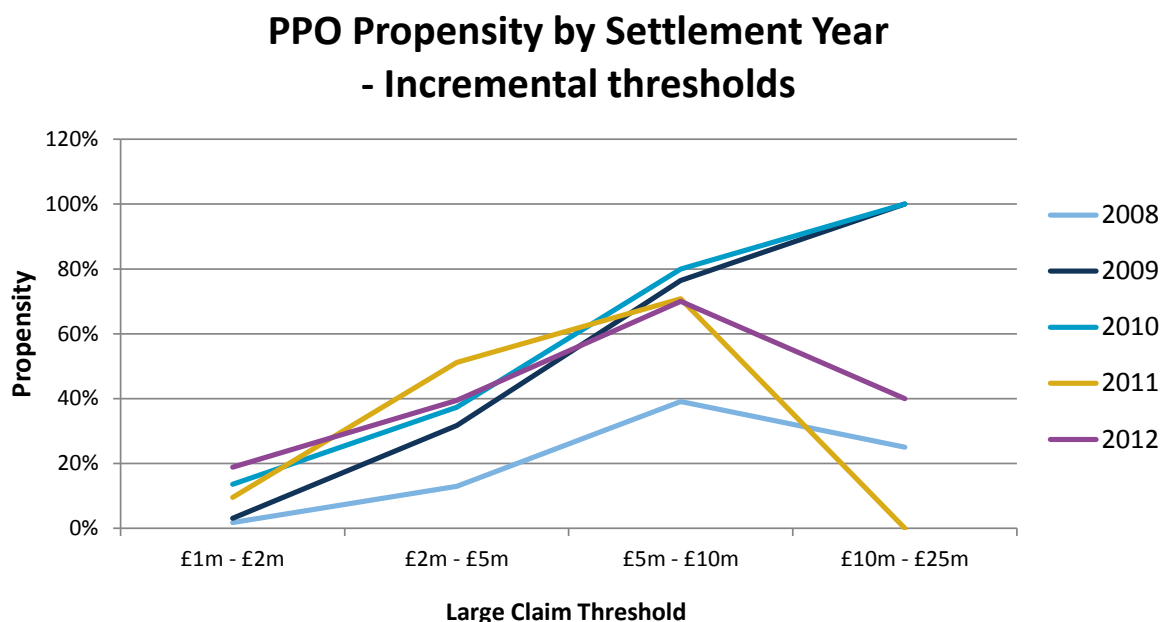
Figure 2.8(b): Large claim propensity by large claim thresholds split by settlement year - incremental

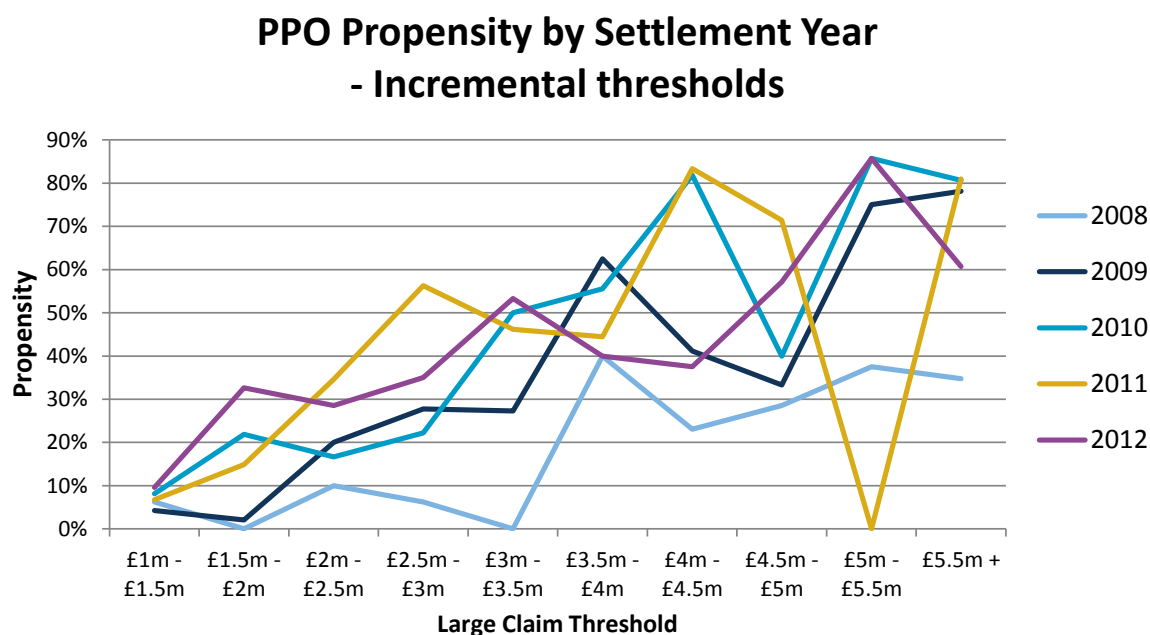2.20   Figures 2.9(a) and (b) below show the same information on a cumulative basis. The graph suggests that the propensity for large claims to result in a PPO at thresholds larger than £5 million has decreased over the last couple of settlement years from around 80% in 2009 and 2010 to around 65% in 2011 and 2012.

PPO Propensity by Settlement Year - Cumulative thresholds
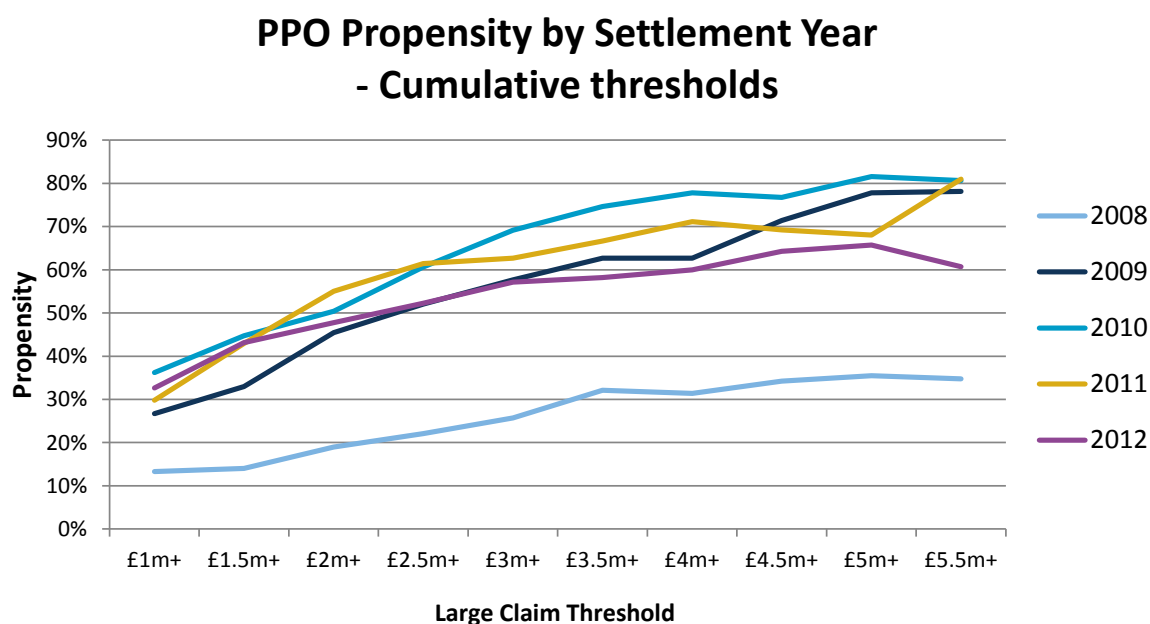
Figure 2.9(a): Large claim propensity by large claim thresholds split by settlement year - Cumulative

PPO Propensity by Settlement Year - Cumulative thresholds
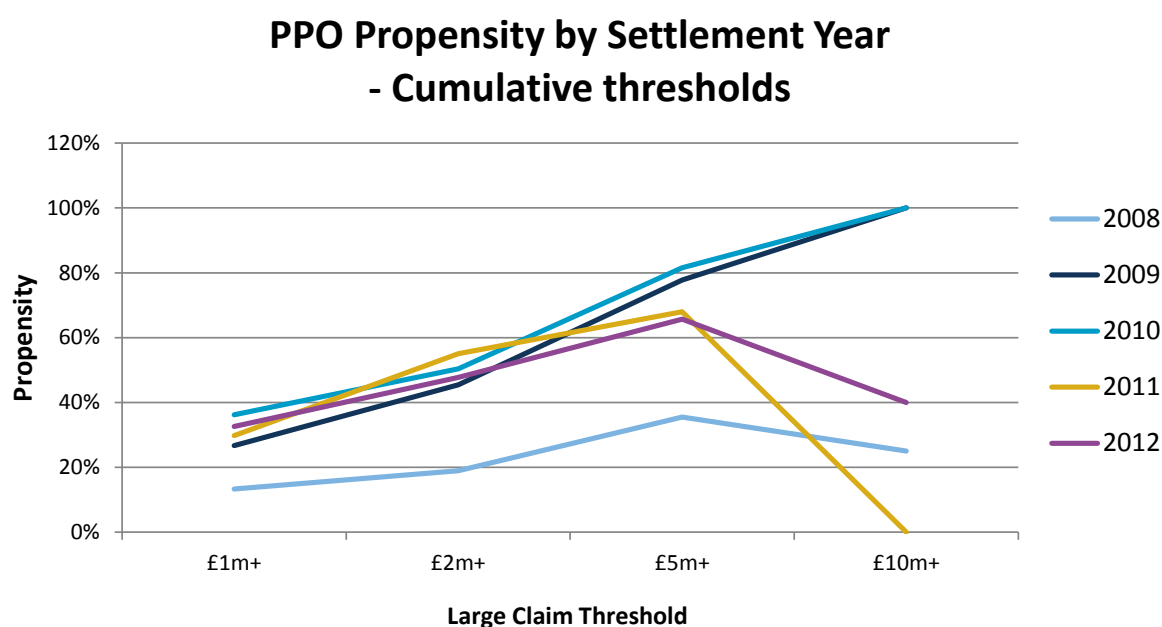
Figure 2.9(b): Large claim propensity by large claim thresholds split by settlement year - Cumulative

2.21   There is significant variation in the PPO propensity of insurers. The following graph indicates the distribution of Motor PPO propensity across insurers in the survey. It excludes insurers which have settled fewer than 25 Motor large claims or PPOs in the last 5 years, and only includes PPOs and large claims settled since 2008.

Distribution of PPO propensity by Insurer - Motor
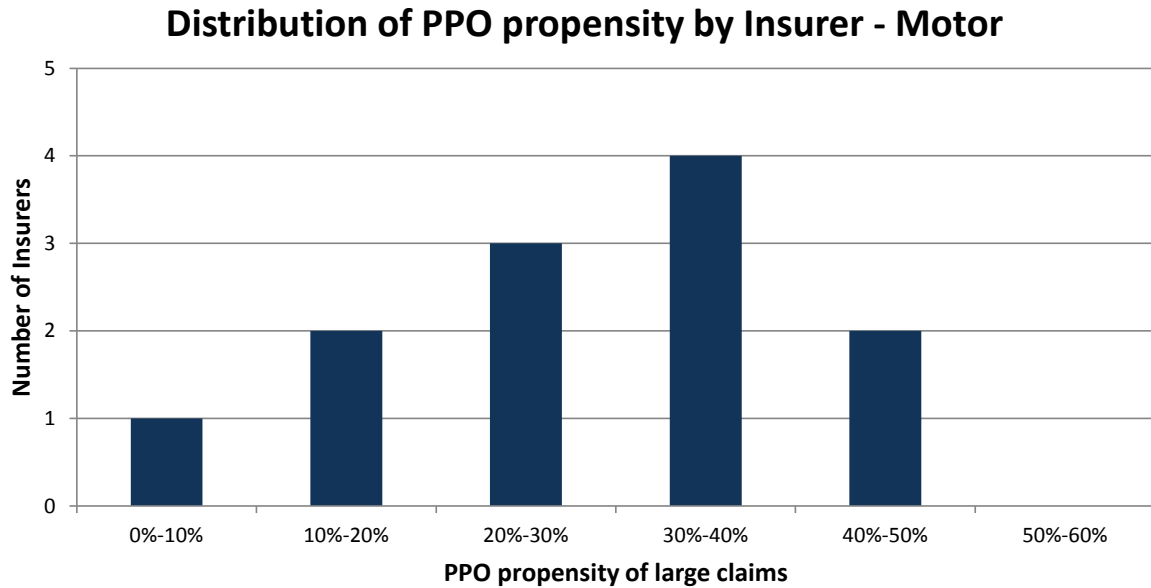
Figure 2.10: Distribution of Motor PPO propensity for insurers who have settled at least 25 large claims (including PPOs) since 2008

2.22 The variability in the propensity may be at least partially due to the definition of large claims used by each provider. However we are not surprised to see a variation in propensity between insurers, for example, as a result of differences in the policyholder profile arising from the mix of business, as well as due to different attitudes towards settling claims as PPOs by various insurers.

2.23 Compared to last year's survey, the propensity distribution is looking more akin to the shape of a normal distribution. The change is not as substantial as the graphs may suggest, since small changes in propensity across the band boundaries have made the graph appear significantly different.

2.24 We also have the data to enable us to look at triangles of propensity rates which take into account accident period as well as settlement period. These cumulative figures can be seen in Figures 2.11 to 2.13 below (and incremental figures are shown in Figures 2.14 to 2.16). We have only collected data on large claims settled since 2008, so the cumulative triangles the cells shaded in blue are incomplete and as such should be treated with caution. We have combined accident years prior to 2001; the oldest accident year to be included is 1997, for which the development is incomplete.

Accident Year	Settlement Year 0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior									47	86	105	125	141
2001								20	33	42	47	54	
2002							27	46	62	73	78		
2003						25	51	71	93	103			
2004					13	39	60	85	94				
2005				11	29	45	74	92					
2006			6	15	33	52	81						
2007		1	5	9	28	60							
2008	0	3	5	13	31								
2009	2	6	9	17									
2010	5	7	9										
2011	9	10											
2012	2												

Figure 2.11: Triangle showing cumulative development of non-PPO large claim numbers

Accident Year	Settlement Year 0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior	0	0	0	0	0	3	5	7	14	25	39	47	54
2001	0	0	0	0	0	1	3	6	10	11	12	13	
2002	0	0	0	0	2	2	5	13	18	20	24		
2003	0	0	0	1	1	4	14	20	24	30			
2004	0	0	0	0	5	17	29	35	43				
2005	0	0	1	3	10	24	38	45					
2006	0	0	0	6	23	33	43						
2007	0	0	0	4	21	28							
2008	0	0	3	11	27								
2009	0	0	3	10									
2010	0	0	3										
2011	0	0											
2012	0												

Figure 2.12: Triangle showing cumulative development of PPO claim numbers

Accident Year	Settlement Year 0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior									23%	23%	27%	27%	28%
2001								23%	23%	21%	20%	19%	
2002							16%	22%	23%	22%	24%		
2003						14%	22%	22%	21%	23%			
2004					28%	30%	33%	29%	31%				
2005				21%	26%	35%	34%	33%					
2006			0%	29%	41%	39%	35%						
2007		0%	0%	31%	43%	32%							
2008	0%	0%	38%	46%	47%								
2009	0%	0%	25%	37%									
2010	0%	0%	25%										
2011	0%	0%											
2012	0%												

Figure 2.13: Triangle showing cumulative development of propensity rates

Accident Year	Settlement Year												
	0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior									47	39	19	20	16
2001								20	13	9	5	7	
2002							27	19	16	11	5		
2003						25	26	20	22	10			
2004					13	26	21	25	9				
2005				11	18	16	29	18					
2006			6	9	18	19	29						
2007		1	4	4	19	32							
2008	0	3	2	8	18								
2009	2	4	3	8									
2010	5	2	2										
2011	9	1											
2012	2												

Figure 2.14: Triangle showing incremental development of non-PPO large claims

Accident Year	Settlement Year												
	0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior	0	0	0	0	0	3	2	2	7	11	14	8	7
2001	0	0	0	0	0	1	2	3	4	1	1	1	
2002	0	0	0	0	2	0	3	8	5	2	4		
2003	0	0	0	1	0	3	10	6	4	6			
2004	0	0	0	0	5	12	12	6	8				
2005	0	0	1	2	7	14	14	7					
2006	0	0	0	6	17	10	10						
2007	0	0	0	4	17	7							
2008	0	0	3	8	16								
2009	0	0	3	7									
2010	0	0	3										
2011	0	0											
2012	0												

Figure 2.15: Triangle showing incremental development of PPO large claims

Accident Year	Settlement Year												
	0	1	2	3	4	5	6	7	8	9	10	11	12
2000 and Prior									13%	22%	42%	29%	30%
2001								13%	24%	10%	17%	13%	
2002							10%	30%	24%	15%	44%		
2003						11%	28%	23%	15%	38%			
2004					28%	32%	36%	19%	47%				
2005				15%	28%	47%	33%	28%					
2006			0%	40%	49%	34%	26%						
2007		0%	0%	50%	47%	18%							
2008	0%	0%	60%	50%	47%								
2009	0%	0%	50%	47%									
2010	0%	0%	60%										
2011	0%	0%											
2012	0%												

Figure 2.16: Triangle showing propensity rates by accident year and settlement period

2.25 Figure 2.17 below uses a different method to measure PPO propensity. This method looks at the number of PPOs as a proportion of earned premium. We have taken the number of PPOs settled in a given year divided by the average earned premium based on the premium earned over a 6 year period starting 7 years earlier (ie the number of PPOs settled in 2012 is divided by the average annual amount of gross premium earned during the period 2006 to 2011). These PPO propensity figures include all PPOs and not just those over £1million, and are in terms of the number of PPOs per £1,000 million of gross earned premium. The £0.2 million increase in earned premium between the 2011 settlement year (calculated from the 2005 to

2010 accident periods) and 2012 settlement year (calculated from the 2006 to 2011 accident years) is due to the significant difference between earned premiums in accident year 2005 and 2011. This is likely to be due to premium rate increases and inflation across the industry.
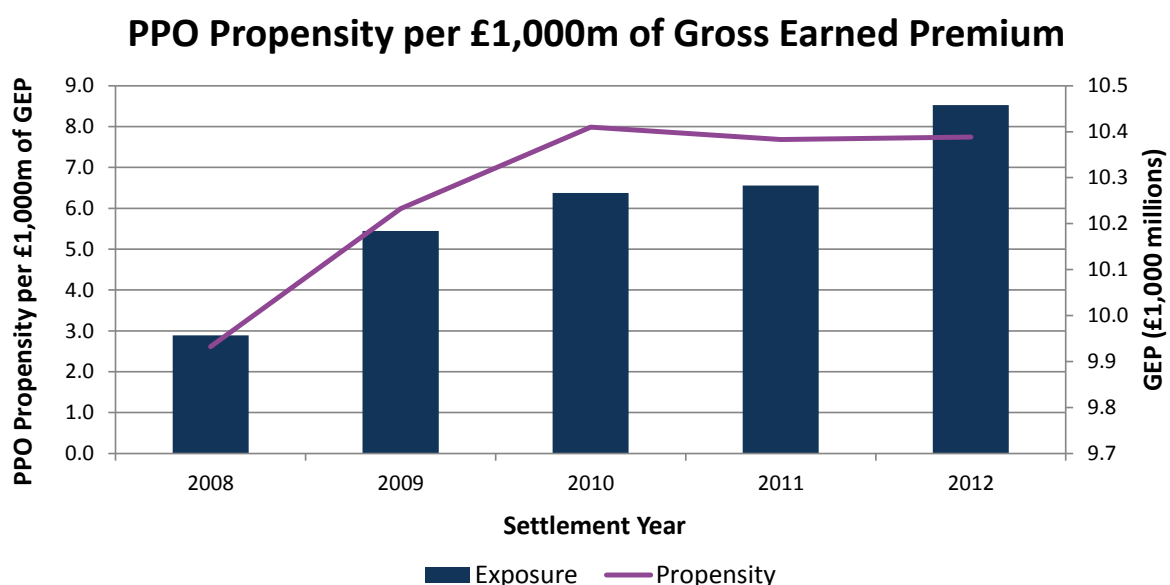
PPO Propensity per £1,000m of Gross Earned Premium

Figure 2.17: Propensity of PPOs measured as a proportion of gross earned premium

2.26   Figure 2.18 below shows the PPO propensity as a proportion of average earned vehicle years. The definition of average exposure is the same as that for earned premiums above. The graph shows the total number of PPOs (not just those over £1million) per million earned vehicle years.

PPO Propensity per million Earned Vehicle Years
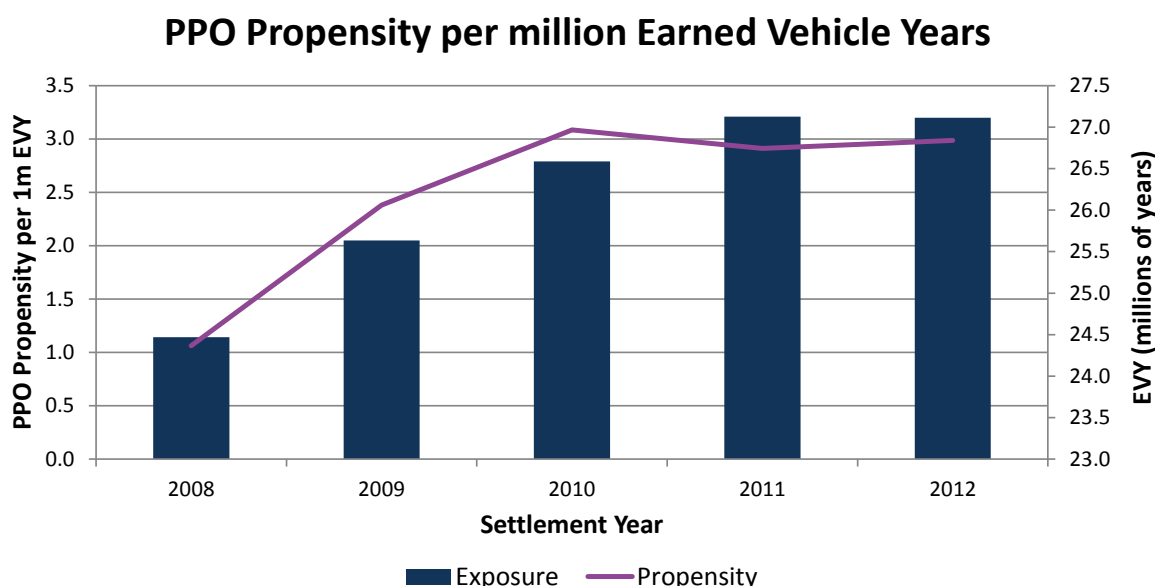
Figure 2.18: Propensity of PPOs as a proportion of earned vehicle years

2.27   Figure 2.19 below looks at the cumulative PPO propensity of Motor claims at different thresholds, split by private and commercial vehicles. It only considers settlement years from 2008 onwards. We can see that the commercial propensity appears to be greater for all claim sizes.

Private/Commercial Propensity by Large Claim Threshold
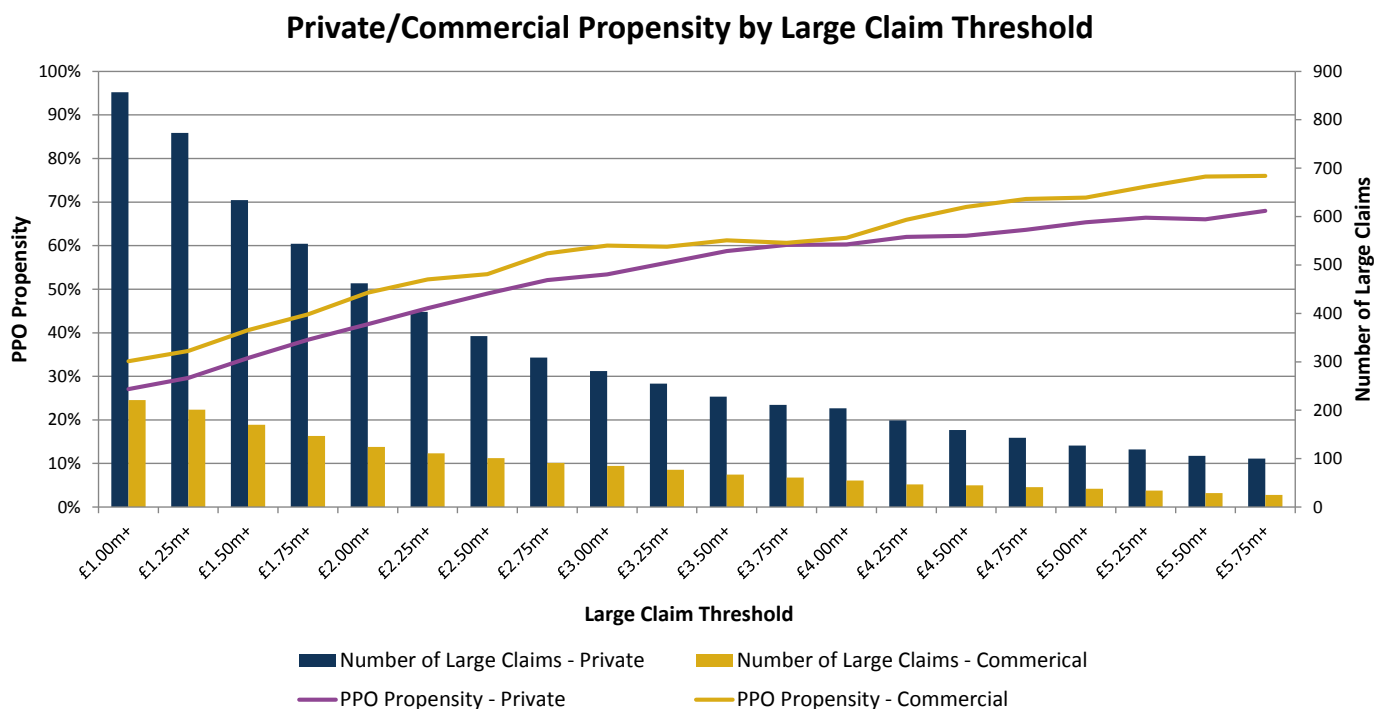
Figure 2.19: PPO propensity for private and commercial Motor by large claims threshold

2.28   Figure 2.20 below, however, shows less conclusive results. When looking at the propensity by settlement year the PPO propensity for commercial Motor is greater in settlement years 2009, and 2010, however since then it has dropped to be the same propensity as private Motor PPOs.
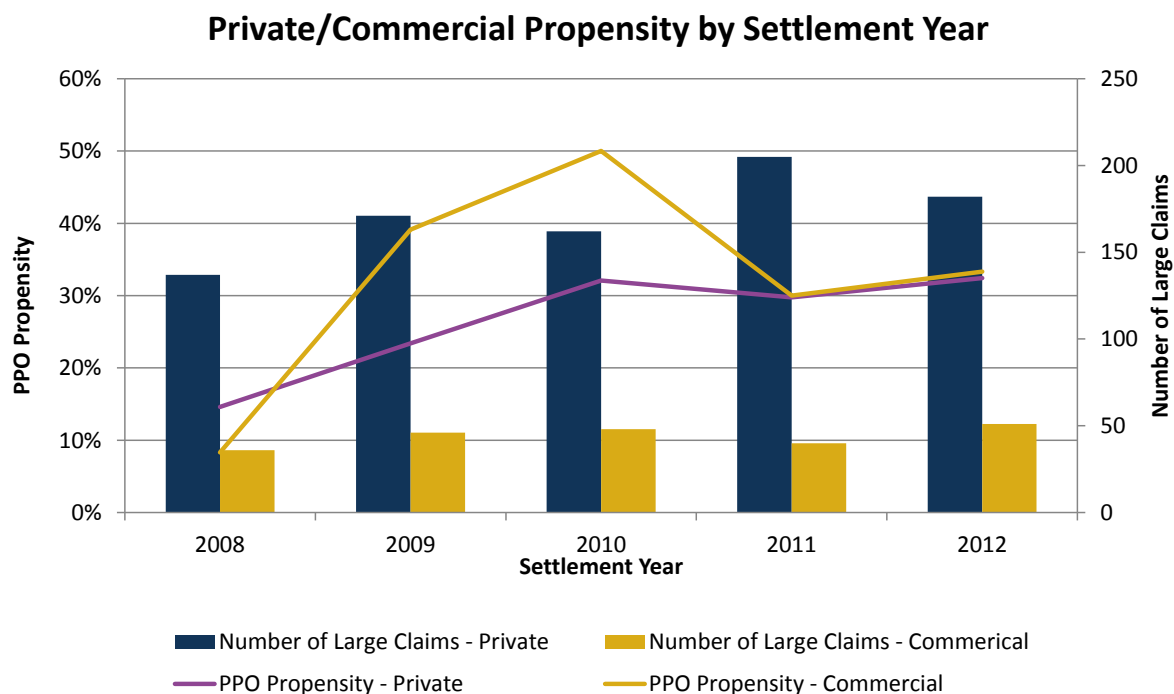
Private/Commercial Propensity by Settlement Year

Figure 2.20: PPO propensity for private and commercial Motor by settlement year

PPO Propensity – Liability

2.29 Figure 2.21 below shows Liability PPO propensity as a proportion of large claims (greater than £1 million in 2011 terms, indexed at 7% per annum). The exposure count shown in the graph includes PPOs with a value above £1million (indexed in the same way as the large claims).

2.30 The PPO propensity for Liability claims appears to still be significantly lower than that for Motor PPOs. The small number of Liability claims that have settled in each year is likely to have contributed to the volatility in experience. In particular, there was only one Liability PPO (above £1million indexed) that settled in 2008.

PPO Propensity of Large Claims - Liability
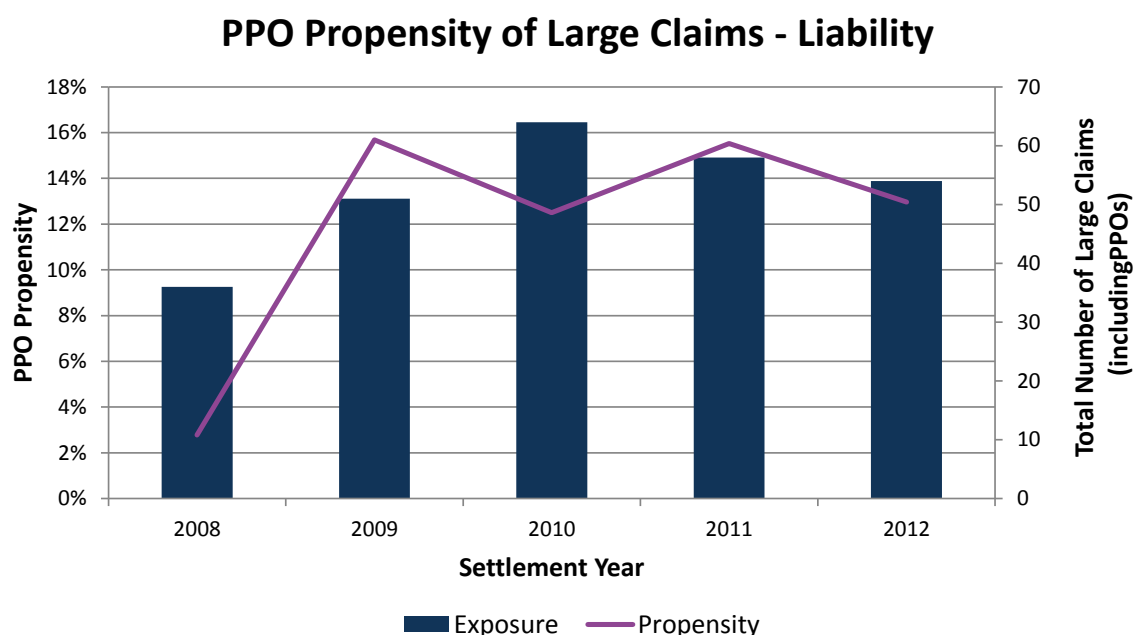
Figure 2.21: Proportion of Liability large claims that settle as a PPO, by settlement year

2.31 Figure 2.22 below shows the PPO propensity for Liability PPOs by large claim threshold. As in the Motor PPO propensity section, the threshold definitions are defined in monetary terms and indexed back at 7% per settlement year. The PPOs have been derived using a real discount rate of 2.5%. This graph and Figure 2.22 only represent claims settled since the beginning of 2009, and hence there are only 23 Liability PPOs included in these graphs.

2.32 Figure 2.22 shows that PPO propensity increases with the large claims threshold band until claims reach £3-4 million. However, there are only seven Liability PPOs greater than £4 million so the results will be volatile.

PPO Propensity at different Large Claim Thresholds - Incremental thresholds
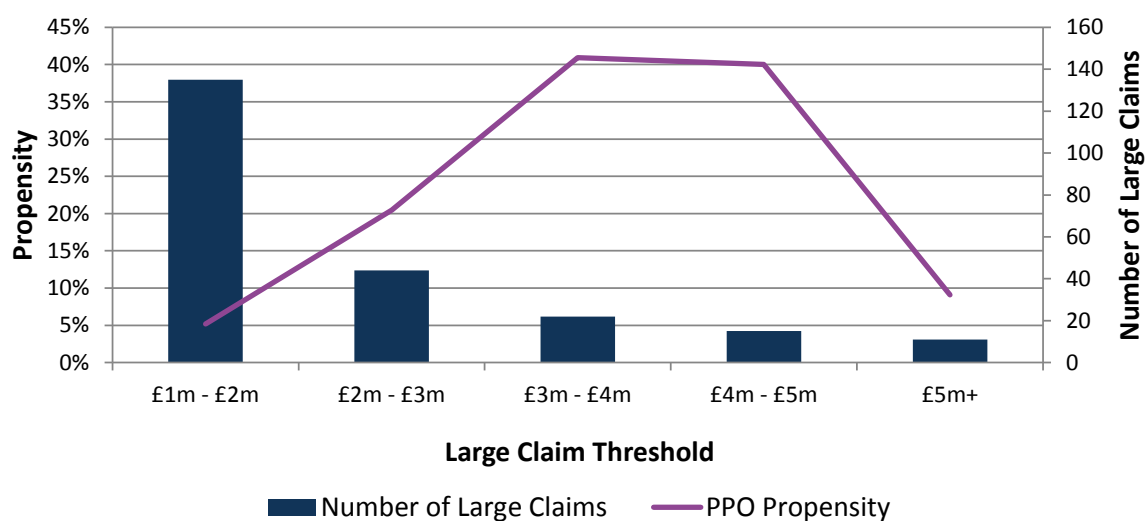

Figure 2.22: PPO propensity by large claim threshold bands (claims settled since 2009 only)

2.33   Figure 2.23 below shows the cumulative PPO propensity by large claim threshold. Unlike for Motor PPOs, after a threshold of £3 million, it appears as though propensity generally decreases as the threshold increases.

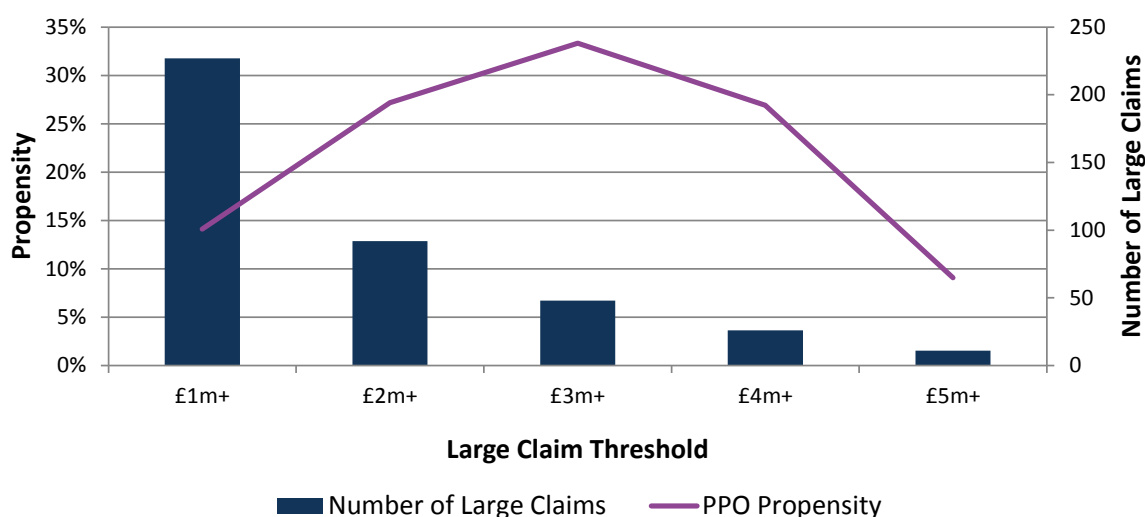## PPO Propensity at different Large Claim Thresholds - Cumulative thresholds

Figure 2.23: PPO propensity by cumulative large claim threshold (claims settled since 2009 only)

2.34   Liability PPOs are more likely to come from policies that have a limit on the cover provided, as opposed to Motor PPOs falling under unlimited Motor Bodily Injury cover. As a result, larger Liability claims may be less likely to settle as PPOs, which may explain the trend seen above in Figures 2.22 and 2.23 of a lower PPO propensity for the larger Liability large claims. However, the small amount of data makes it difficult to support this conclusion.

2.35 Figure 2.24 below shows the propensity of Liability PPOs as a measure of gross earned premium. The definition of gross earned premium is the same as that for Motor PPOs (see Section 2.25). These PPO propensity figures include all PPOs and not just those over £1million, and are in terms of the number of PPOs per £1,000 million of gross earned premium.
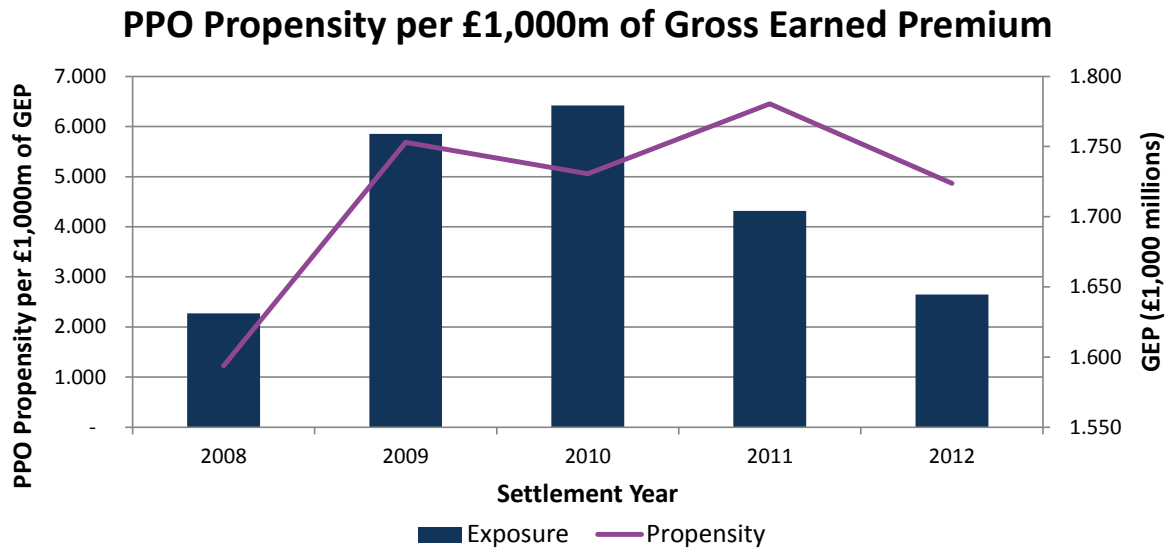
PPO Propensity per £1,000m of Gross Earned Premium

Figure 2.24: Propensity of Liability PPOs by gross earned premium

3. Motor PPOs – General Characteristics

Cover Type

3.1   The pie chart on the left shows the proportion of Motor PPOs split by cover type, and the one on the right shows the split of cover type based on premium data supplied by the contributors. They show that in total (over all insurers), the proportion of PPOs for private car cover corresponds to the proportion of premium that the cover makes up.
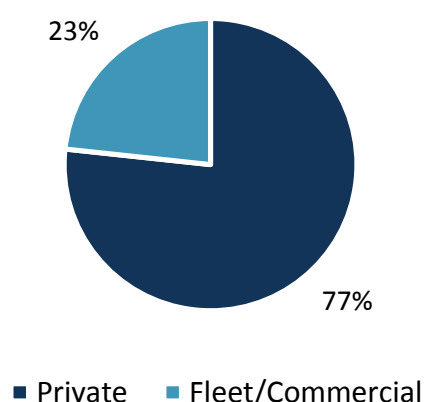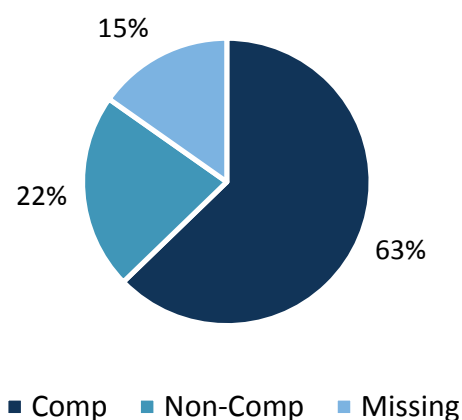
Split of Motor PPOs by Cover Type
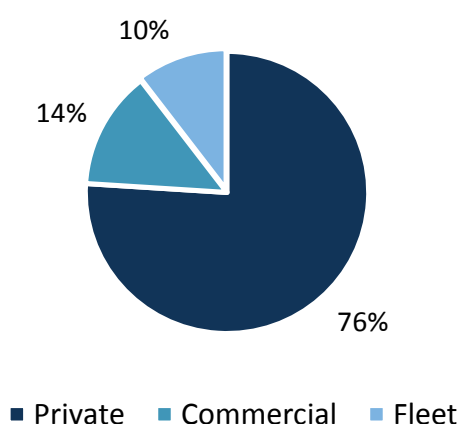
Premium Split

Figure 3.1: Commercial/ Private Split of Motor PPOs and Motor Premiums

3.2   Similarly, the following two charts compare the proportion of PPOs from comprehensive and non-comprehensive private Motor policies against the proportion of premium written.

Split of Private Motor PPOs
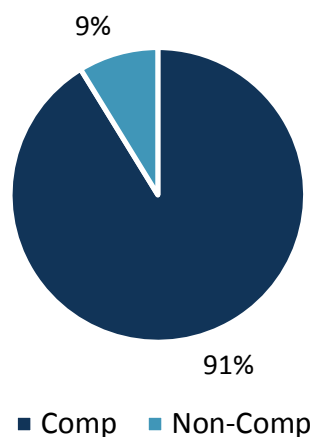
Premium Split

Figure 3.2: Comprehensive/ Non-Comprehensive Split of Motor PPOs and Motor Premiums

Indexation Measures

3.3   The index used to inflate annual payments was originally automatically linked to the Retail Prices Index (RPI). However, in 2006, a court case was brought in the form of Thompstone vs Tameside and Glossop Acute Services NHS Trust which questioned this assumption and suggested that the payments for future cost of care would be better linked to wage inflation. The court agreed and the annual inflation increase was linked to the Annual Survey of Hours and Earnings (ASHE). The case was appealed and a number of other cases were put on hold pending the outcome. In 2008 the Court of Appeal upheld the ruling that a different index other than RPI can be chosen if thought more appropriate. Since then the majority of PPOs have had inflation linked to ASHE as is shown in Figure 3.3 below.

3.4   PPOs can have different elements included within the regular stream of payments, for example they can include both a loss of earnings and a cost of care head of damage. These can be linked to different indices, so Figure 3.3 below just shows the index for the primary head of damage PPO payment, where the primary head of damage has been defined as the one for which the associated PPO amount is the largest.
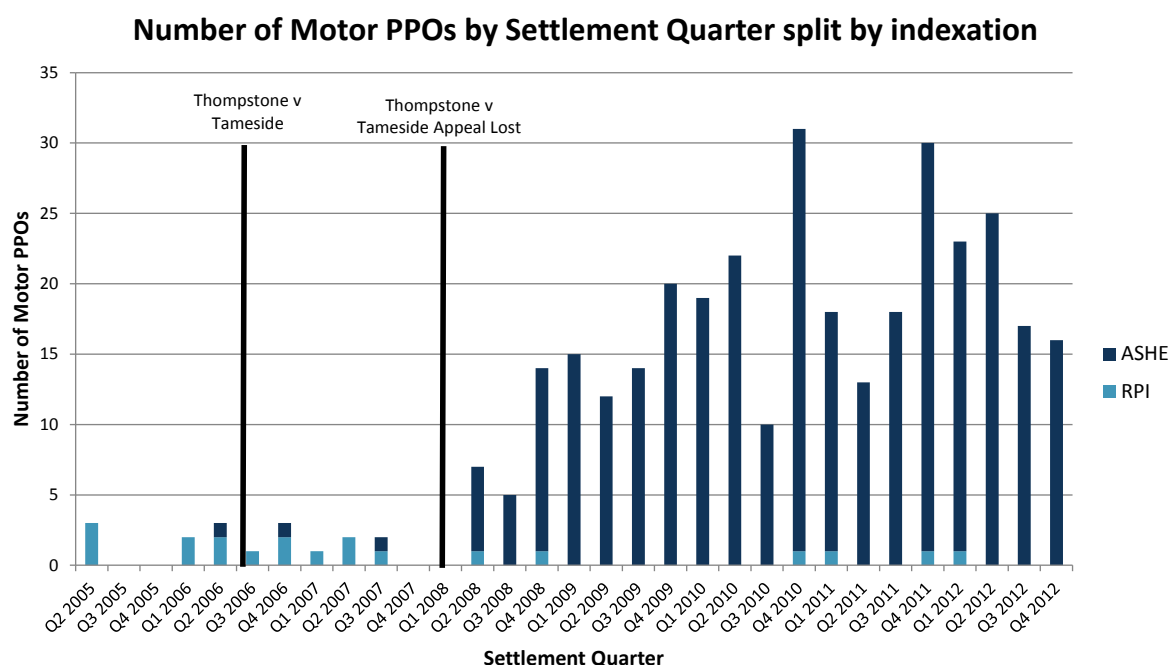
Number of Motor PPOs by Settlement Quarter split by indexation

Figure 3.3: Number of PPOs settled in each quarter split by index used for initial PPO for each claim

3.5   ASHE is produced by the Office of National Statistics (ONS) every November, based on data as at April. It covers a wide range of occupations, though the vast majority of PPOs so far have been linked to sub category 6115 relating to care assistants and home carers as for care rather than loss of earnings.

3.6   Within a particular job category the ASHE earnings inflation measures are further split into percentiles, i.e. a PPO will have the annual inflation linked to a specific percentile, for example to those whose earnings are in the top 10% of earners in the category, or the 90th percentile of earners, say.

3.7   As can be seen from the graph above, very few PPOs have been settled with just an RPI element in the last five years, the rest have all been ASHE. Of those relating to care costs that have been settled using ASHE as the index, all have been settled using ASHE 6115 (some periodic payments for nursing or earnings have used alternative ASHE indices).

3.8   As of this year, ASHE code 6115 (Care assistants and home carers) has been split into two new codes; 6145 (Care workers and home carers) and 6146 (Senior care workers). Even though the ONS have stated that they will continue to publish 6115, albeit separately to the main tables, 'for the foreseeable future', there is an additional complication since the basis of the ASHE 6115 figures has changed, and so a slight adjustment is required to be made to the figures for 2011 onwards. No PPOs have yet been settled that are recorded as being linked to one of the new ASHE codes.

3.9   There are a number of PPOs with multiple heads of damage; 27 PPOs or 7.8% of all Motor PPOs in the survey. Of these, where type was specified, there was a tendency for the second head of damage to cover loss of earnings.

3.10   Table 3.1 below shows the breakdown of all Motor PPO payments in the survey, by head of damage and indices. Note there are 375 PPO payment streams (corresponding to 346 Motor PPOs, 27 of which have second heads of damage and 2 that have a third head of damage).

All Heads of Damage	ASHE 6115	ASHE Other	RPI	Un-indexed	Missing	Total
Care	284	1	16			301
Loss of Earnings	7	8	3		1	19
Case Management			1			1
Rent/Accomodation			1	1		2
Other	1	0	3			4
NA/Missing	41	0	7			48
Total	333	9	31	1	1	375

Table 3.1: Index linked to each head of damage for Motor PPOs

3.11   "ASHE Other" in the table above corresponds to 8 different ASHE codes.

3.12   Of the 303 PPOs where the nature of the payment for the primary head of damage was specified, only 4 had a primary head of damage that did not relate to care (recorded as either: care, care and case management, or nursing) and were related to loss of earnings instead.

3.13   Of the 299 Motor PPOs with primary heads of damage that were recorded as being related to care, the vast majority of PPO payments with care as the primary head of damage are linked to ASHE with only 16 linked to RPI.
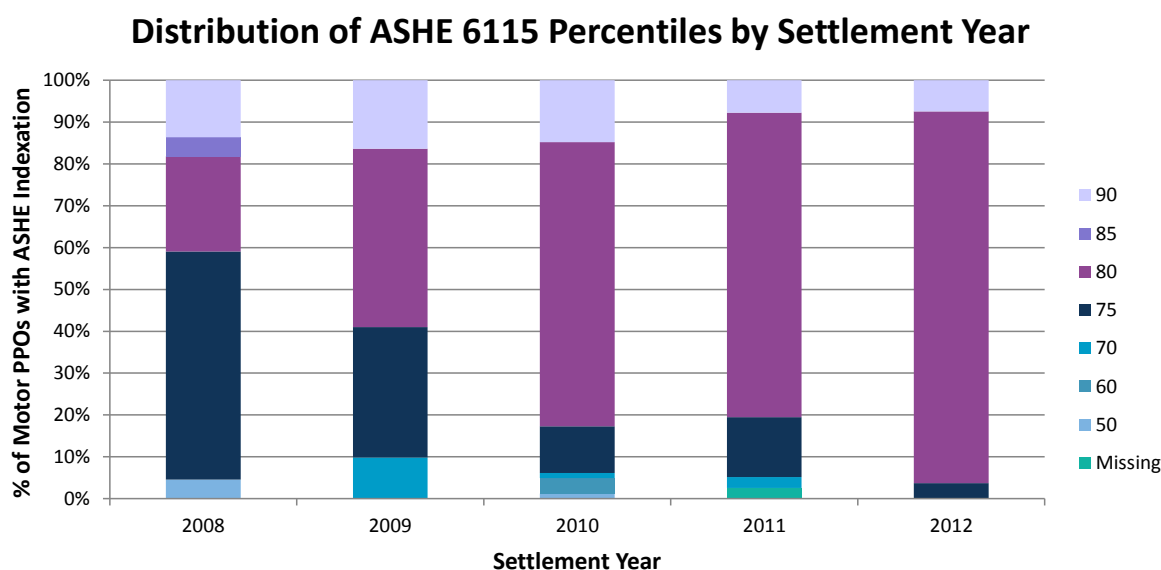
Distribution of ASHE 6115 Percentiles by Settlement Year

Figure 3.4: Distribution of ASHE 6115 Percentiles used for primary Head of Damage by Settlement Year

3.14   It can be seen in Figure 3.4 that there has been an increase in the use of the 80th percentile over time, which in the 2012 settlement year accounted for almost 90% of Motor PPOs; up from just over 20% in 2008. This appears to be primarily at the expense of the 75th percentile which was the most popular in 2008.

Claimant and Driver Details

3.15   Figure 3.5 shows the number of PPOs by age and gender of driver at the time of the accident.

3.16   The profile of driver age for males is similar to the claim frequency profile by driver age seen across the industry. This is less apparent for females, though this may just be due to the relatively small sample size for females. Please note, these figures are for private and commercial covers combined; the profile is different depending on which cover you are looking at (these differences are shown in Section 5).
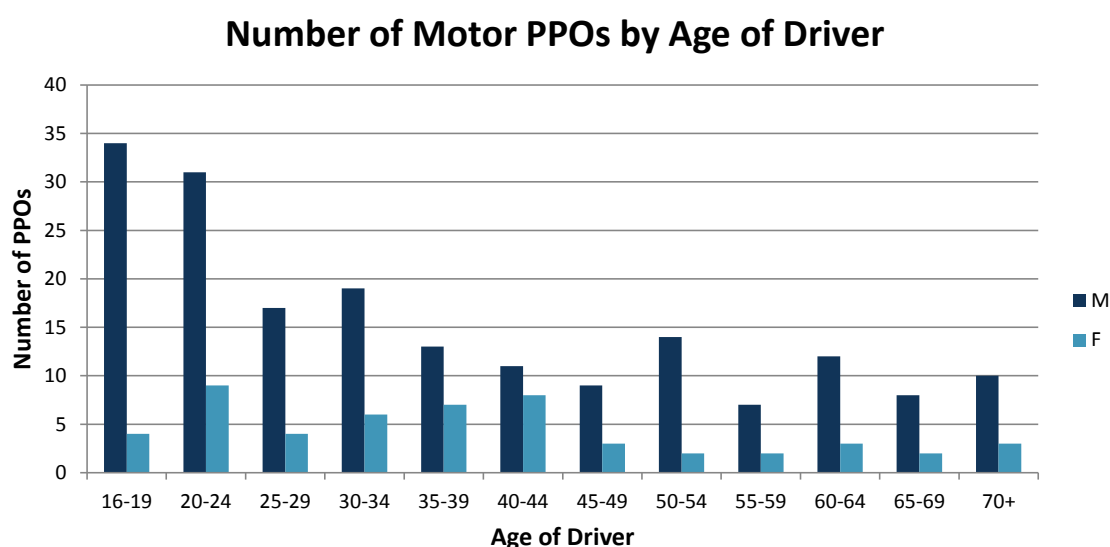
Number of Motor PPOs by Age of Driver

Figure 3.5: Age of Driver at the time of Accident by Gender

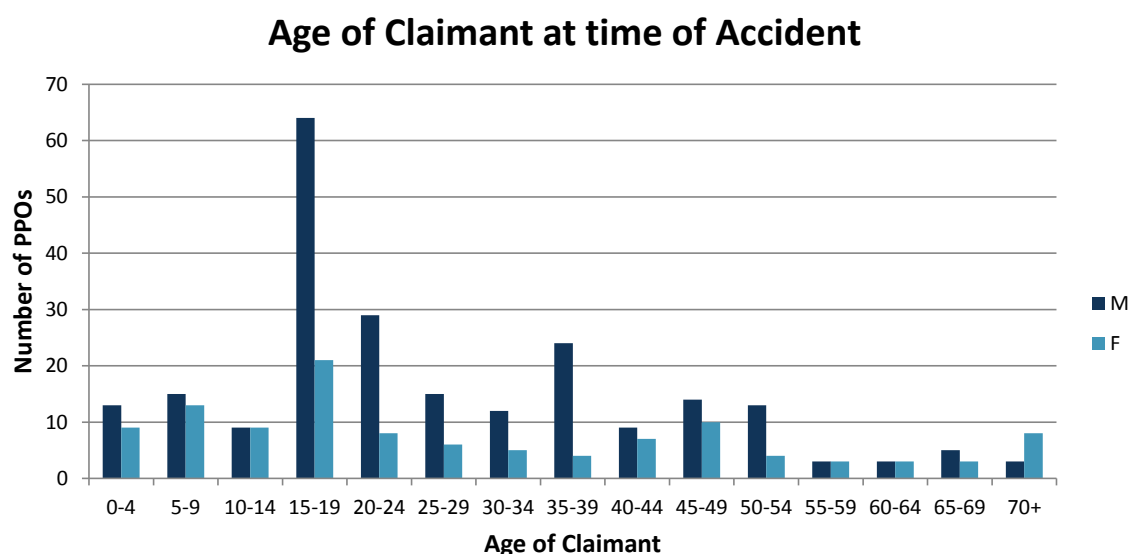3.17   There is a spike in claimant age between the ages of 15 and 19 which can be seen in Figure 3.6 below.

Age of Claimant at time of Accident

Figure 3.6: Age of Claimant at the time of Accident by Gender

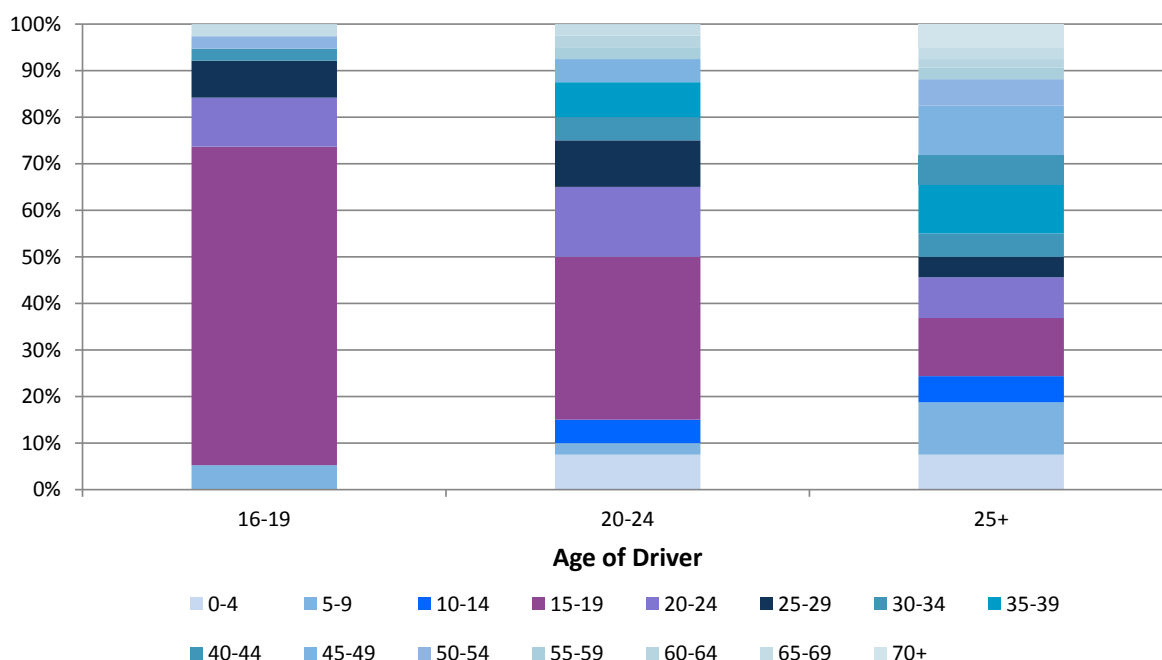# Age of Driver against age of Claimant at Time of Accident

Figure 3.7: Age of Claimant at the time of Accident

3.18 Figure 3.7 above, shows that there is a strong relationship between young drivers and young claimants. In particular the 16-19 driver age bracket has over 80% of PPO claimants under 25. This may be due to a feature of young male drivers tending to drive around with a group of similarly aged friends in the car and being more likely to have a serious accident at speed.

3.19 However it is worth noting that claimants between the ages of 15 and 24, where the drivers are also between these ages, only represent 49 (or 14%) of Motor PPO claims in this survey.

3.20 Claimants who are younger at the time of the accident tend to have longer settlement delays; this is likely to be due to the fact that minors are advised to wait until they are at least 18 before seeking to settle their claims, as only then then can a fair medical prognosis of their condition be made. This would explain the spike in settlements at durations of 13 to 14 years in the Figure 3.8 below.

3.21 Figure 3.8 below suggests that the distribution of PPOs by delay to settlement appears to be shifting towards shorter durations, with the average decreasing from 6.8 years for claims settled in 2009 to 6.3 years for claims settled in 2012. PPOs settled in 2011 also had an average settlement delay of 6.3 years, but the shape of the distribution for the 2012 settlement year looks significantly different to previous settlement years.
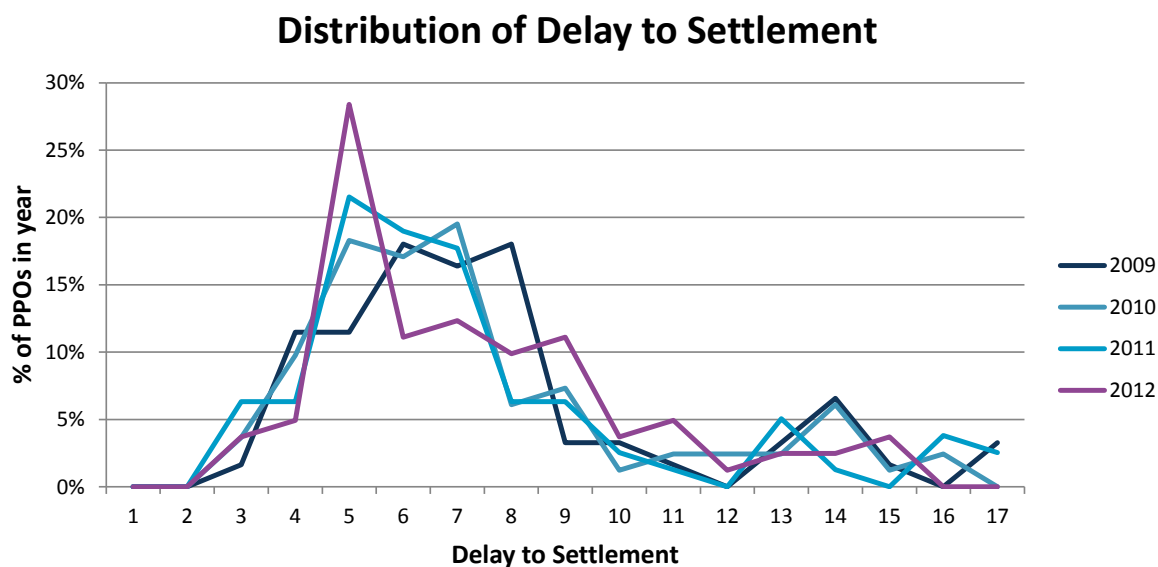
Distribution of Delay to Settlement

Figure 3.8: Distribution of Delay to Settlement by Settlement Year
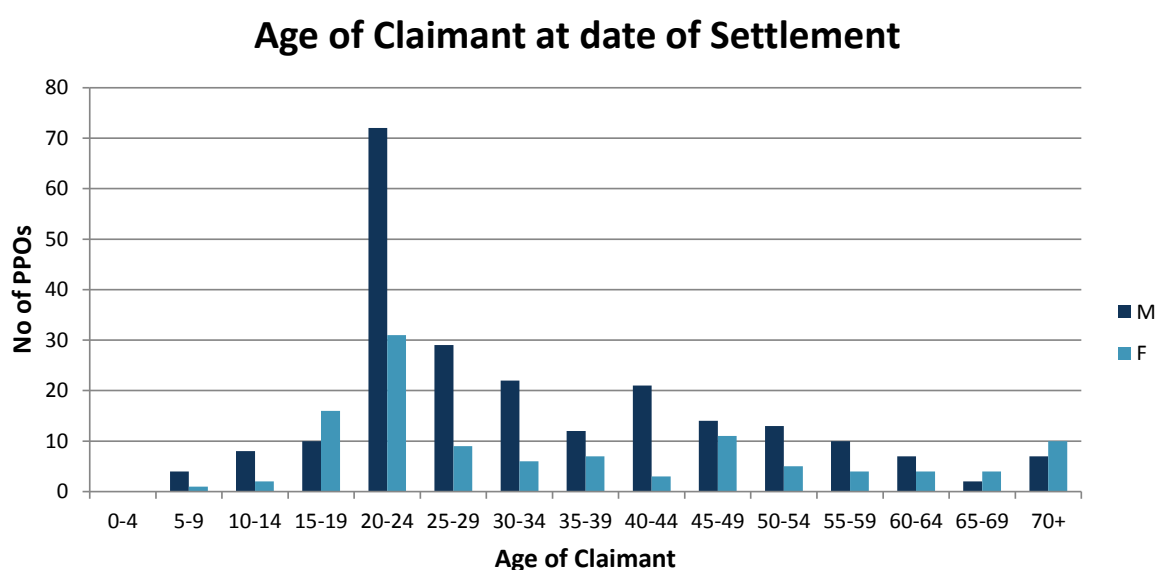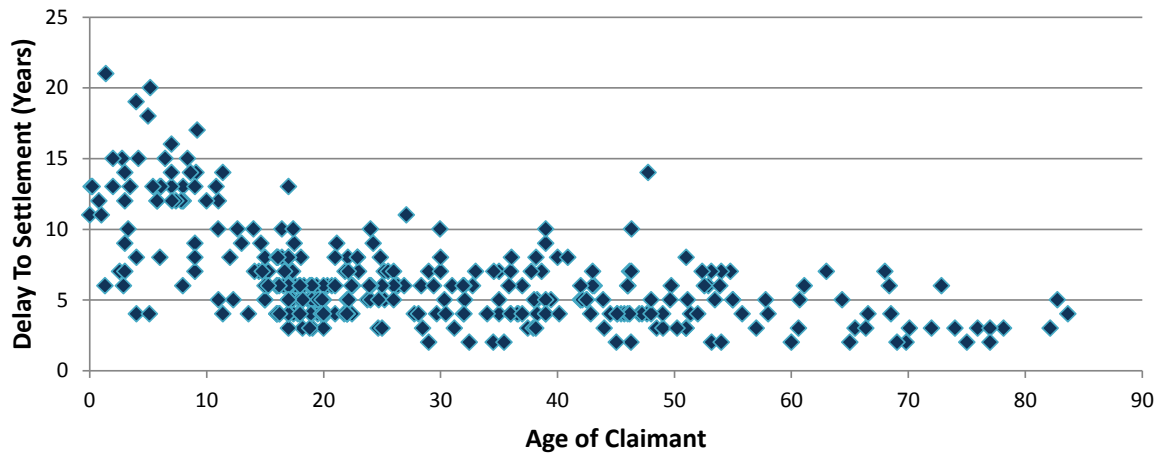
Age of Claimant at date of Settlement

Figure 3.9: Age of Claimant at the time of Settlement by Gender

3.22 The peak in the number of PPOs for claimants aged 20-24 at settlement date seen above in Figure 3.9 corresponds to the peak in number of PPOs for claimants aged 15-19 at age of accident as seen in Figure 3.6.

Age of Claimant At Accident date against Delay To Settlement

Pearson Correlation Coefficient	-0.53
Spearman Correlation Coefficient	-0.54

Figure 3.10: Scatter Graph showing age of claimant at the time of accident against delay to settlement

3.23   The above scatter plot shows that longer delays to settlement are more likely for claimants under 18; this is probably due to the effect of minors waiting until the age of maturity for settlement as discussed above. This is emphasized in Figure 3.11 below which shows the average delay to settlement for each of the claimant age bands.
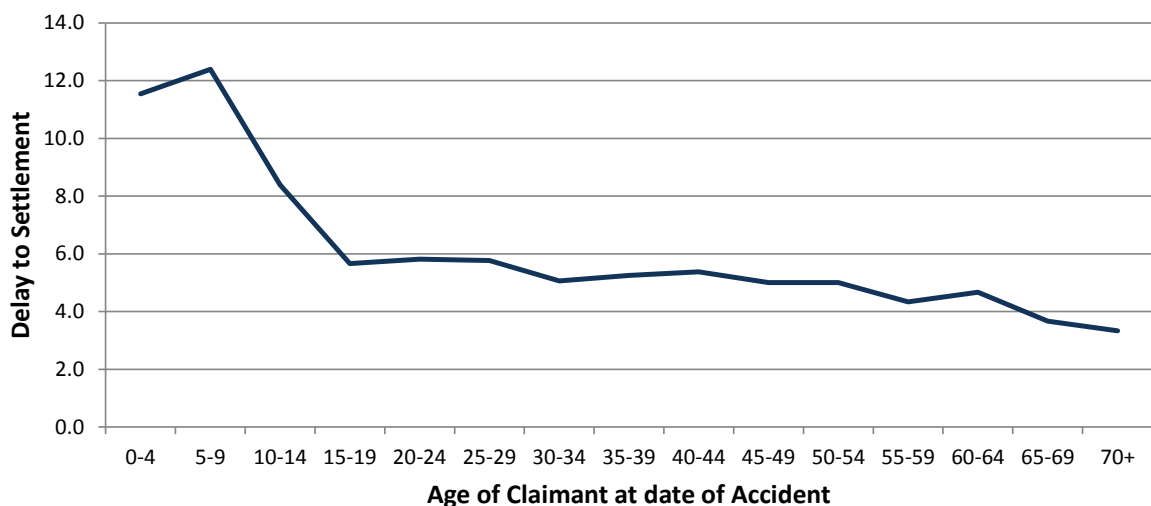
Average delay to Settlement

Figure 3.11: Average Delay to Settlement by Age of Claimant at Accident date

Future Life Expectancy

3.24   The term 'life expectancy' in this document is defined as the future life expectancy at the time of settlement, as per the survey responses. There is likely to be a wide variation in the practise of determining the future life expectancy in the market. Figure 3.12 shows the distribution of life expectancy for the 336 Motor PPOs for which it was provided.
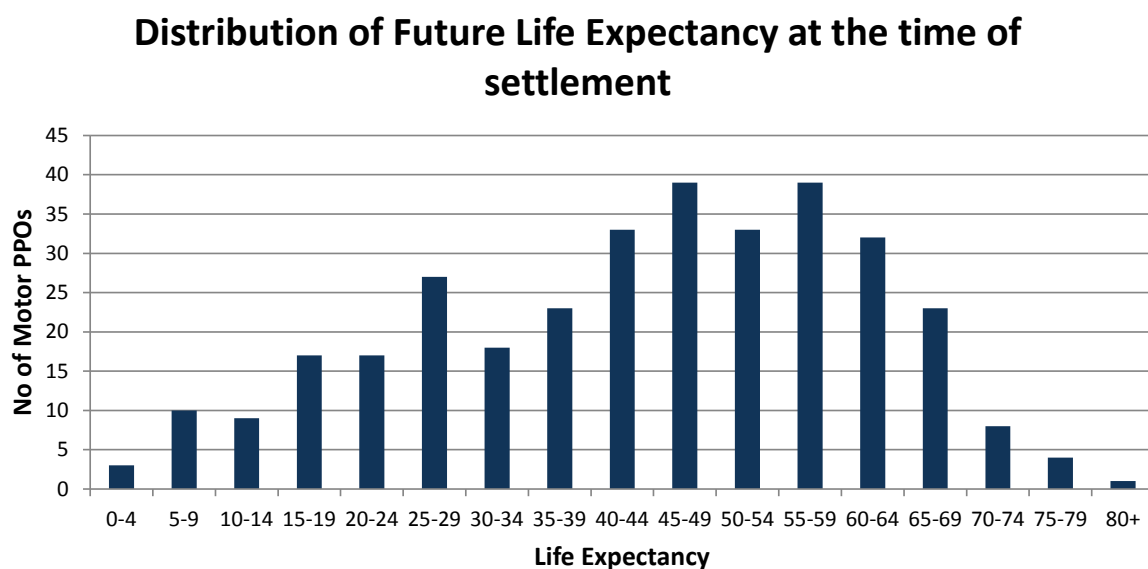
Distribution of Future Life Expectancy at the time of settlement

Figure 3.12: Distribution of future life expectancy from date of settlement

3.25   It is no surprise that future life expectancy reduces with age of claimant. This can be seen clearly in Figure 3.13 below.

Age of Claimant at Settlement Date against Future Life Expectancy

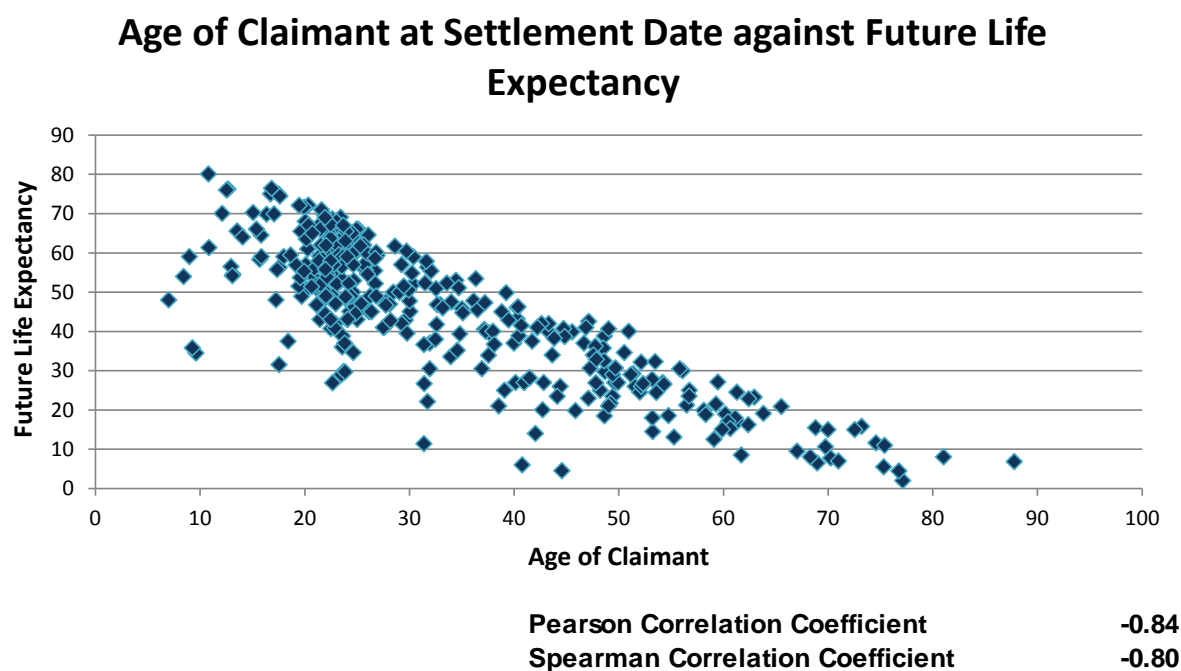| Pearson Correlation Coefficient | -0.84 |
| Spearman Correlation Coefficient | -0.80 |

Figure 3.13: Scatter Graph showing age of claimant at date of settlement against future life expectancy from date of settlement

3.26   However there is no discernible correlation between age of claimant and reduction in future life expectancy compared to an unimpaired life. This is illustrated in Figure 3.14 below.

3.27   Percentage reduction in life expectancy is defined as:

$$\frac{Unimpaired\ Life\ Expectancy - Life\ expectancy\ as\ provided\ by\ contributors}{Unimpaired\ Life\ expectancy}$$

Where the unimpaired life expectancy is taken from the version 7 of the Ogden tables and all life expectancies are quoted as at date of settlement.
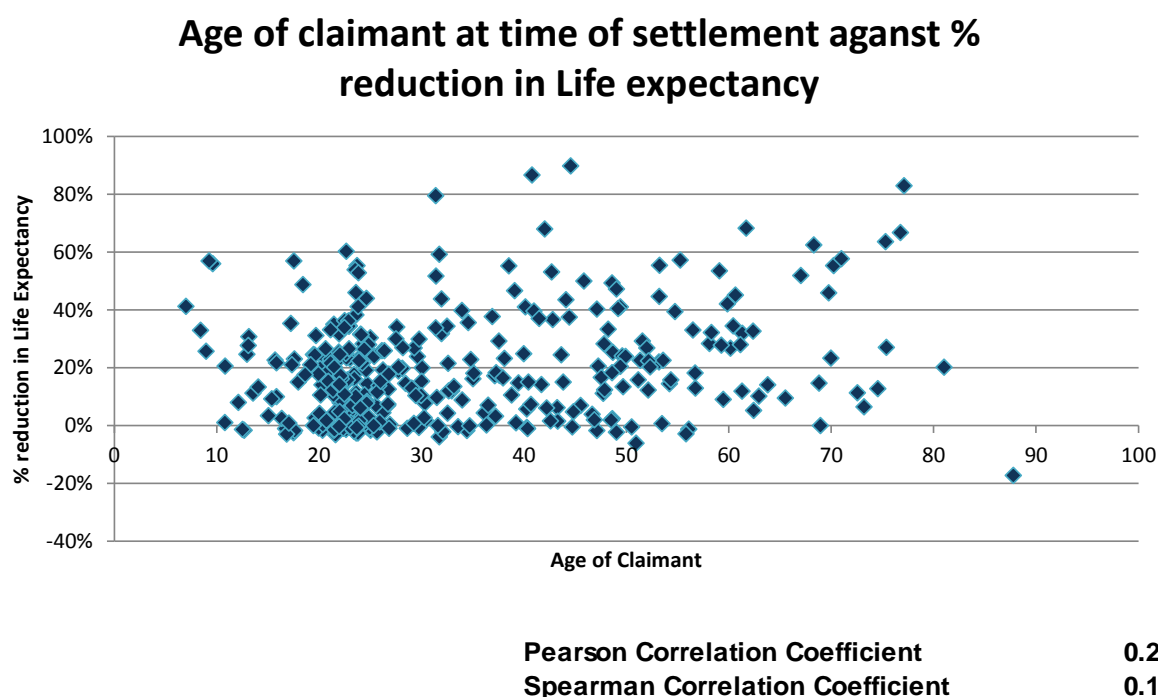
Age of claimant at time of settlement aganst % reduction in Life expectancy

| Pearson Correlation Coefficient | 0.23 |
| Spearman Correlation Coefficient | 0.18 |

Figure 3.14: Scatter Graph showing age of claimant at date of settlement against % reduction in life expectancy

3.28   Figure 3.14 shows some cases of negative reductions in life expectancy; this is likely to come from differences between the unimpaired life expectancy taken from the Ogden 7 tables and that used by the insurer. The reasons for these differences are unclear, but one possible explanation is that the insurer assumes greater longevity improvements than those incorporated in the Ogden 7 tables.

Lump Sums and Initial Payments

3.29   Figure 3.15 below shows the distribution of the lump sum elements of Motor PPOs in the survey (where the lump sum element excludes the first regular PPO amount). Note that all the lump sum values are in nominal terms.
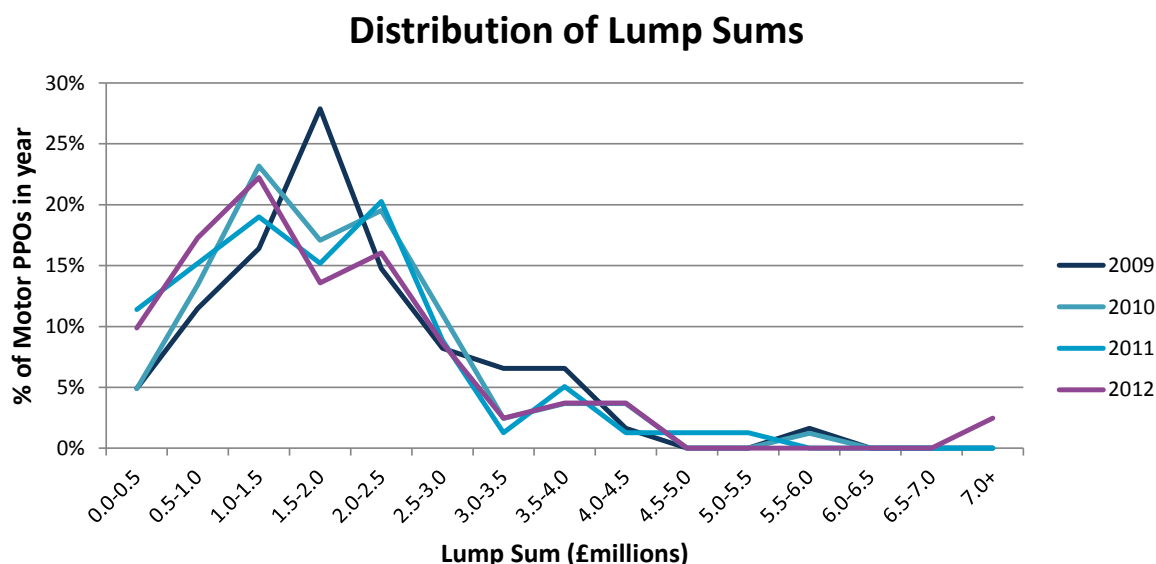
Distribution of Lump Sums

Figure 3.15: Distribution of size of Lump sums associated with a PPO, split by settlement year

3.30   Figure 3.16 below shows the distribution of the initial regular payment amount of Motor PPOs in the survey at the time of settlement. It should be noted that in cases where one claimant is awarded more than one series of payments (corresponding to different heads of damage) the PPO amount is the sum of the payments for all heads of damage. The un-inflated initial PPO payment has been used which is the size of the annual payments at settlement (before any stepped payments kick in).

3.31   These figures have not been indexed and are in nominal terms for simplicity. However, as the inflation measured by the ASHE index has been negligible since 2009 they wouldn't look much different on an indexed basis.
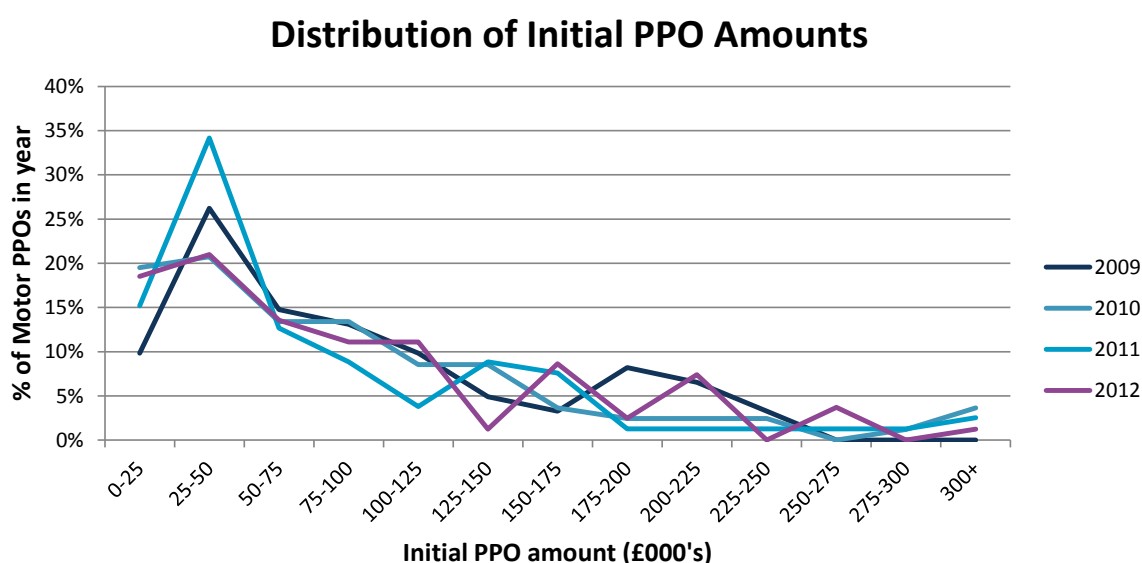
Distribution of Initial PPO Amounts

Figure 3.16: Distribution of size of initial regular PPO payment, split by settlement year

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3.32 The distributions of PPO amounts and lump sum amounts appear to have followed reasonably consistent distributions over the last 4 years (especially when taking into account the relatively small sample size).

3.33 Unsurprisingly, there is some positive correlation between the size of lump sum awarded and the size of the annual PPO amount as demonstrated in the Figure 3.17 (which compares the nominal amounts of both).
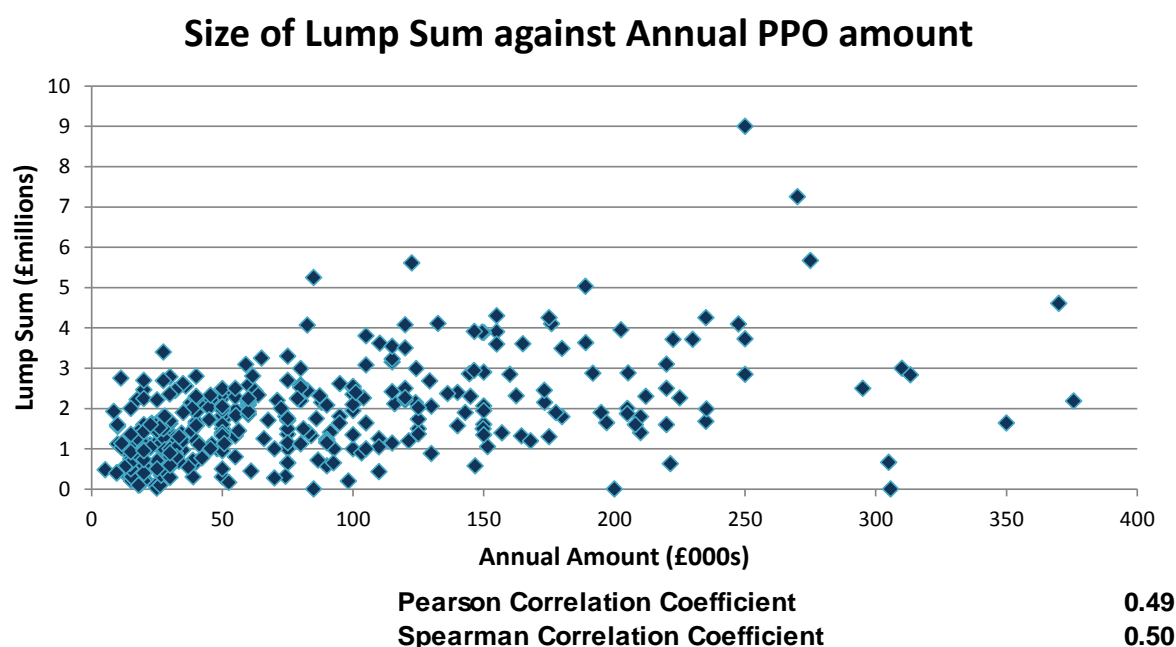
Size of Lump Sum against Annual PPO amount

| Pearson Correlation Coefficient | 0.49 |
| Spearman Correlation Coefficient | 0.50 |

Figure 3.17: Scatter of the initial annual PPO amount and the Lump sum amount

3.34 It can also be seen that there is a partial trend where PPOs with larger reductions in life expectancy have higher annual PPO amounts; this would make sense as more serious injuries are likely to have higher care costs and will also lead to shorter life expectancy.
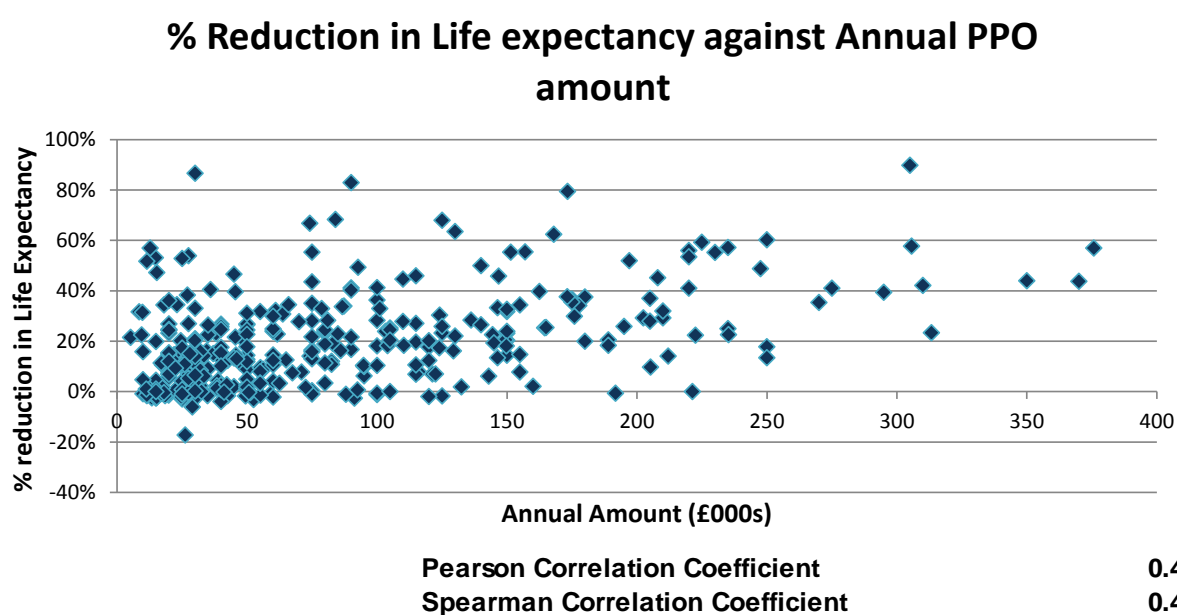
% Reduction in Life expectancy against Annual PPO amount

| Pearson Correlation Coefficient | 0.47 |
| Spearman Correlation Coefficient | 0.45 |

Figure 3.18: Scatter Graph of reductions in life expectancy and PPO payment amounts

Stepped PPOs

3.35   A significant proportion (29%) of Motor PPOs have stepped payments. A stepped PPO is a PPO where there is a provision for step changes in the regular payment to be made. These stepped changes will apply at fixed points in time to situations where a specific change in circumstance has already been foreseen at the time of settlement. For example, there could be a step payment of a one-off increase in payments to be made to account for a claimant whose parents are the primary carers. This would allow for the time when the parents cannot deliver the same standard of care and additional care costs will need to be incurred.

3.36   Note that this is different to a variation order, which is an allowance for a change in the payment amount usually triggered by a certain event such as the claimant developing more symptoms in the future as a result of the original accident. The variation order only specifies the conditions of the trigger event at the time of settlement and does not specify the amounts that the payments will change to. Indemnity and Reverse Indemnity guarantees are also not included as stepped payments. (See 'Other Statistics' below).

3.37   The majority of step changes tend to be increases, but it should be noted that the step change can be both upward and downward.

3.38   The following graph in Figure 3.19 shows that claimants at younger ages are more likely to have stepped payments. Younger claimants are more likely to require changes to their care as they grow older which suggests why we see this trend. The ages shown are age at accident date.
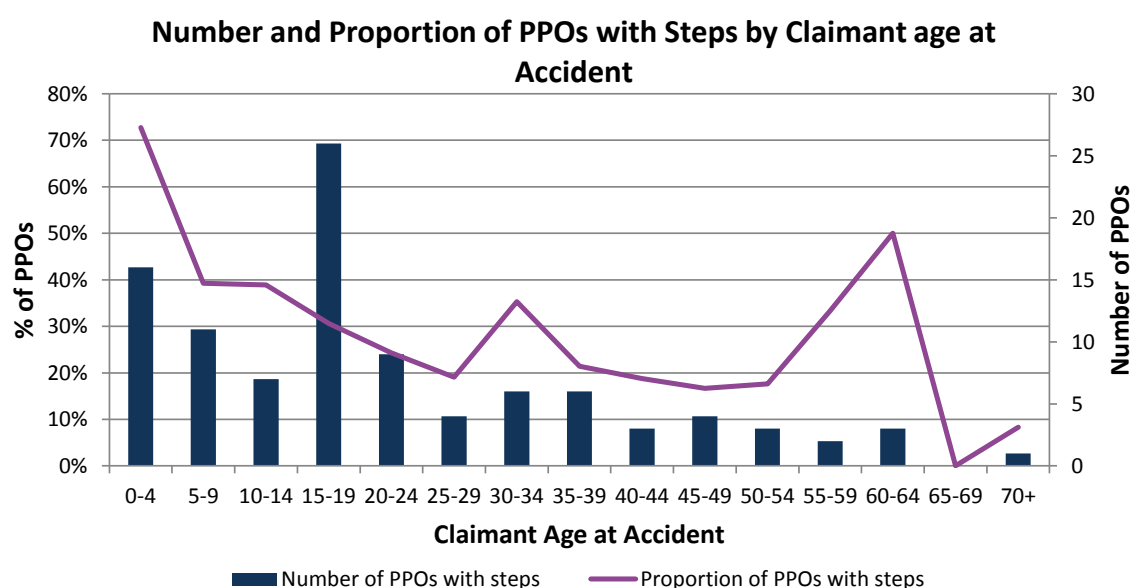
Number and Proportion of PPOs with Steps by Claimant age at Accident

Figure 3.19: The number and proportion of Motor PPOs that include a step payment agreement by age of claimant

3.39   The data suggests that claimants with a spinal injury are also more likely to have a stepped payment than those with a brain injury (43% against 25%). This might be a result of the care regime for spinal injuries being more variable over a claimant's lifetime than that for brain injuries. As claimants with spinal injuries get older, they require a much higher level of care than previously.

Other Statistics

3.40 Table 3.2 below shows some statistics regarding the proportion of Motor PPOs that have various features. Please note that these figures are the number of PPOs that are recorded as having the feature divided by the total number of Motor PPOs for which a response to that particular question was received. The table also shows the number of responses received (note that there are 346 Motor PPOs in total in the survey).

Feature	Proportion of Motor PPOs	Number of Responses
Stepped Payments	29%	346
Variation Orders	8%	302
Contributory Negligence	21%	330
Indemnity Guarantees	7%	296
Reverse Indemnity Guarantees	36%	184

Table 3.2: Proportion of PPOs with different features

3.41 There are 25 Motor PPOs with variation orders in the market. Of these, the 12 with descriptions provided, all allow for revision of the order if pre-specified conditions develop. Data was not sufficient to establish whether the severity of injury of the claim is correlated with variation orders, however, of these 25 PPOs, a disproportionately high number related to spinal injuries (64% as compared to the general Motor PPO population proportion of 22%).The most prominent pre-specified condition that could lead to a revision of the PPO is deterioration due to Syringomycelia (cyst within the spinal cord). Other conditions include epilepsy.

3.42 76% of Motor PPOs are paid annually and 18% quarterly with the rest being paid either monthly or bi-annually. More than half the number of insurers who contributed to the survey only make annual payments.

3.43 The vast majority of claims have a single PPO claimant, with just 4 accidents that have two PPO claimants.

3.44 Only 21% of claims, for which the relevant information was provided, had some sort of contributory negligence. (This data has been better recorded as only 5% of PPOs had this information missing as opposed to 31% last year).

3.45 In the majority (83%) of cases for which information was provided as to who decided on (pushed for) the PPO, it was solely the claimant who decided on the PPO. In 11% of cases it was a mutual decision between claimant and defendant, and about 6% of the cases were decided on by court. There was one PPO where the decision was driven by the defendant.

3.46 An indemnity guarantee is a guarantee given by the insurer to pay additional costs in circumstances such as where services provided by the local council are reduced or withdrawn in the future. A reverse indemnity guarantee would cover the opposite situation; for example, where the insurer can reduce their payments if the claimant increases their reliance on public provision of care.

3.47 Indemnity guarantees appear to be quite rare, applying to only 21 PPOs. However reverse indemnity guarantees appear to be more frequent; occurring in 66 Motor PPO cases.

3.48 The "Name of Third Party Legal Firm" field was filled in well this year with about 200 different solicitors named out of 305 PPOs with details supplied.

3.49 Irwin Mitchell and Stewarts together make up about a third of all Motor PPO cases.

4.   Motor PPOs – Nature of Injury

4.1   The vast majority, about 70%, of the PPOs in the survey related to brain injuries and 23% related to spinal injuries. Some claimants suffered multiple injuries so Figure 4.1 represents only the primary injury.
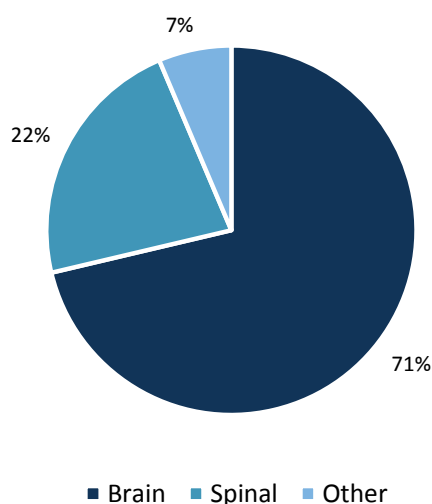
Nature of Primary Injury - Motor

Figure 4.1: Pie chart showing Motor PPOs by Injury

Injury Analysis

4.2   The proportion of Motor PPOs from brain injuries has seen an increase in 2012. The proportion of spinal injuries has fluctuated by settlement year, though we note there are fewer PPOs with spinal injuries which may contribute to the volatility.

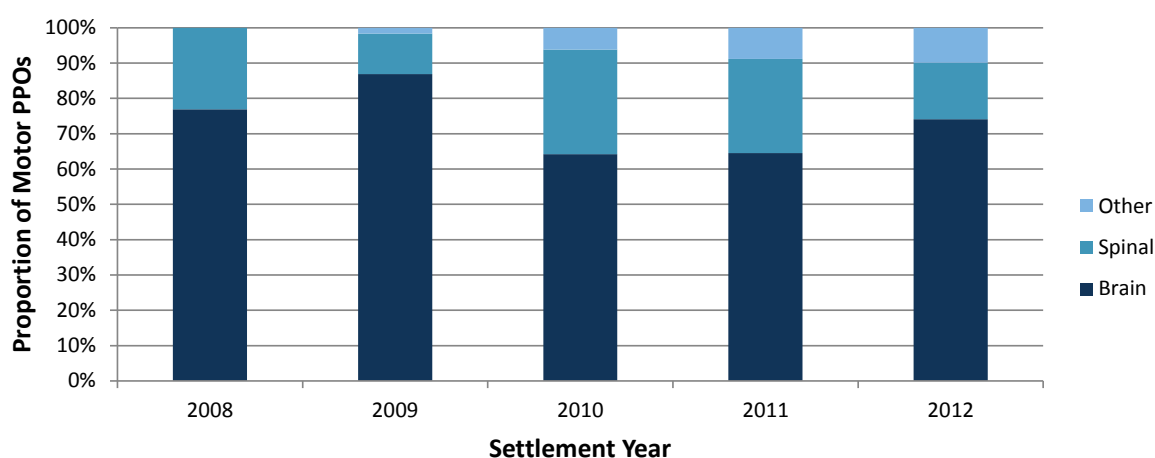### Proportion of Motor PPOs by Settlement Year and Injury Type

Figure 4.2: Proportion of Motor PPOs relating to Brain and Spinal Injuries by settlement year

4.3   Figure 4.3 below shows the proportion of PPOs that were due to brain and spinal injuries at different age bands. The graph suggests that the younger the Motor claimant is at the accident date the higher the chance the injury is a brain related one.
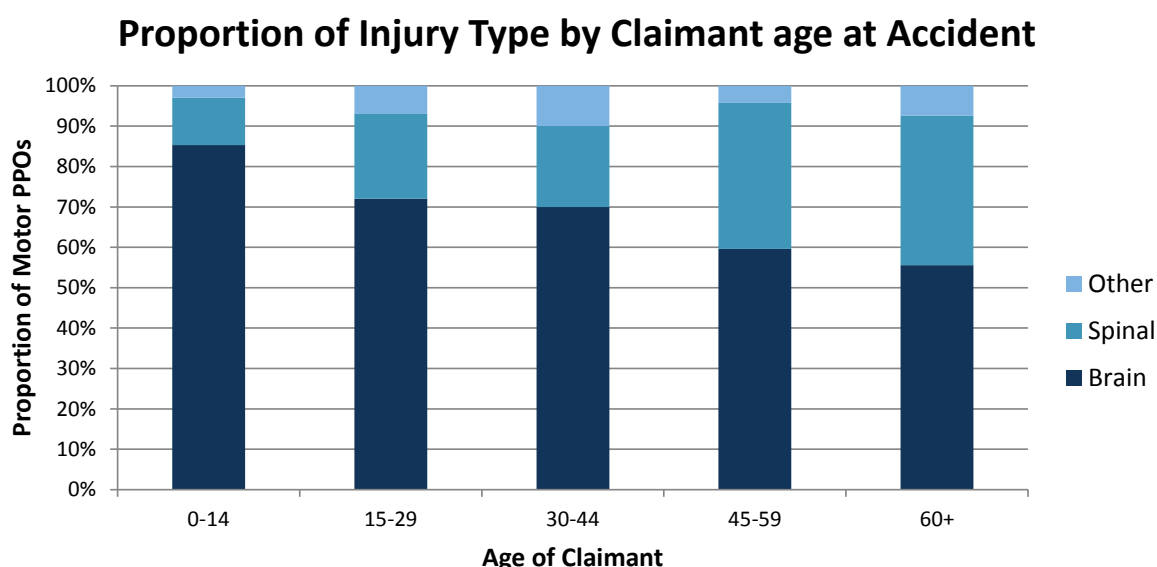
Proportion of Injury Type by Claimant age at Accident

Figure 4.3: Proportion of Motor PPOs by injury type split by age of claimant at time of accident

4.4   The following graph shows the number of PPOs in each banding to give an indication of credibility.

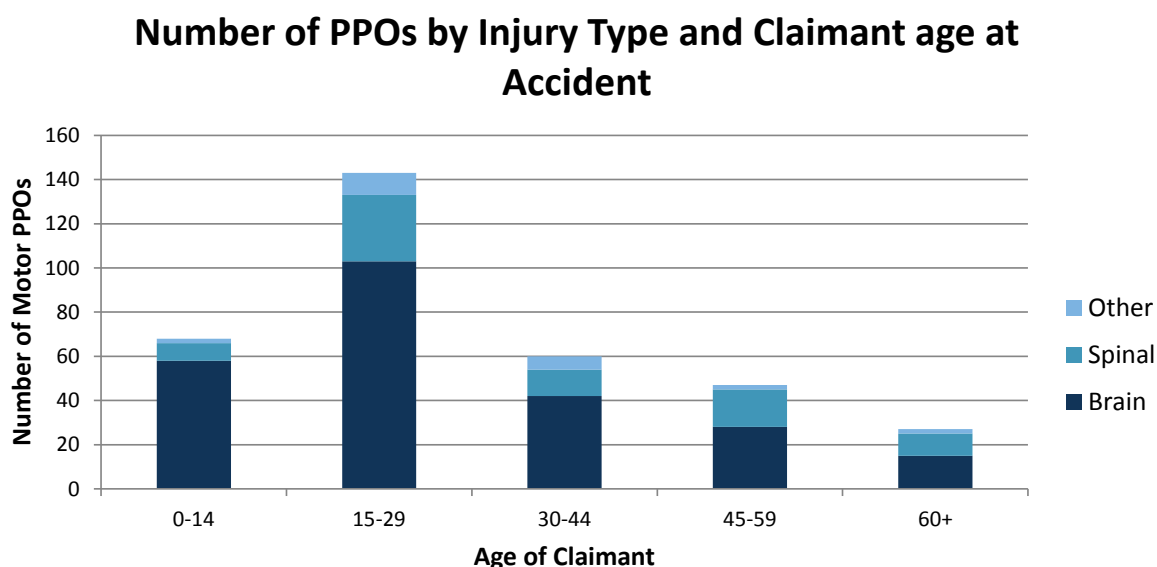## Number of PPOs by Injury Type and Claimant age at Accident

Figure 4.4: Number of Motor PPOs by injury type split by age of claimant at time of accident

4.5   Note that we are now only going to consider brain and spinal injuries and will be ignoring the 7% of other injuries.

4.6   Figure 4.5 below suggests that PPOs with claimants suffering from spinal injuries are settled quicker than those involving claimants with brain injuries (4.8 years on average as compared

to 6.9 years); in the graph below the peak can be seen to be sooner and the tail is much less. This could be because spinal injuries are easier and clearer to diagnose quicker. However it could also be related to brain injury claimants generally being younger as discussed in Section 4.3.
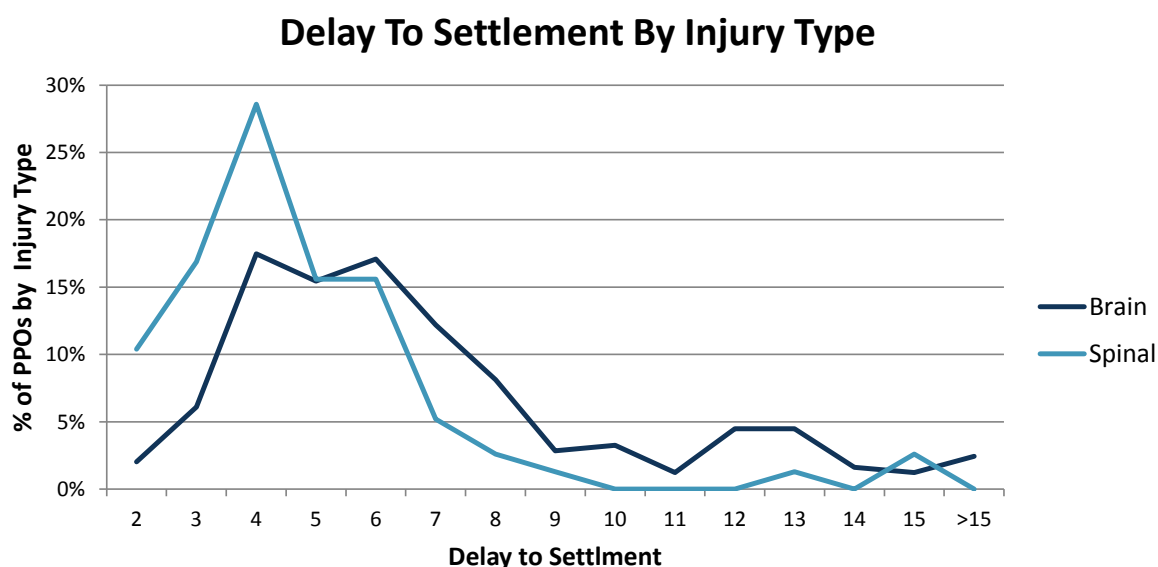
Delay To Settlement By Injury Type

Figure 4.5: Distribution of Delay to settlement in years from accident date, split by Injury type

4.7   The following graph shows the distributions of reduction in life expectancy compared to unimpaired life expectancy, by injury type. The data suggests that these distributions are significantly different, with claimants suffering from spinal injuries typically experiencing greater reductions. The average future life expectancy at settlement for brain injuries is 47 years and is 35 years for spinal injuries, with the average reduction from unimpaired life expectancy being 16% and 32% respectively. This will be partly due to the majority of young claimants suffering brain injuries, as seen in Figure 4.3, but may not explain the trend fully.
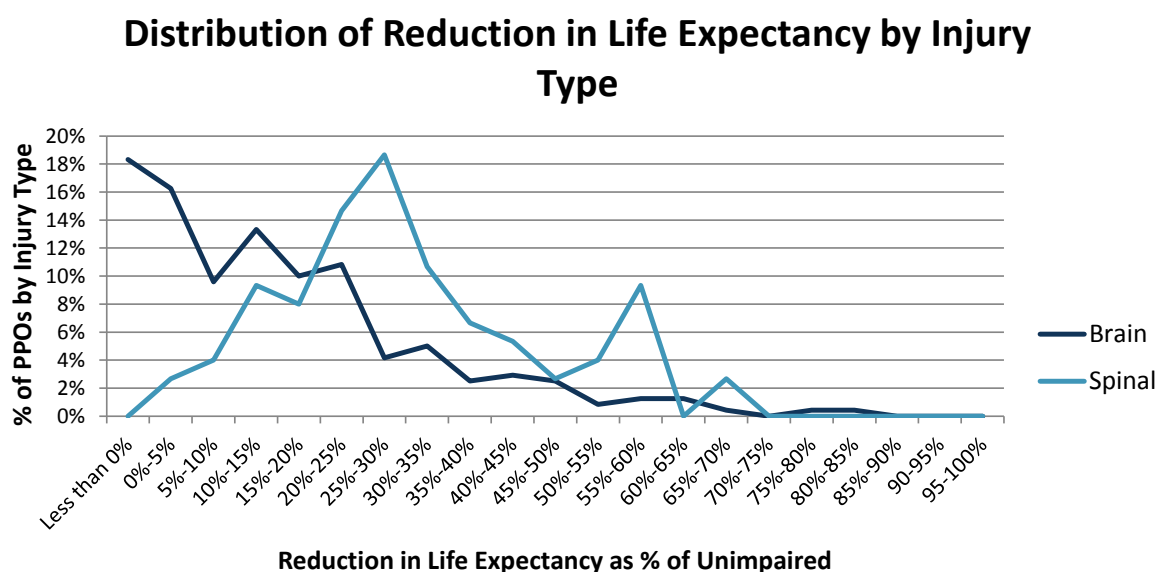
Distribution of Reduction in Life Expectancy by Injury Type

Figure 4.6: Distribution of Reduction in life expectancy (as percentage of unimpaired), by Injury type

4.8   Spinal injury PPOs have a higher average lump sum than brain injury PPOs, at £2.3 million
       for spinal injuries and £1.7 million for brain injuries (where both figures are in nominal terms
       and do not consider inflation over settlement years), which can be seen in the distributions
       shown in Figure 4.7 below. Note that the graph below also uses the nominal value of the lump
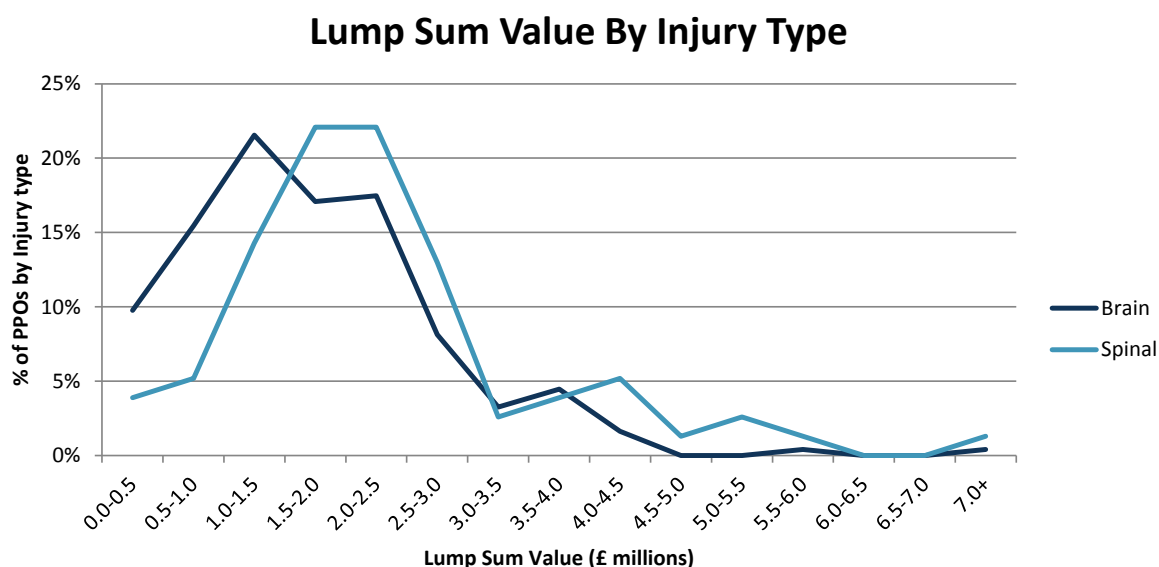   sums.

Lump Sum Value By Injury Type

Figure 4.7: Distribution of Lump Sum values, split by Injury type

4.9   As with lump sums, the annual PPO amounts for spinal injuries are also typically higher than
       those for brain injuries, as seen below in Figure 4.8 (with the average annualised PPO
       amount in nominal terms for spinal injuries at £112,600 compared to £78,700 for brain
       injuries). Note that in the above figures and the below graph the annualised PPO amounts
       include payments for all heads of damage, and are the amounts initially paid at settlement
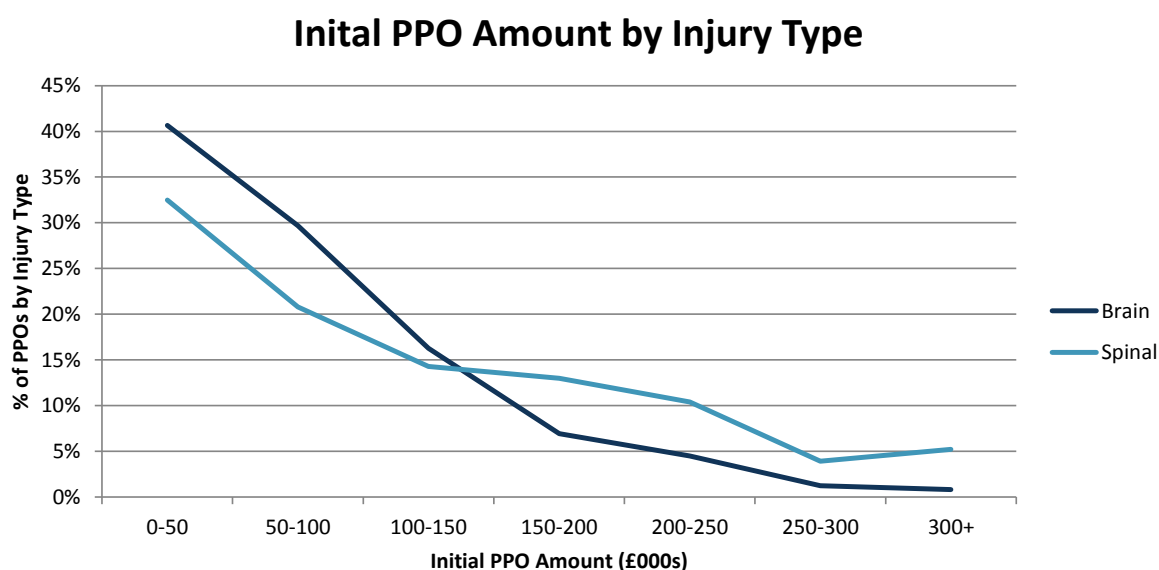   (ignoring stepped payments).

Inital PPO Amount by Injury Type

Figure 4.8: Distribution of Regular PPO payment amount, split by injury type

5. Motor PPOs – Comparison of Private and Commercial Covers

5.1   Private Motor PPOs have been increasing in number since 2008. However, the data may now be suggesting that the number of private Motor PPOs settled each year has started to level off.
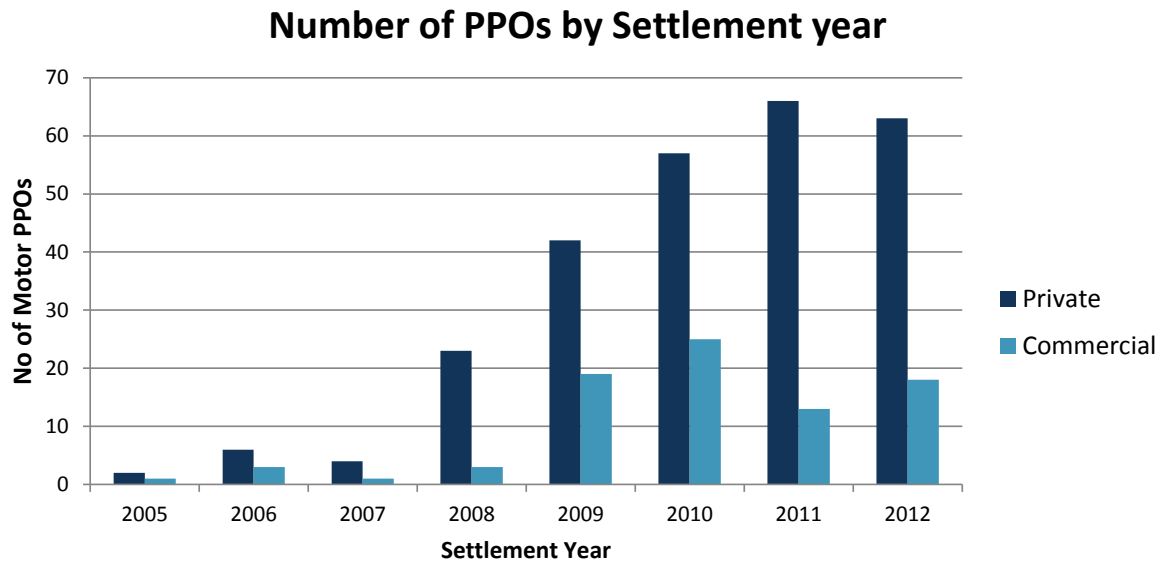
Number of PPOs by Settlement year

Figure 5.1: Number of Private and Commercial Motor PPOs by settlement year

Driver details

5.2   The two graphs in Figures 5.2 and 5.3 below compare the difference between drivers causing accidents that lead to PPOs under private and commercial covers. The driver age profile of commercial PPOs is less skewed to the younger ages than private Motor and has a higher average driver age.

5.3   The graphs below only include the PPOs for which the age and gender of the driver was available. These fields were missing in around 30% of private Motor PPOs and around 40% of commercial Motor PPOs.
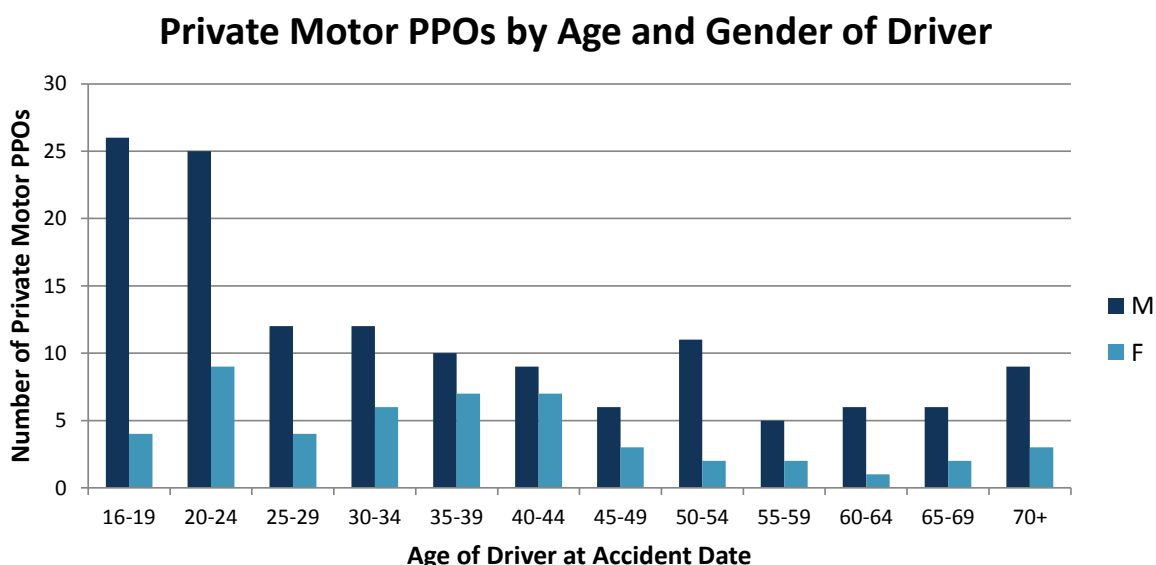
Private Motor PPOs by Age and Gender of Driver

Figure 5.2: Number of Private Motor PPOs split by Gender and Age of driver at accident date

5.4   There are very few female drivers under the commercial PPOs which may be because there are fewer females that drive commercial vehicles.
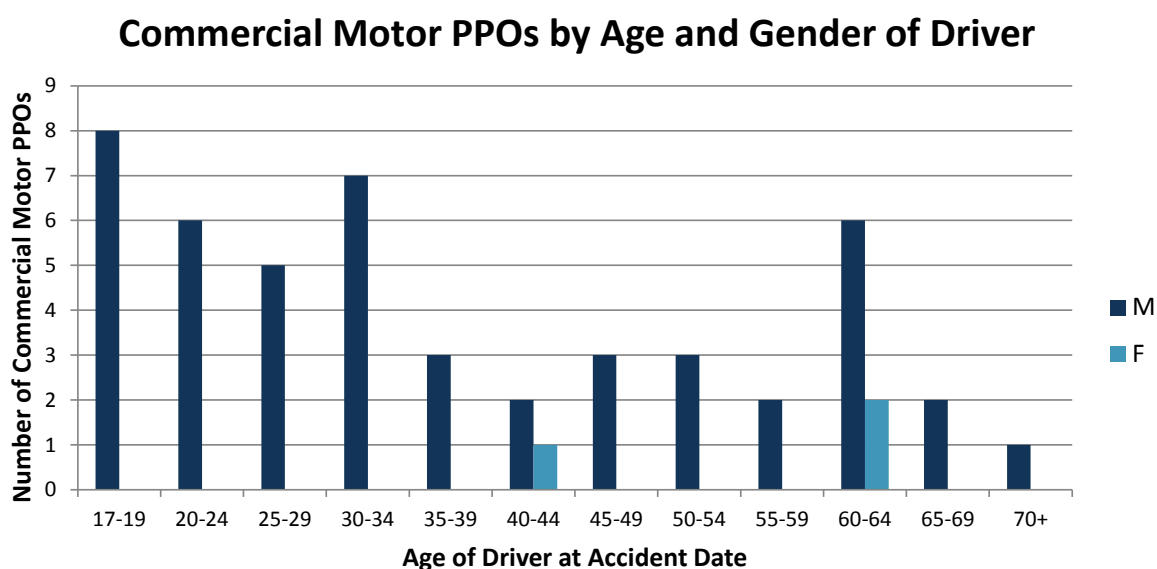
Commercial Motor PPOs by Age and Gender of Driver

Figure 5.3: Number of Commercial Motor PPOs split by Gender and Age of driver at accident date

Claimant details

5.5   A similar difference can also be seen with age of claimant between private and commercial covers. However this is likely to be due to the correlation between driver age and claimant age, whereby young drivers are more likely to cause accidents that result in PPOs involving younger claimants.
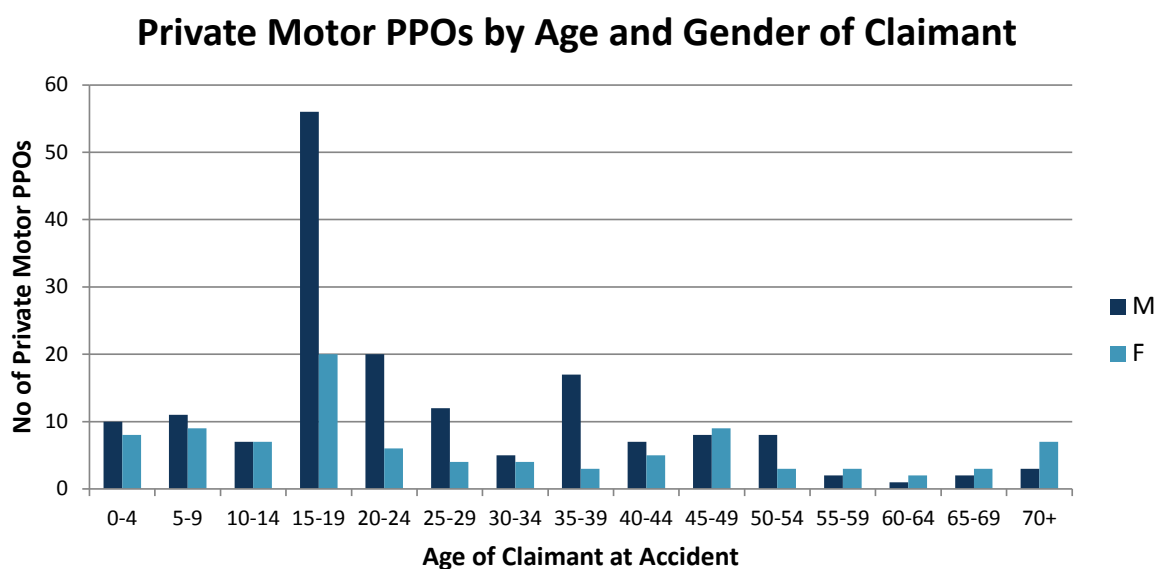
Private Motor PPOs by Age and Gender of Claimant

Figure 5.4: Number of Private Motor PPOs split by Gender and Age of claimant at accident date

Commercial Motor PPOs by Age and Gender of Claimant
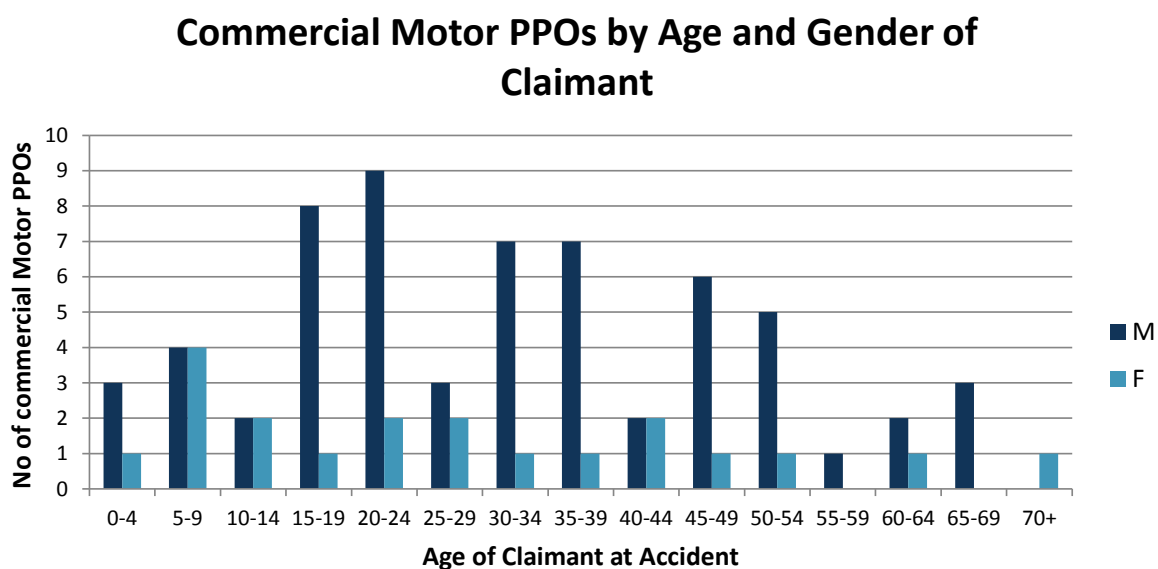

Figure 5.5: Number of Commercial Motor PPOs split by Gender and Age of claimant at accident date

Driver and claimant age correlation

5.6   The correlation between age of driver and age of claimant is still in evidence under both private and commercial covers, as shown in Figures 5.6 and 5.7. The relatively fewer number of younger claimants for commercial Motor PPOs needs to be borne in mind when interpreting these graphs.

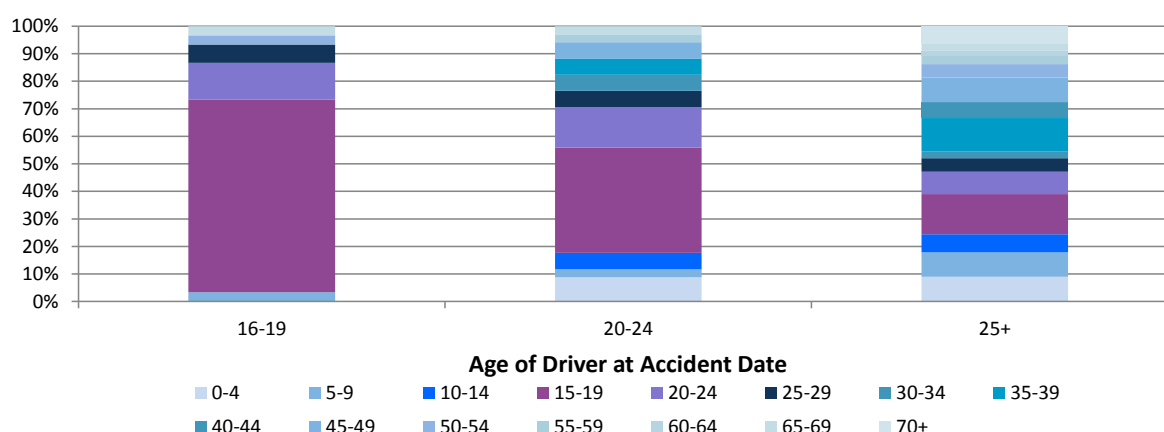## Age of Driver vs age of Claimant at Accident Date - Private Motor

Figure 5.6: Correlation between age of driver and age of claimant at accident date for Private Motor

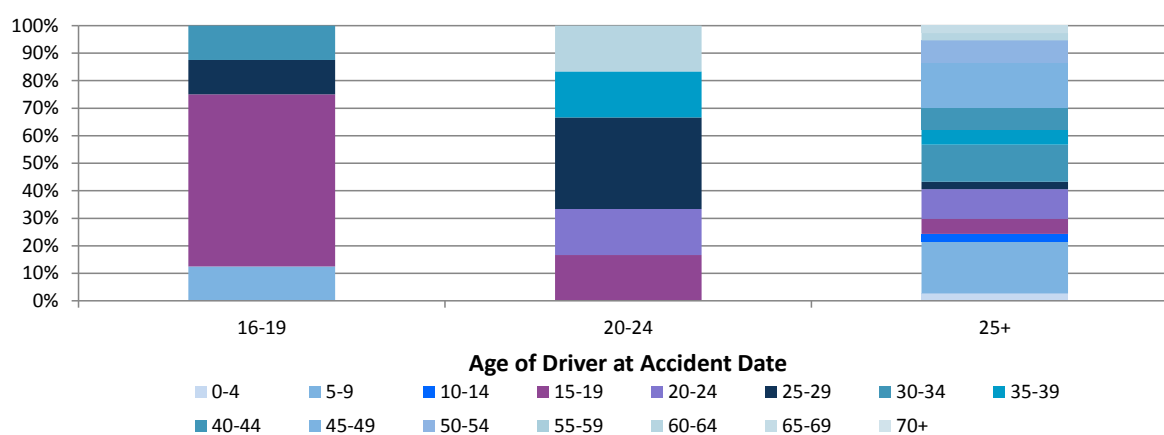## Age of Driver vs age of Claimant at Accident Date - Commercial Motor

Figure 5.7: Correlation between age of driver and age of claimant at accident date for Commercial Motor

Future life expectancy

5.7   The difference in claimant age profile between private and commercial covers also means
       that future life expectancy is significantly shorter for most PPOs arising under commercial
       covers. Since commercial claimants are older, the average future life expectancy from
       settlement is approximately 40 years, compared with 45 years for PPOs arising under private
       cover. The distribution of these future life expectancies is illustrated below in Figure 5.8.
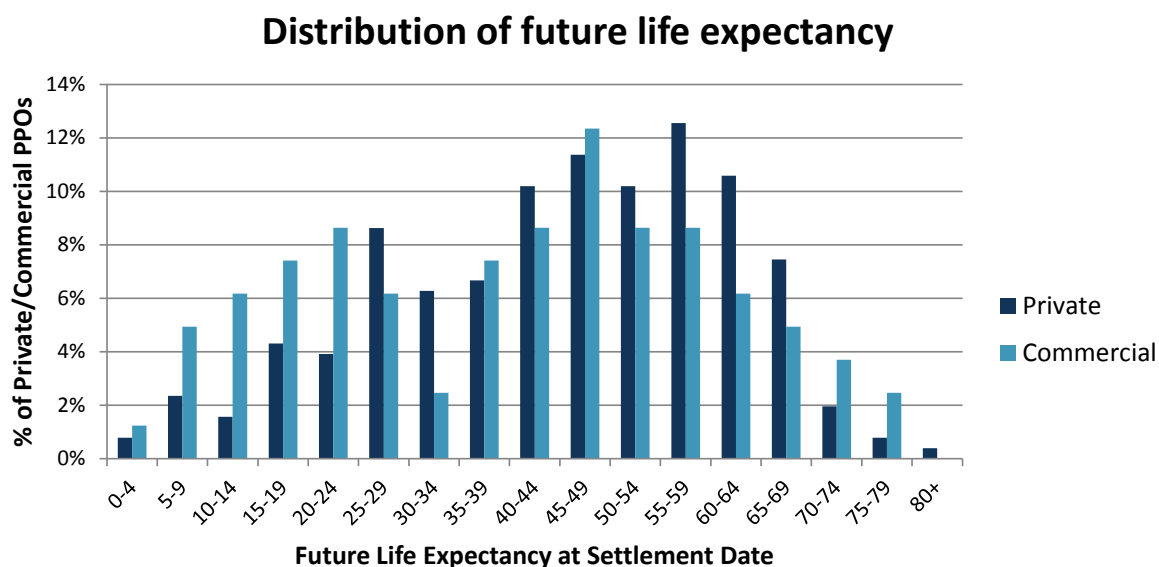
Distribution of future life expectancy

Figure 5.8: Distribution of Future Life Expectancy split by PPOs arising to
Private/Commercial covers

6. Motor PPOs – Comparison of Comprehensive and Non-Comprehensive Covers

6.1 We have compared the results for comprehensive and non-comprehensive PPOs arising out of private Motor covers. There were 165 PPOs recorded as being comprehensive cover but only 58 PPOs as non-comprehensive cover, with the cover type missing for the remaining 40 private Motor PPOs. The number of non-comprehensive PPOs is relatively small, so the results for non-comprehensive cover are likely to be of limited credibility.

Number of Private Motor PPOs by Settlement year
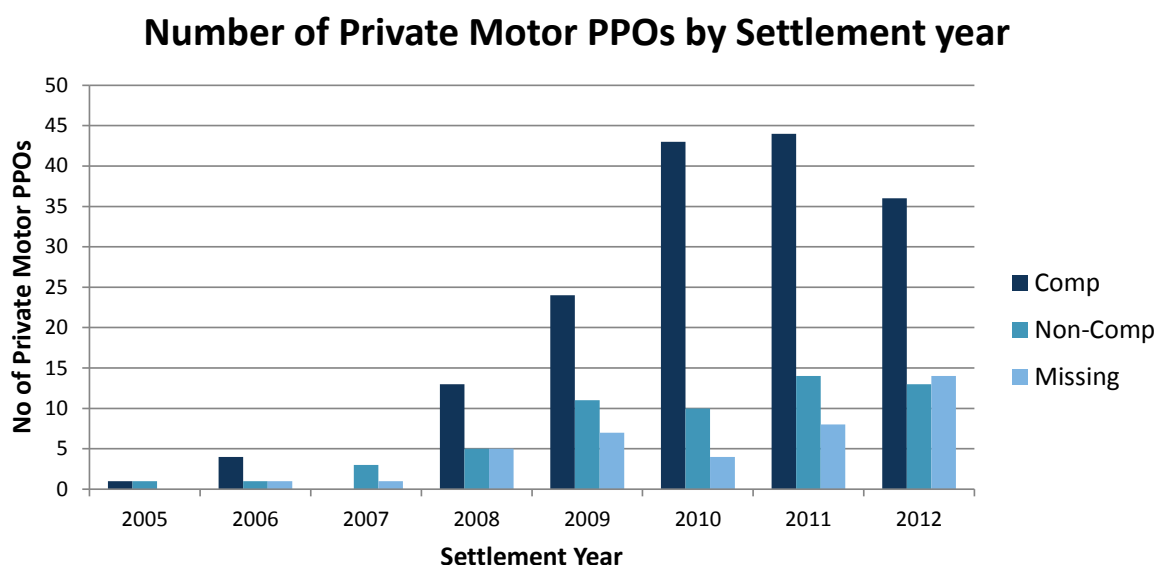
Figure 6.1: Number of Private Motor PPOs split by Settlement year and cover type

6.2 It appears as though the number of PPOs arising from comprehensive and non-comprehensive covers have decreased in 2012, however this figure is misleading due to the high number of "Missing" cover types supplied with the data (Figure 5.1 showed that the total number of private Motor PPOs is stabilising rather than markedly decreasing).

6.3 Figure 6.2 below suggests that PPOs involving spinal injuries are proportionately less common under non-comprehensive covers than comprehensive covers (and brain injuries more common) however, as stated above, the results are likely to be of limited credibility due to the small number of non-comprehensive PPOs.

Distribution of PPOs by Injury Type
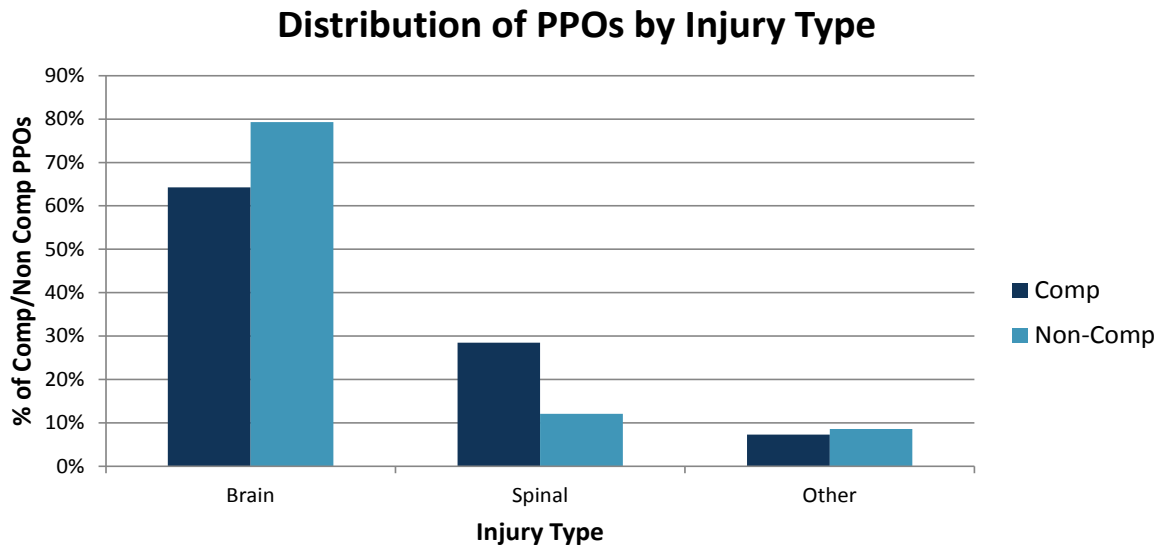

Figure 6.2: Distribution of Private Motor PPOs by injury type split by cover type

6.4   From looking at Figure 6.3 below, there appear to be proportionally more PPOs relating to young drivers from non-comprehensive covers than from comprehensive covers, this is probably because younger drivers are more likely to have purchased non-comprehensive Motor insurance, potentially due to the price of available cover.

Distribution of PPOs by Driver Age at Accident

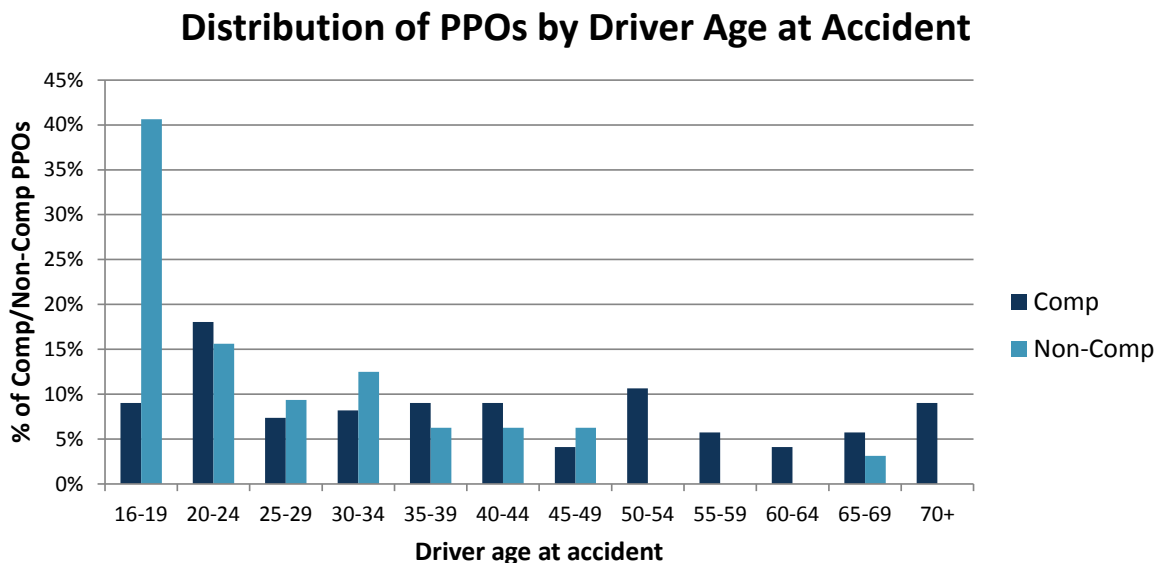*Figure 6.3: Distribution of Private Motor PPOs by Driver age at accident date*

split by cover type

6.5   A similar difference can also be seen with age of claimant at accident date, with a higher proportion of teenage claimants under non-comprehensive cover. This is likely to be due to the correlation between driver age and claimant age, particularly driven by teenagers who tend to ride in cars together.

Distribution of PPOs by Claimant Age at Accident
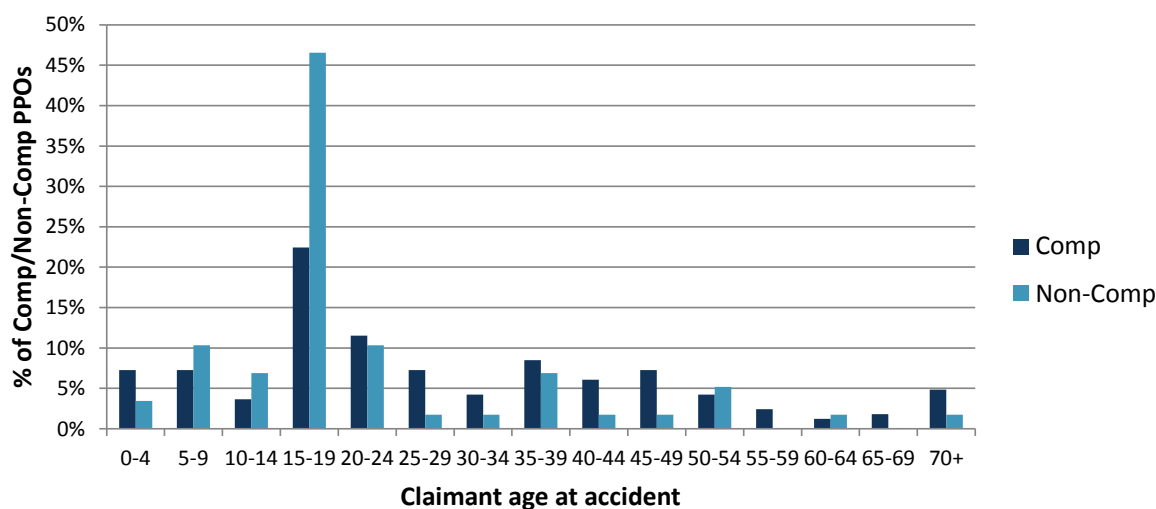
Figure 6.4: Distribution of Private Motor PPOs by Claimant age at accident date split by cover type

6.6   The difference in claimant age profile also means that future life expectancy from settlement tends to be longer for PPOs arising under non-comprehensive cover rather than comprehensive cover.

Distribution of PPOs by Life Expectancy at Settlement
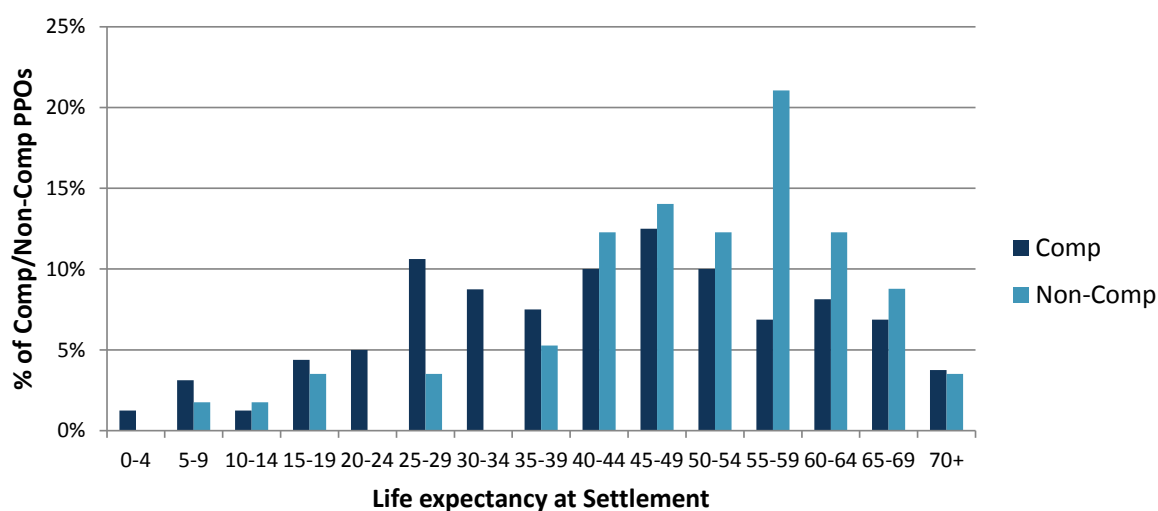
Figure 6.5: Distribution of Private Motor PPOs by Future Life expectancy from settlement date split by cover type

6.7   The following two graphs in Figures 6.6 and 6.7, show the distribution of private Motor PPOs by age of claimant at date of accident by gender, for PPOs arising from comprehensive and non-comprehensive covers respectively.

6.8   The peak for age group 15-19 seen in both graphs shows more differentiation between males and females for PPOs arising from non-comprehensive cover (in Figure 6.7), but this may be due to the small sample size.

Age of Claimant at Accident date by Gender - Comprehensive Cover
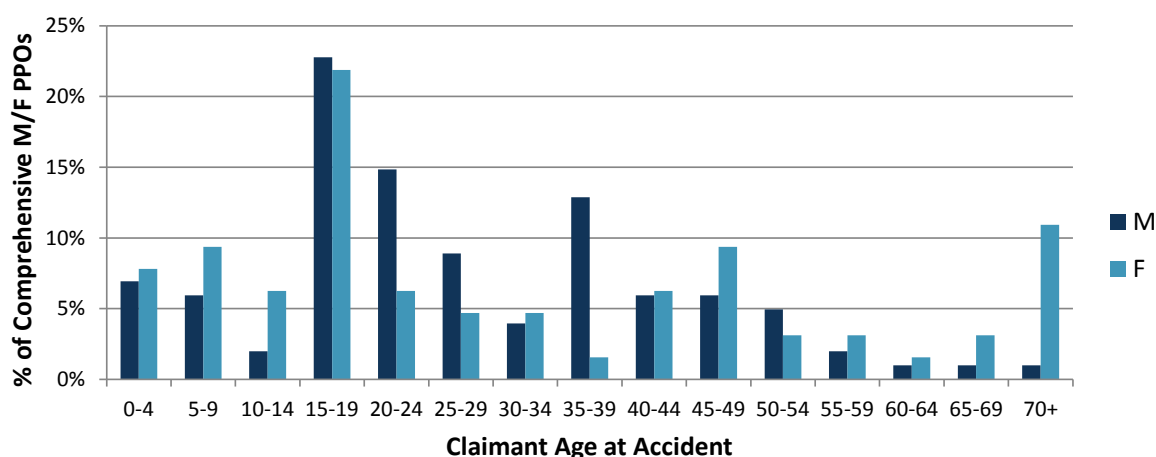
Figure 6.6: Distribution of Comprehensive Cover PPOs by claimant age at accident split by gender

Age of Claimant at Accident date by Gender - Non-Comprehensive Cover
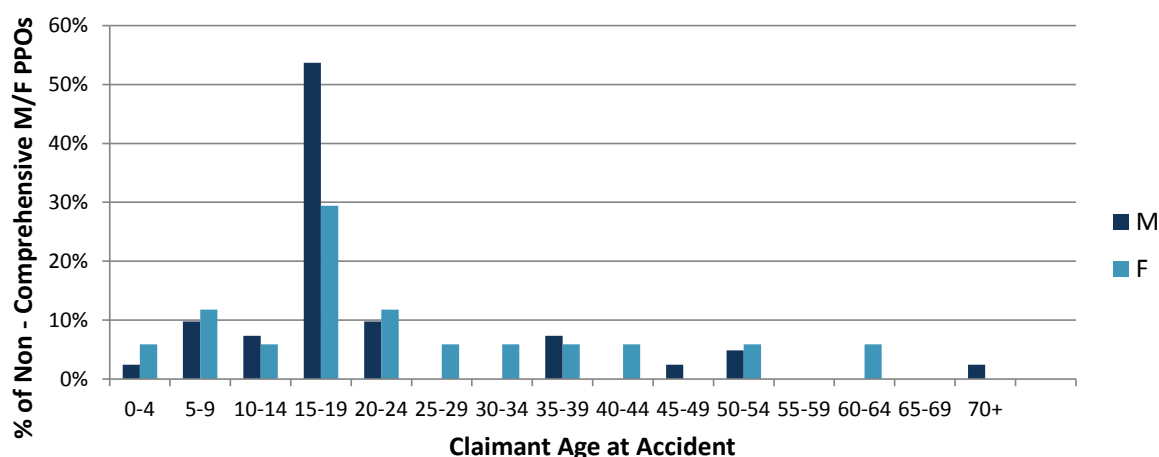
Figure 6.7: Distribution of Non-Comprehensive Cover PPOs by claimant age at accident split by gender

7. Liability PPOs

7.1   There were 42 Liability PPOs in the survey, from 8 insurers (as not all of the contributors offer Liability insurance).

7.2   It is possible that the existence of indemnity limits on Employers' Liability cover is impacting PPOs settled under Liability covers.

7.3   Figure 7.1 below shows the number of Liability PPOs settled each year since 2005.

Number of Liability PPOs by Settlement Year
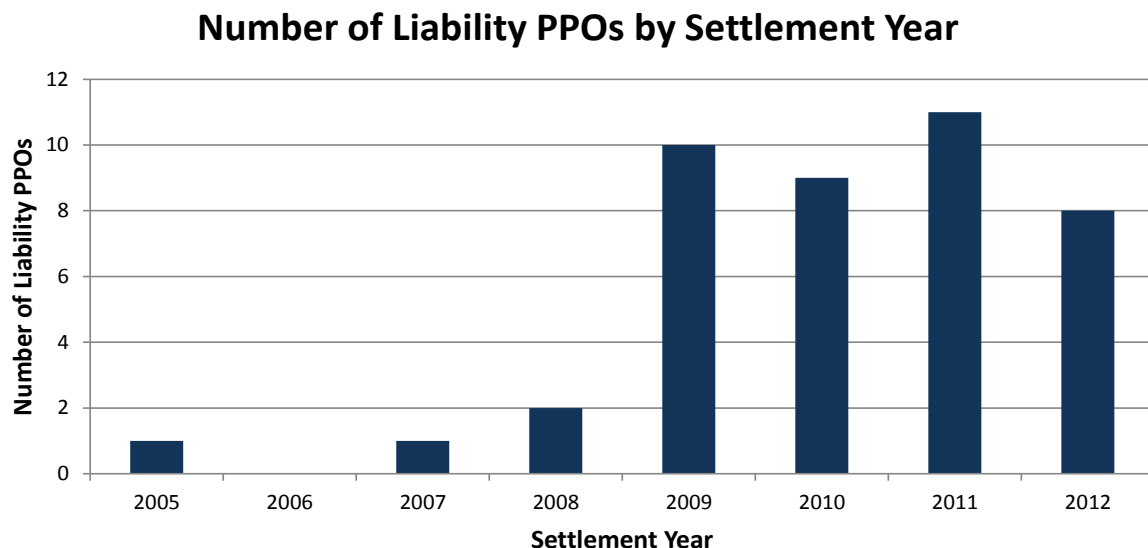
Figure 7.1: Number of Liability PPOs by settlement year

7.4   The pattern of settlement of Liability PPOs is broadly similar to that of the Motor PPOs, in that the number of PPOs settled each year since 2009 has been fairly level. The smaller sample size may account for some additional random noise in the numbers.

7.5   All of the Liability PPOs in the survey fall into one of the two cover types in Figure 7.2, with Employers' Liability accounting for about two thirds of the total Liability PPOs.

Liability Cover Type
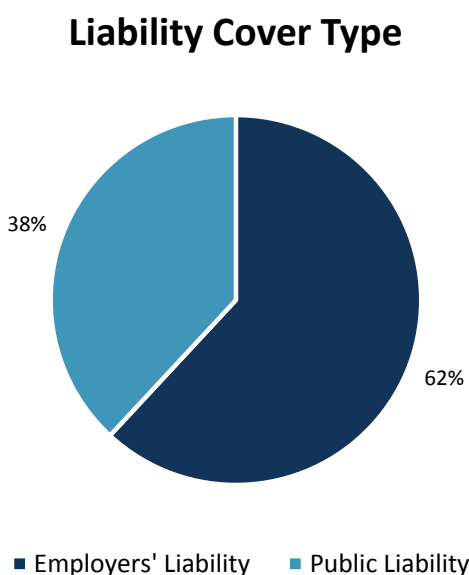
Figure 7.2: Split of Cover type between Employers' Liability and Public Liability

7.6   All but two of the Liability PPOs are indexed to ASHE 6115 (care workers) indexation. One is linked to RPI and the other is linked to Indemnity Cost of Care.

7.7   As seen below, in Figure 7.3, the 80th percentile has been the most popular for PPOs arising under Liability covers since 2009 and 100% of all PPOs settled in 2012 are indexed to it. (Note that settlement year 2008 comprises only of 2 PPOs).

7.8   Figure 7.3 only considers the primary heads of damage for the Liability PPOs. However, only two Liability PPOs have a second head of damage, both of which are indexed to ASHE 6115 (one at the 80th percentile and the other at the 90th percentile.)

ASHE Percentiles for Liability PPOs by Settlement Year
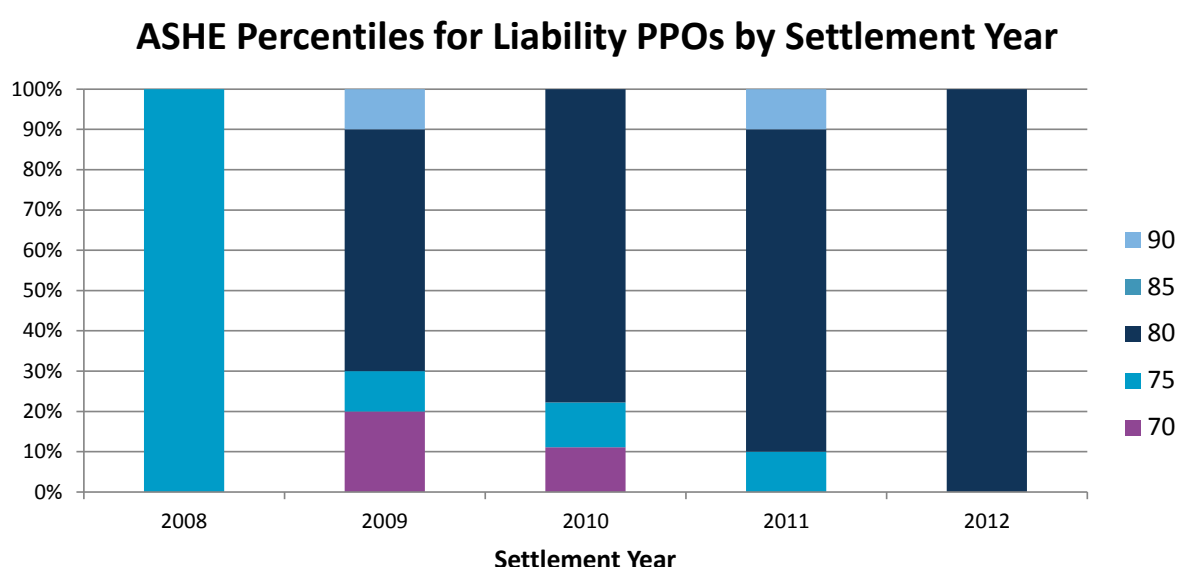
Figure 7.3: Distribution of ASHE percentiles used for Liability PPOs

7.9   Spinal injuries appear to be significantly more common under Liability coverage, as shown in Figure 7.4. The nature and cause of accidents under Motor and Liability covers are likely to be very different, with those under Liability cover more likely to be accidents such as trips and falls, as opposed to high speed crashes that would be more common under Motor insurance.

Distribution of Liability and Motor PPOs by Injury Type
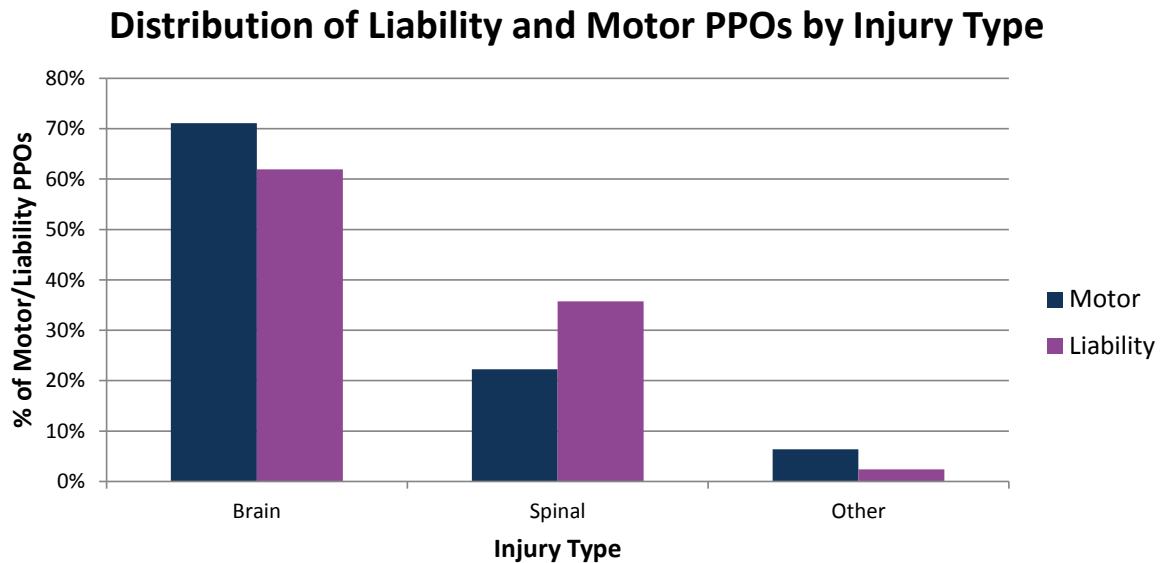
Figure 7.4: Distribution of Motor and Liability PPOs by Injury Type

7.10   As shown in Figures 7.5 and 7.6 below, nearly all claimants are male. There is one female claimant under Employers' Liability cover, but the claimant age was not available, so it is not included in Figure 7.5.

7.11   There appears to be no particular trend in the age of claimant, though virtually all claimants under Employers' Liability policies are of working age, as would be expected (we note that the data included one claimant in the 5-9 year old bracket).

Age of Claimant at Accident Date - Employers' Liability
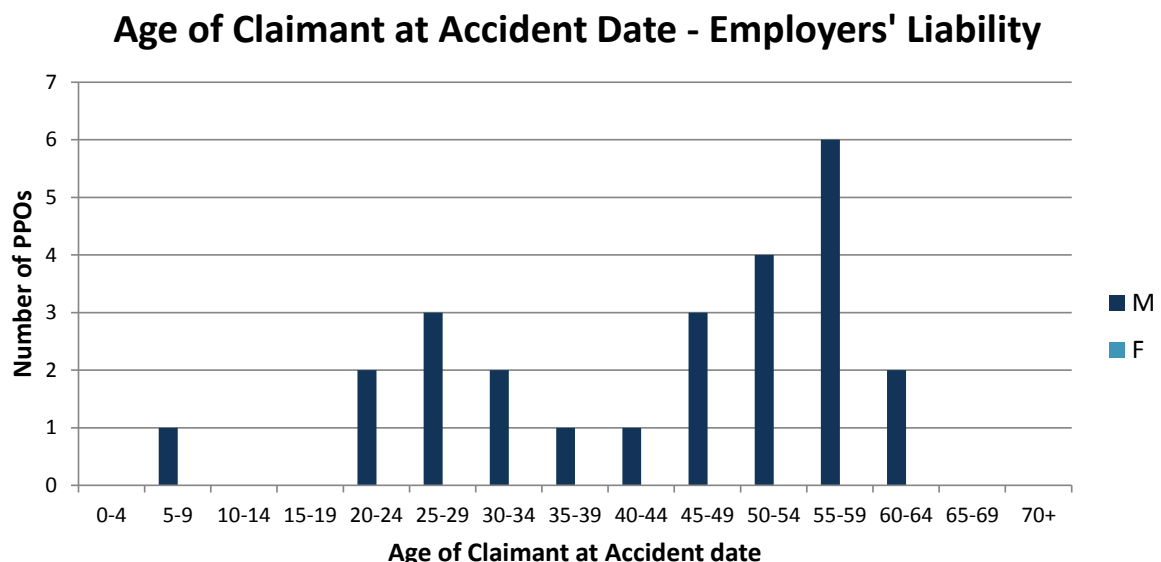
Figure 7.5: Distribution of Employers' Liability PPOs by age of claimant at accident date

Age of Claimant at Accident Date - Public Liability
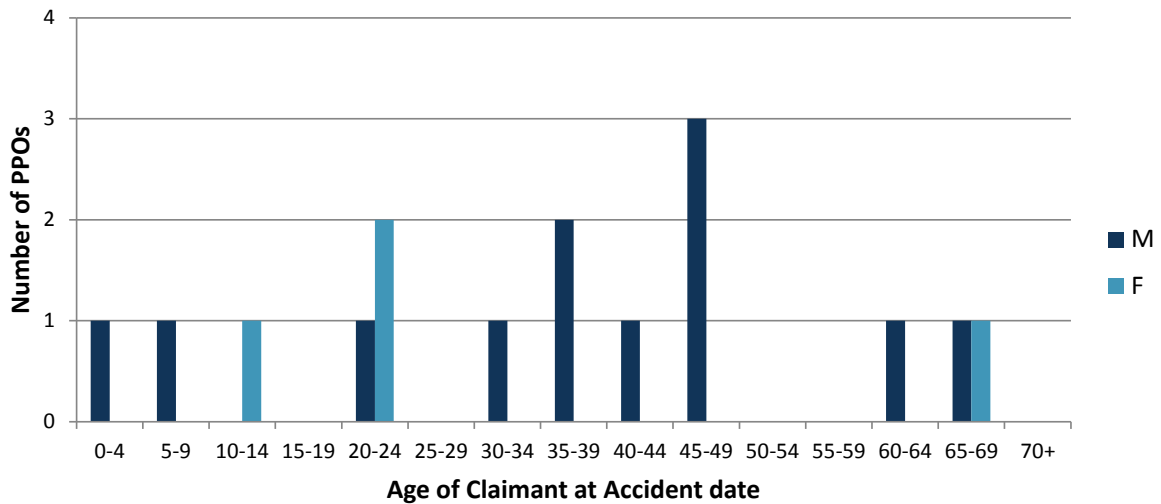
Figure 7.6: Distribution of Public Liability PPOs by age of claimant at accident date

7.12   Figure 7.7 shows that PPO claimants arising under Liability covers tend to be significantly older than claimants arising under Motor covers.

Distribution of Claimant age at Accident
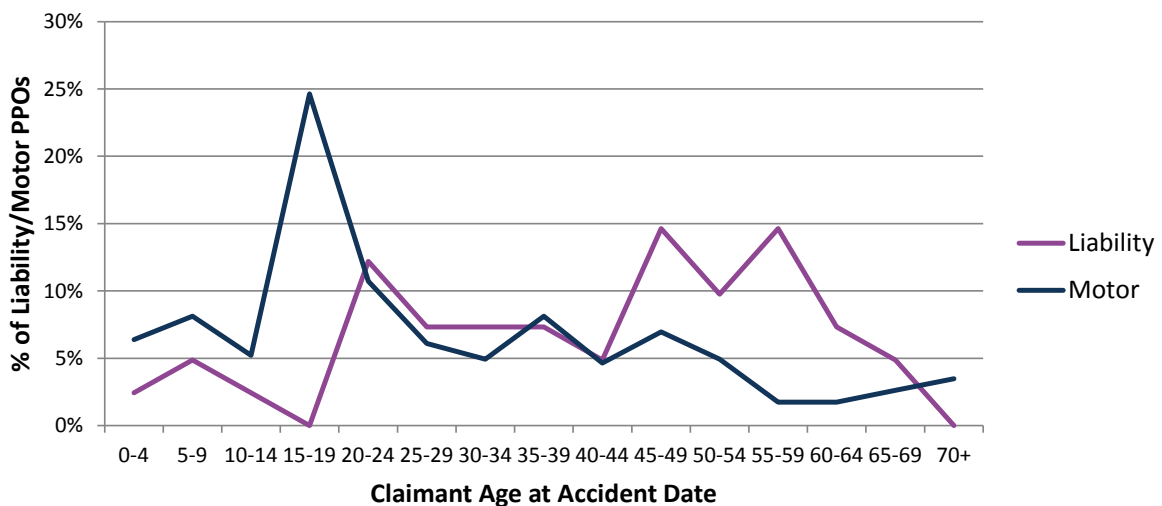
Figure 7.7: Distribution of Motor & Liability PPOs by age of claimant at accident date

7.13   Following on from the claimant age profile, the future life expectancy of claimants from
        Liability PPOs is significantly shorter than that of Motor PPOs, as shown in Figure 7.8 below.

Distribution of Future Life Expectancy
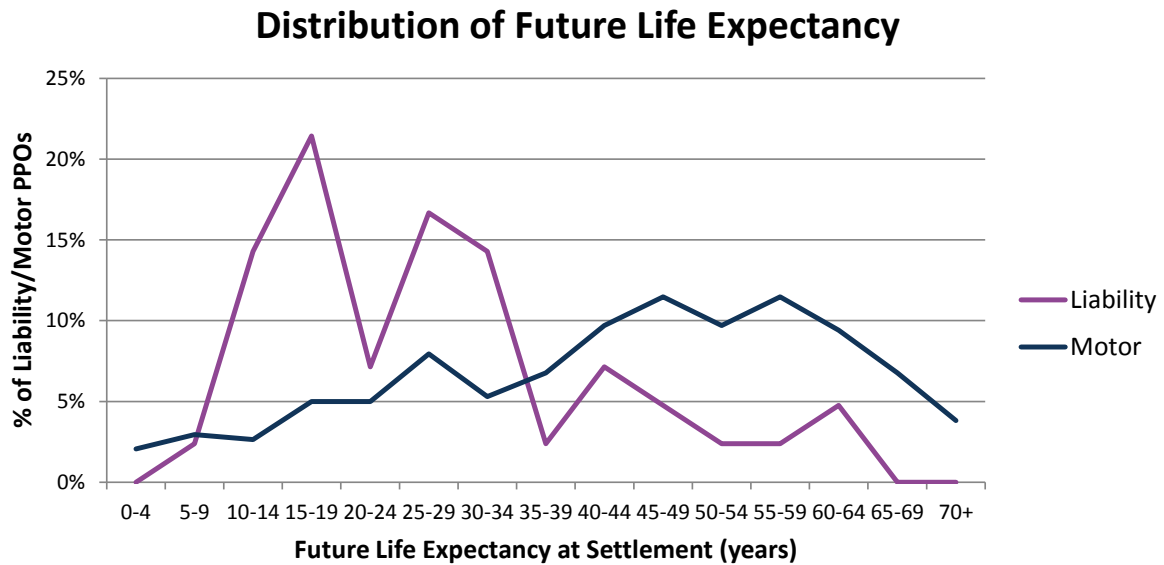
Figure 7.8: Distribution of Motor & Liability PPOs by future life expectancy from date of settlement

7.14   There is some evidence in Figure 7.9 that Liability PPOs may settle quicker than Motor PPOs,
        though due to the small sample size it is not possible to state this with confidence. There are
        fewer minors under Liability cover and we know that minors can have longer delays to
        settlement as decisions are often delayed until the claimant has reached the age of maturity.
        This would imply that we would expect to see fewer claims in the tail of the distribution for
        Liability covers. In addition, we saw in Section 4 that spinal injuries may settle quicker than
        brain injuries and there are proportionately more spinal injuries under Liability cover than
        Motor cover.

Distribution of Years to Settlement
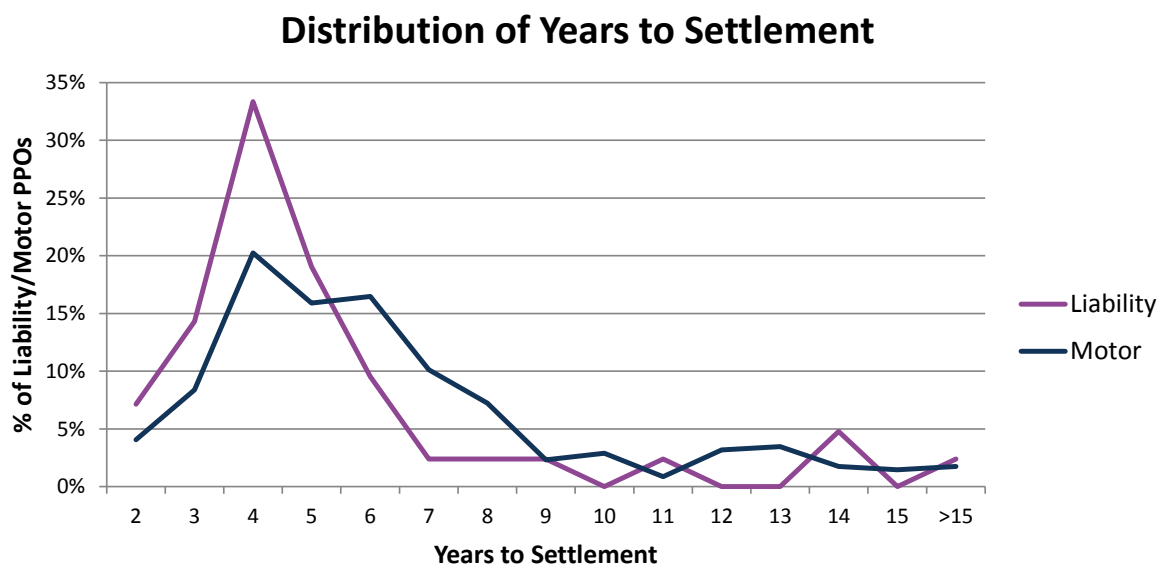
Figure 7.9: Distribution of Motor & Liability PPOs by delay to settlement in years from accident date

7.15   Figure 7.10 shows that Liability PPOs appear to have a lower lump sum associated with them than Motor PPOs do. This is likely to be due, at least in part, to the higher average age of claimants under Liability covers, thus meaning wage compensation, which is often awarded within the lump sum rather than the periodic payments, would be paid for fewer years. In addition, large claims under Employers' Liability covers tend to arise from manual and semi-skilled workers who may have lower than average wages. Note that the lump sums in Figure 7.10 are nominal amounts and have not been indexed by settlement year.

Distribution by Lump Sum Amount
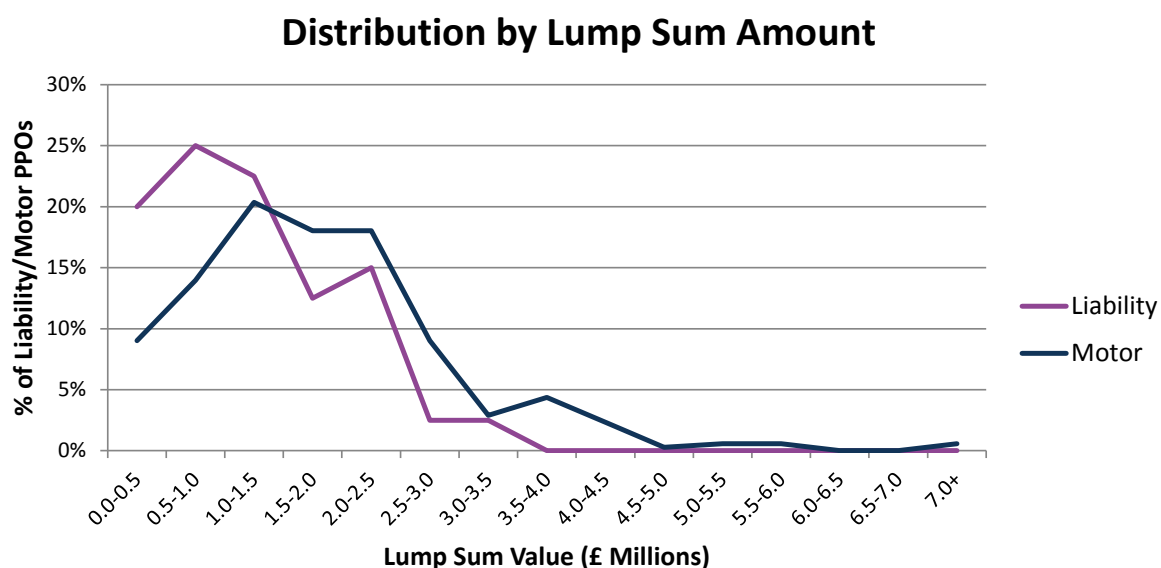
Figure 7.10: Distribution of Motor & Liability PPOs by lump sum value

7.16   Figure 7.11 below shows that the distribution of PPO amounts appears to be similar between Liability and Motor PPOs. The initial payments correspond to the sum across all heads of damage, and are the amounts paid initially following settlement (ignoring stepped payments).

Distribution by Initial Payment Amount
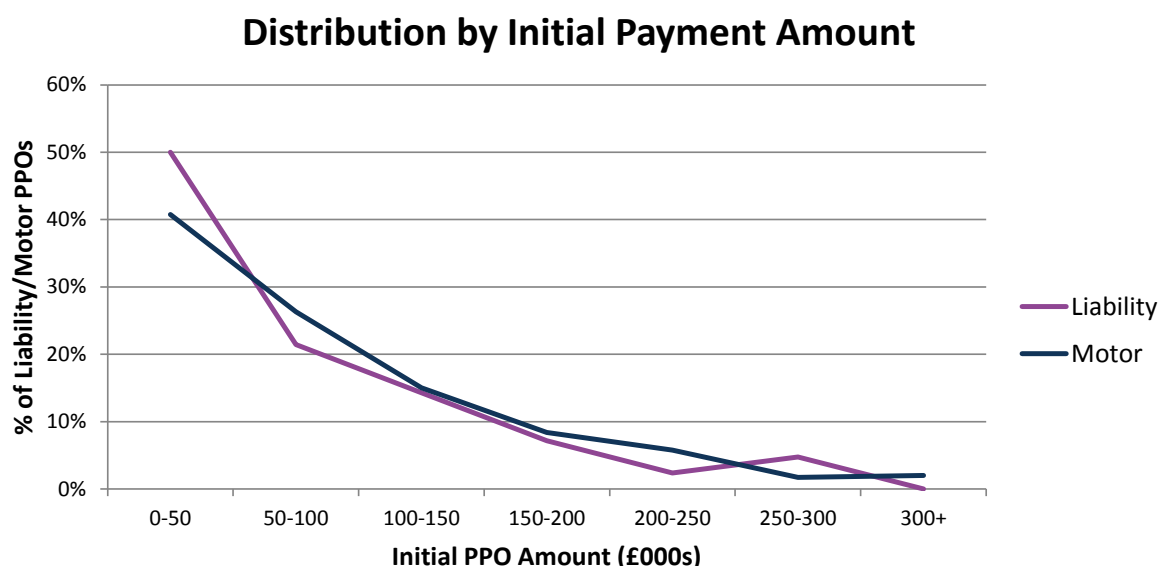
Figure 7.11: Distribution of Motor & Liability PPOs by regular PPO payment amount at settlement date

8. Motor Insurers' Bureau (MIB) Experience

8.1   The MIB was established in 1946 to compensate the victims of negligent uninsured and untraced motorists. Every insurer which underwrites compulsory Motor insurance is obliged to be a member of MIB and to contribute to its funding.

8.2   We have chosen to show the results of the MIB experience separately because, as the MIB covers uninsured or untraced motorists, we thought their profile of claims may be different from the rest of the Motor insurance industry. Whilst there are some differences, most notably in the propensity rate, the age of claimants and the size of lump sums, the following results show that in many cases the profile of PPOs for the MIB is actually quite similar to that of the rest of the industry.

8.3   Some of the fields requested, such as nature of injury and driver details, were not readily available and so were not provided.

Propensity

8.4   Figure 8.1 below shows the number of MIB claims settled in each year. It can be seen that the number of PPOs settled by the MIB each year has remained relatively constant since 2007, with the exception of a spike in numbers seen in 2009 and to a lesser extent 2012. We asked the MIB what might have caused the 2009 spike and they said there was no obvious reason they were aware of, and that it is simply likely to be due to random variation.
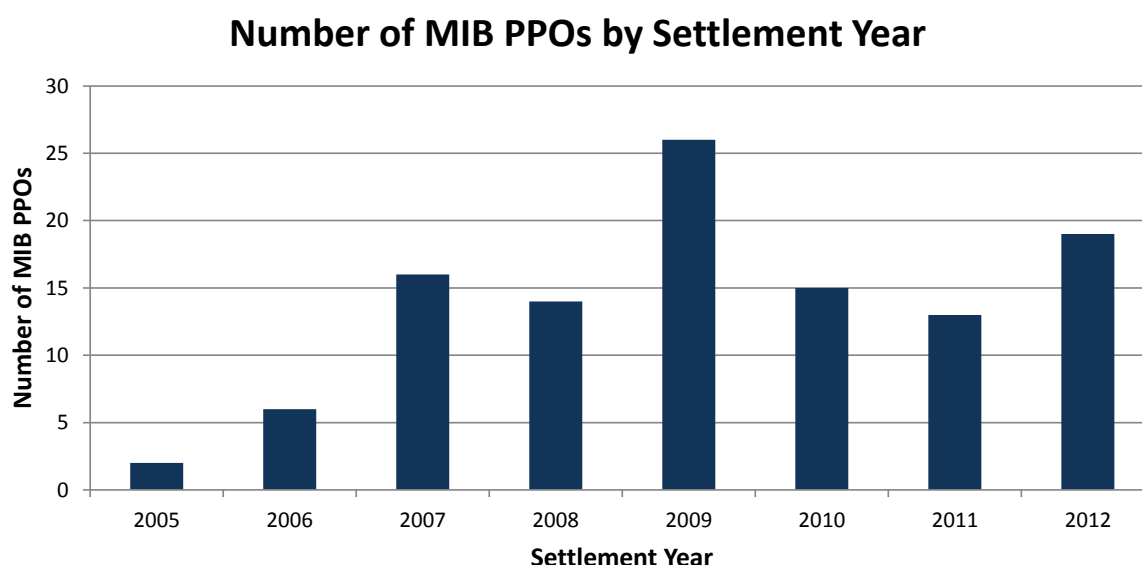
Figure 8.1: Number of PPOs settled by the MIB each year

8.5   Figure 8.2 below shows how the proportion of total PPOs in the survey that are settled by the MIB each year has changed. Before 2009 (and with the exception of 2007) the MIB were settling around 40% of the PPOs each year; however this has decreased in recent years to between 10% and 20% of the market. As was seen in Figure 8.1 the absolute number of PPOs settled by the MIB each year has remained relatively constant since 2007 (with the exception of 2009), so this decrease in proportion is likely to be related to the fact that the MIB started settling a sizeable number of PPOs from late 2006, a couple of years before the rest of the market.

Proportion of PPOs settled by the MIB/Industry by settlement year

Figure 8.2: Proportion of PPOs settled by the MIB compared with the rest of the Industry each year

8.6   Figure 8.3 below shows the number of Motor PPOs settled by the MIB in comparison to the rest of the market by settlement year.

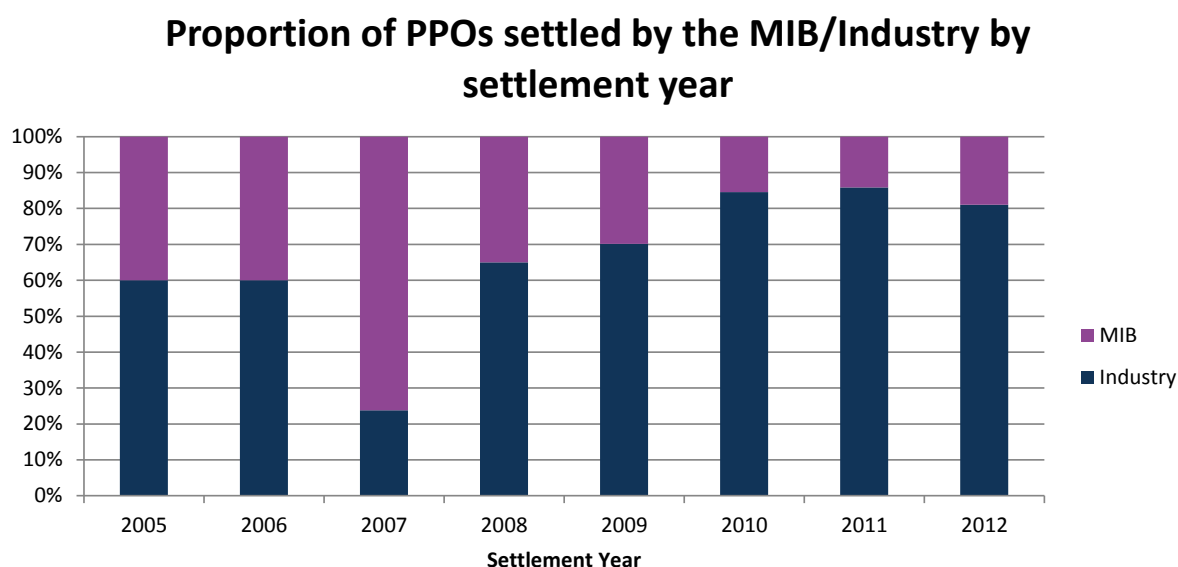## Number of PPOs settled by the MIB/Industry by settlement year
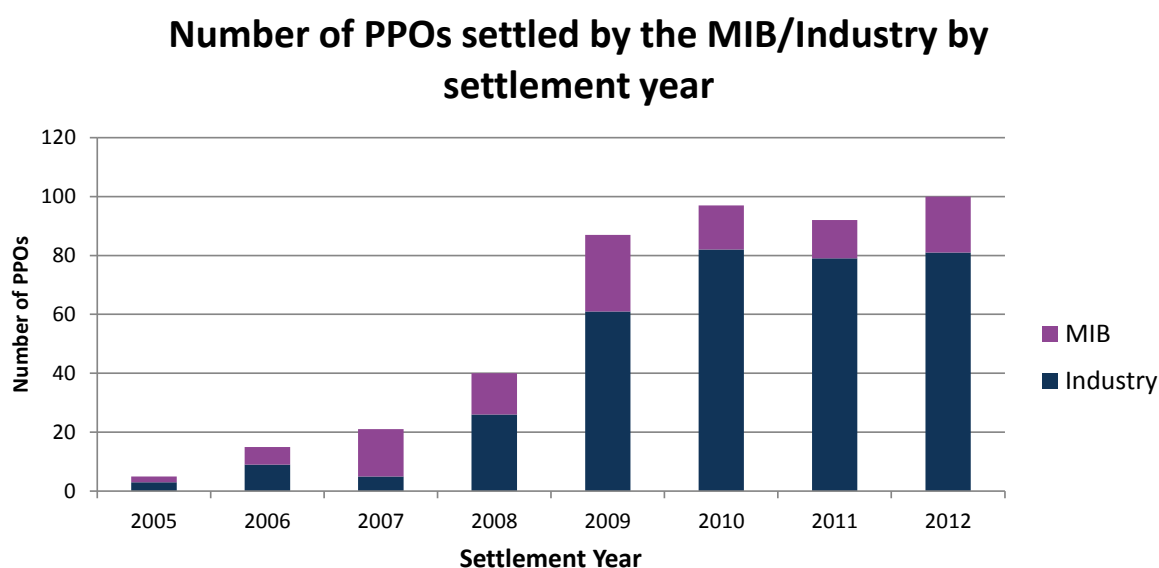
Figure 8.3: Number of PPOs settled by the MIB or the rest of the Industry each year

8.7   Figure 8.4 below shows the number of PPOs settled by the MIB in each accident quarter. By comparing with Figure 3.3 it can be seen that the MIB started settling a sizeable amount of PPOs from the fourth quarter of 2006, much earlier than the main market. It is also worth noting that half of the PPOs settled by the MIB before the Thompstone vs Tameside Appeal at the beginning of 2008 were indexed to RPI, however, after the appeal only one PPO is indexed to RPI with the rest indexed to ASHE.

Number of MIB PPOs by Settlement Quarter split by Indexation
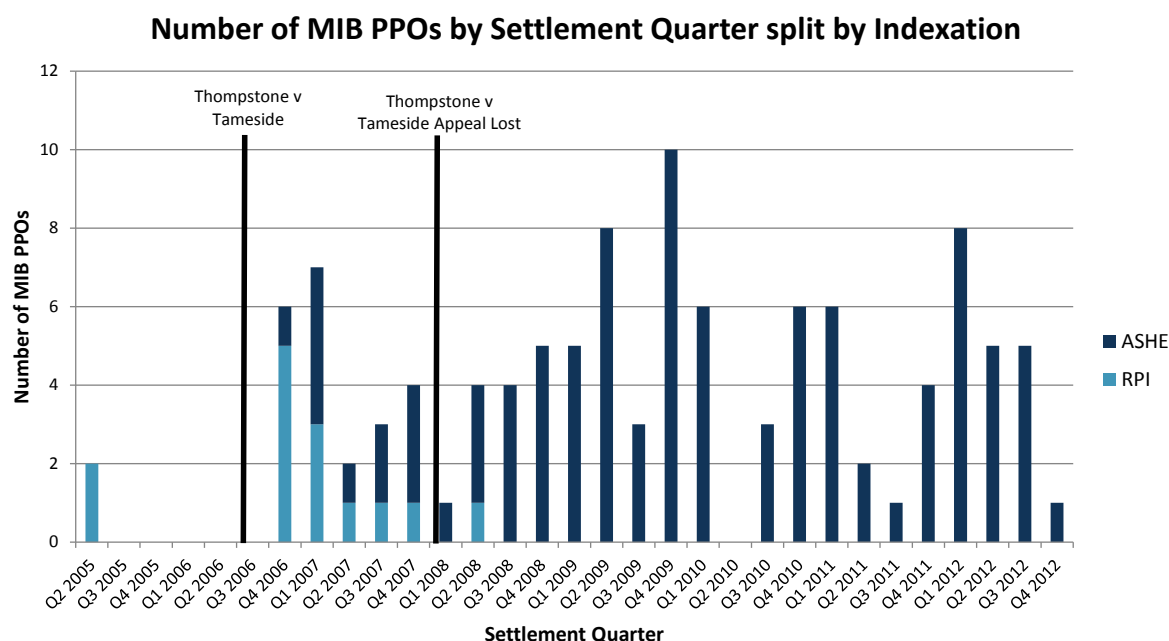
Figure 8.4: Number of PPOs settled in each quarter by the MIB split by index used for Initial PPO for each claim

8.8   Figure 8.5 below shows the propensity of PPOs as measured by the number of PPOs divided by the number of large claims (as defined as greater than £1 million) settled in each year. The propensity for PPOs can be seen to be significantly higher for the MIB than for the rest of the Motor insurance industry. Last year (in the 2011 survey) it appeared that the MIB propensity for PPOs was decreasing towards Industry levels, however this no longer seems to be the case. There have been some changes in the data which account for these differences in propensity: i) in the 2010 review, settlement date was not provided and we used an estimate of a field we understood to be first PPO payment as a proxy and adjusted for an assumed delay between settlement and first date of payment, ii) there was a one-off house-keeping exercise at the start of 2012 to correct the recorded start date of the PPO, and iii) the estimate of the number of large claims has changed slightly since last year. This graph is now more consistent with that seen in the 2010 survey with MIB PPO propensity consistently higher than the rest of the market.

PPO Propensity by Number of Large Claims (>£1m)
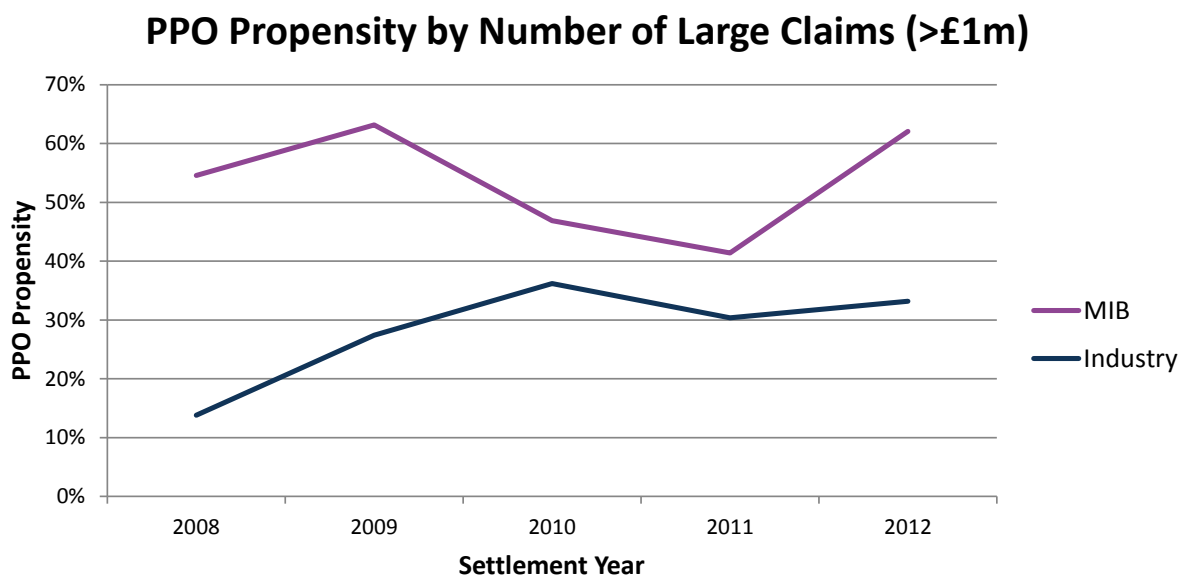
Figure 8.5: PPO Propensity split by MIB and the main Motor market by settlement year

8.9   The following graph compares the total number of large claims by settlement year between the MIB and the Motor industry. Apart from a spike in 2010, which is likely to be driven by the unexplained drop seen in settled Motor industry large claims that year, the proportion of large claims the MIB has been settling has been relatively steady.

Number of Non-PPO large claims (>£1m)
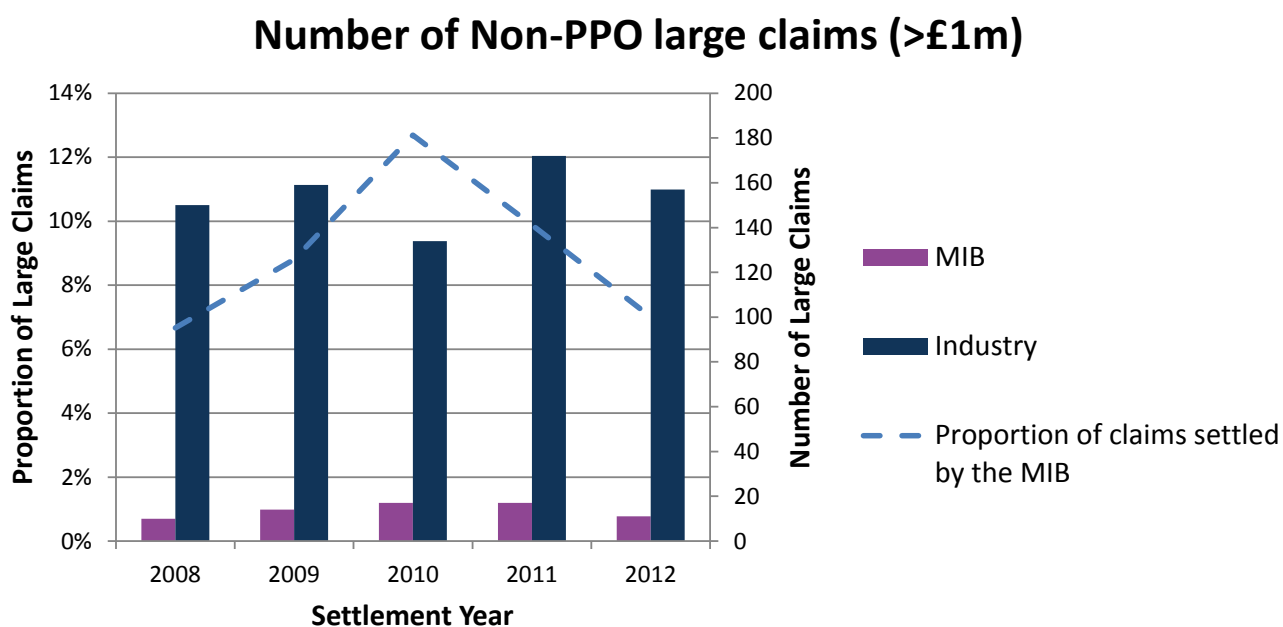
Figure 8.6: Number of Non-PPO large claims settled by MIB/Industry and the proportion of large claims settled by the MIB

Number of MIB PPOs by Age of Claimant at Accident Date by Gender
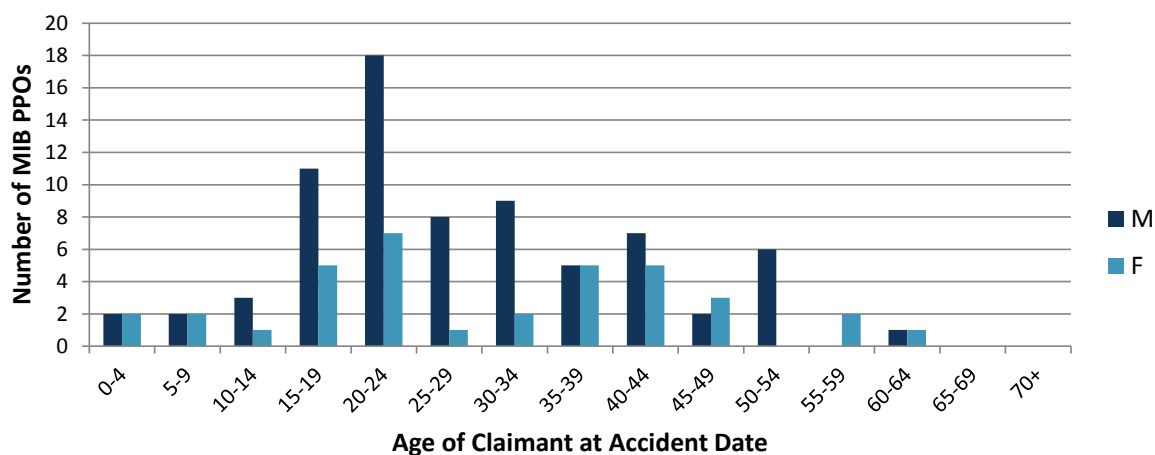
Figure 8.7: Number of PPOs settled by the MIB split by Age of claimant at accident date split by gender

8.10   The distribution of claimant age can be seen to be similar to the age profile of claimants seen in the market. However there appear to be a lower proportion of claimants who are minors in the MIB figures, and proportionately more MIB claimants in the 20 to 24 age bracket, as can be seen in Figure 8.8 below. We asked the MIB what might be causing this, and whilst there is no definitive explanation, they cited two potential theories: i) that a claim involving a minor is more likely to be settled as a PPO than that of a claim involving an adult, and whilst the Motor industry PPO propensity is generally lower than that of the MIB, this difference in propensity is likely to much less marked in the case of minors, and ii) that the MIB book of claims is weighted towards younger drivers and passengers (most often in the 17-25 age band).

Distribution of MIB PPOs by Age of Claimant at Accident Date
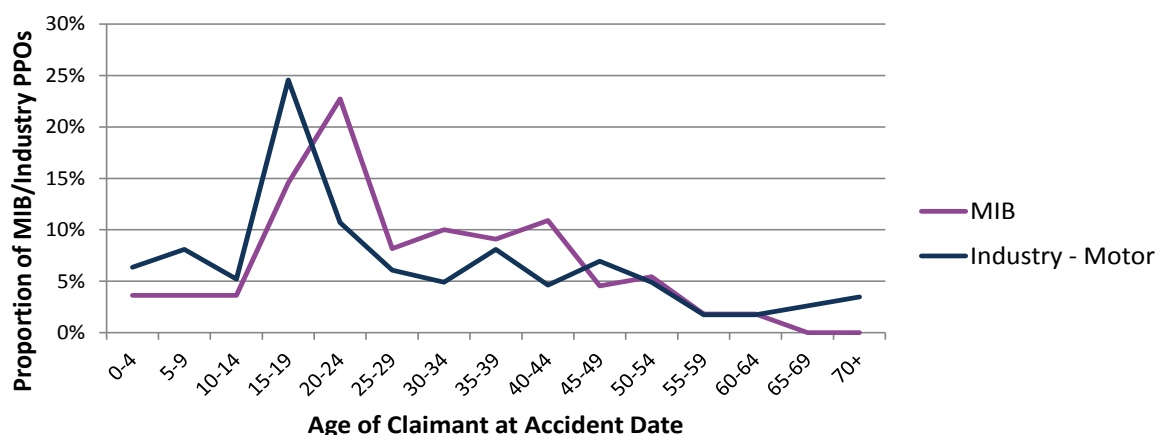
Figure 8.8: Comparison of distributions of PPOs settled by MIB/Industry by Age of claimant at accident date

8.11   The distribution of claimant age at date of settlement can be seen below in Figure 8.9. Similar to the above, the distribution seems to follow that of the main market closely, however the peak at age group 20-24 is not as large, which is most likely due to the lower proportion of the claimants who are minors in the MIB data.

Distribution of MIB PPOs by Age of Claimant at Settlement Date
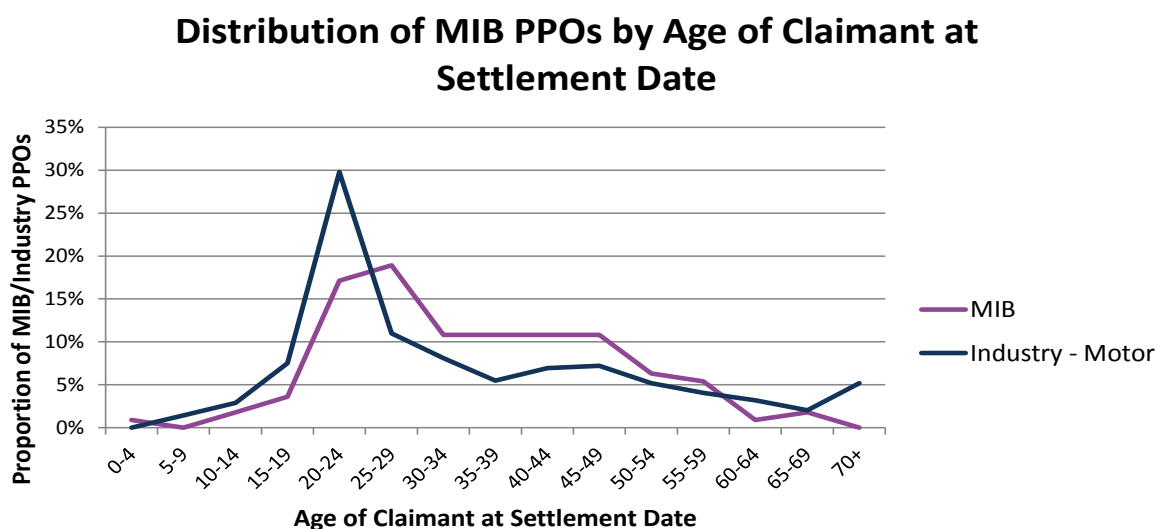
Figure 8.9: Comparison of Distributions of PPOs settled by MIB/Industry by Age of claimant at settlement

8.12   It can be seen in Figure 8.10 below that the distribution of delay until settlement for PPOs settled by the MIB is very similar to that of the main market.

Distribution of delay to settlement
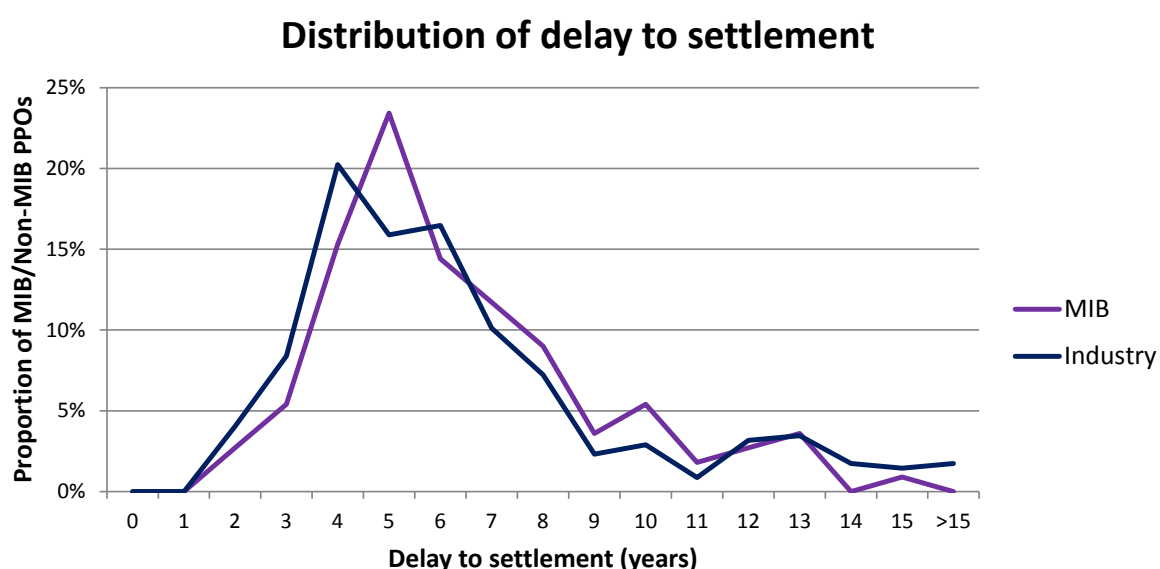
Figure 8.10: Comparison of Distributions of PPOs settled by MIB/Industry by Age Delay to Settlement

8.13   Figure 8.11 below compares the distribution of PPOs settled by both the MIB and the rest of the market by lump sum value. The lump sums awarded by the MIB appear to be significantly smaller, with an average lump sum value of £1.2 million compared to an average of £1.8 million for the rest of the market.

Distribution of PPOs by Lump Sum Value
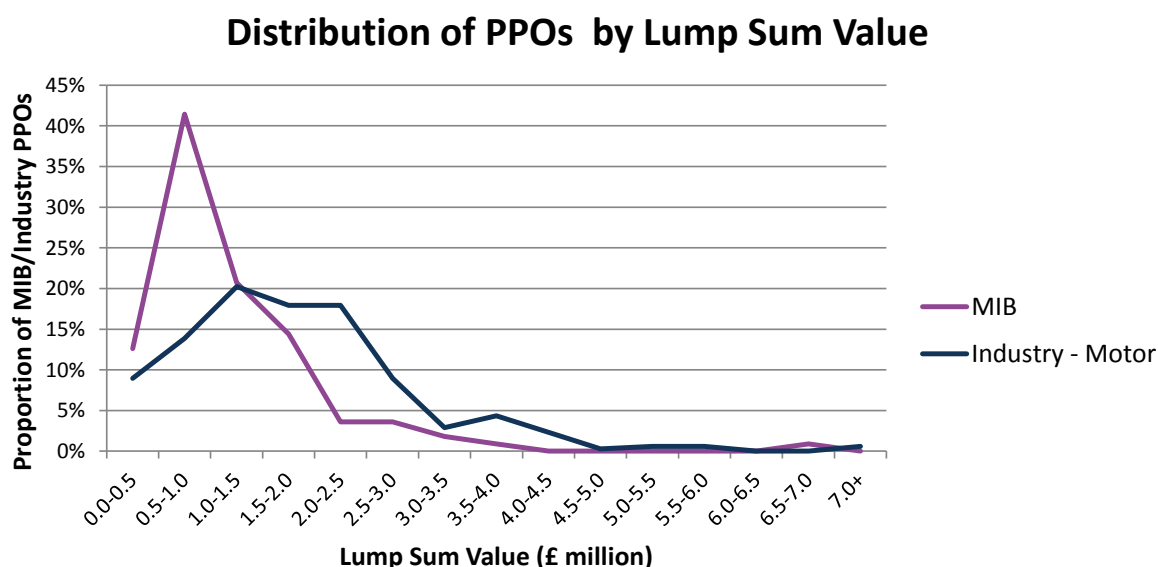
Figure 8.11: Comparison of Distributions of PPOs settled by MIB/Industry by Lump Sum Value

8.14   Figure 8.12 below compares the distribution of PPOs settled by both the MIB and the rest of the market by initial PPO amount (as defined earlier in chapter 3). The distributions are broadly similar; although it does appear that the MIB has a larger proportion of the smaller PPO payments (ie less that £50,000). This means the average initial PPO for the MIB is over £20,000 less than industry PPOs (at about £61,000 compared to about £85,000 for the rest of the market).

Distribution of PPOs by Initial PPO Amount
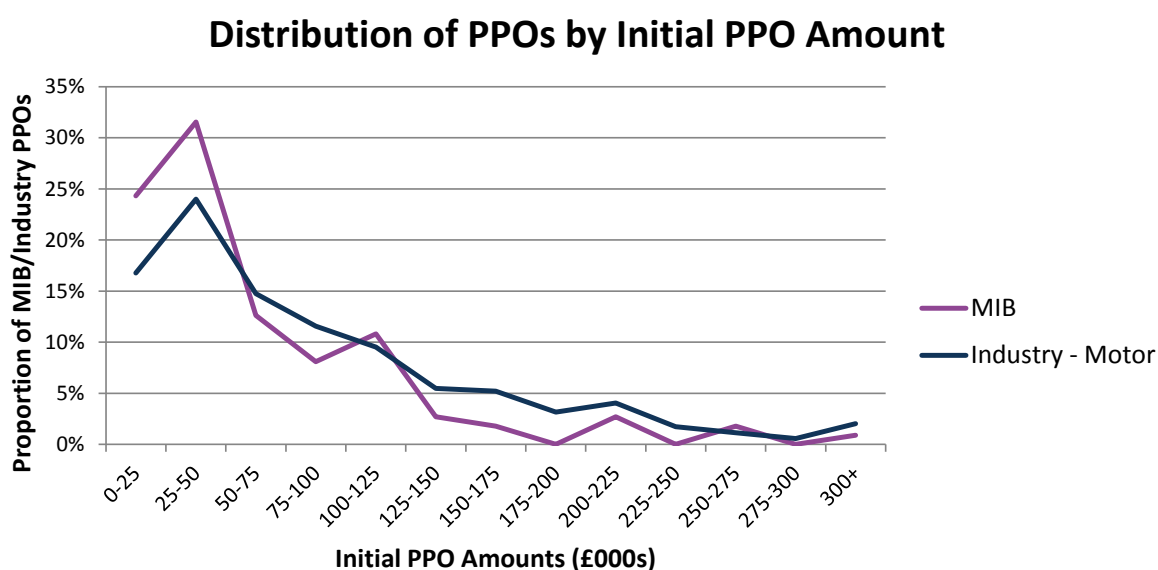
Figure 8.12: Comparison of Distributions of PPOs settled by MIB/Industry by Initial PPO amount

8.15   Figure 8.13 below compares the distribution of initial PPO amount by settlement year. Notice that in 2009, the year that had an unusual spike in the number of claims as shown in Figure 8.1, the distribution looks quite different to the following years with the peak occurring at initial PPO payments below £25,000. Hence it appears that there were greater smaller claims settled as PPOs in 2009 than in subsequent years.

Distribution of Initial PPO Amounts
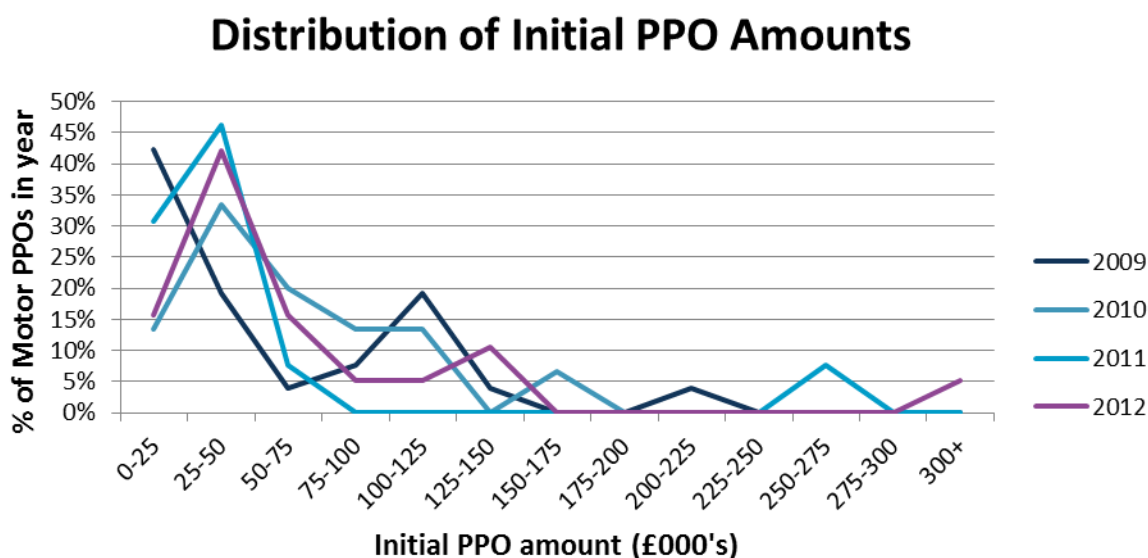
Figure 8.13: Comparison of distribution of initial PPO amount by settlement year

8.16   Figure 8.14 below appears to suggest that on average the future life expectancy for MIB claimants is slightly lower than for the rest of the market - the average life expectancy from date of settlement for MIB claimants is 39 years as opposed to 43 years for the rest of the market. This is consistent with the observation from figure 8.8 that there are proportionately fewer minors in the MIB data.

Distribution of Future Life Expectancy from Settlement Date
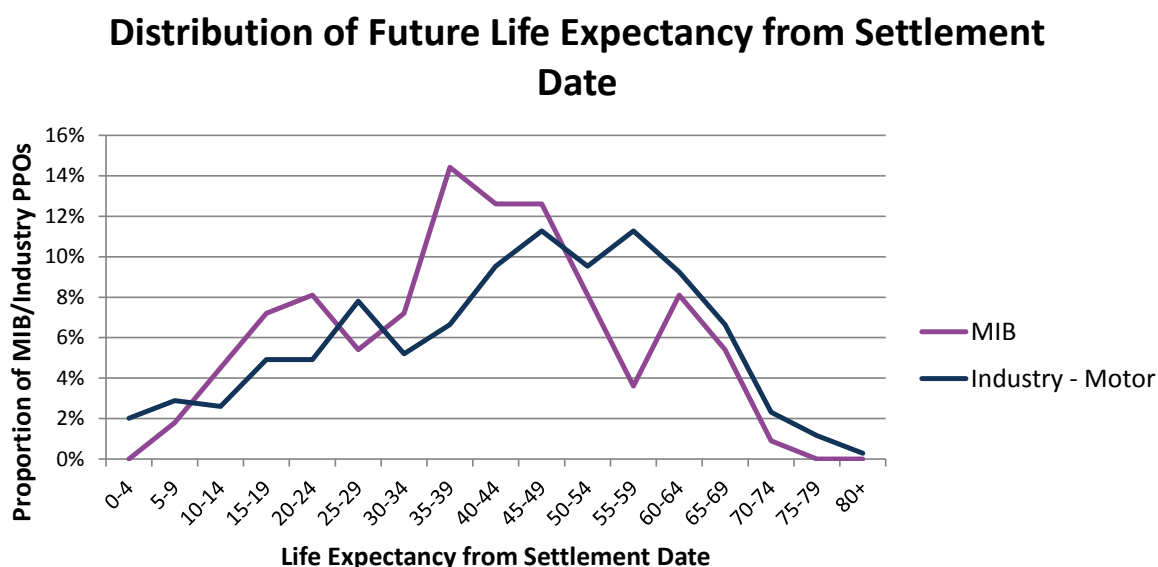
Figure 8.14: Comparison of distributions of PPOs settled by MIB/Industry by Life Expectancy from date of Settlement

8.17   It can be seen in Figure 8.15 below that the distribution of PPOs by reduction in life expectancy is very close to that of the rest of the market, thus the difference in average life expectancies seen above is a result of the higher average age of MIB claimants seen in figure 8.8 above.

Distribution of PPOs by Reduction in Life Expectancy as % of Unimpaired
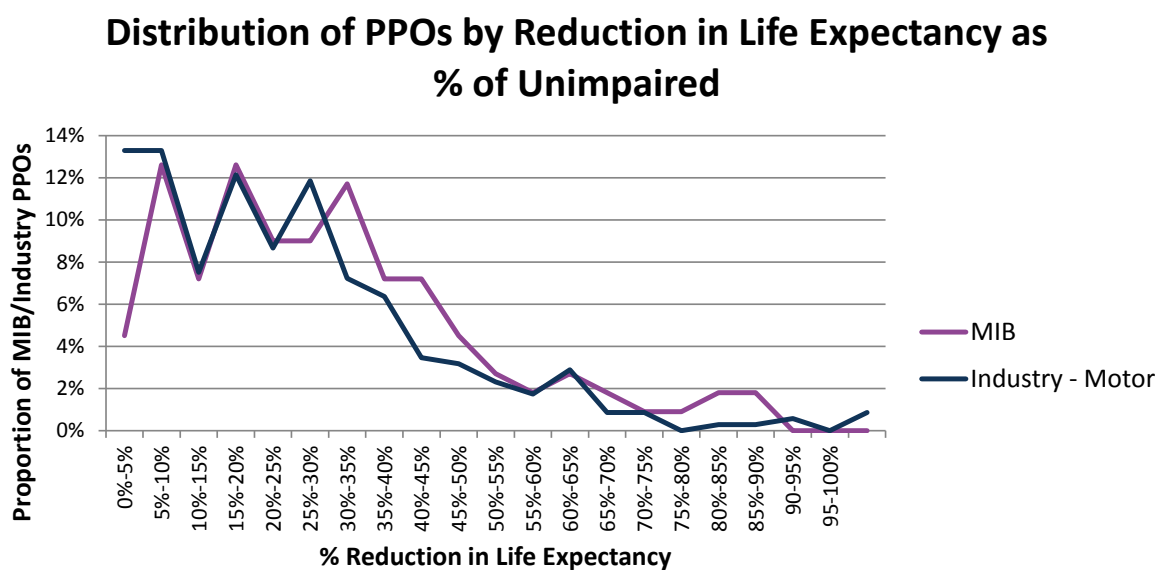
Figure 8.15: Comparison of Distributions of PPOs settled by MIB/Industry by Reduction in life expectancy as a percentage of unimpaired life expectancy

9. Longevity

Number of Deaths in Survey

9.1   The survey shows that there have been 10 male and 6 female PPO claimant deaths in the period from 2006 to 2012. This compares against the 7 male and 6 female deaths quoted in last year's survey. These figures include 5 MIB deaths. Figures 9.1 and 9.2 below show the number of deaths by age group for both male and female claimants. The figures also show a graph of initial exposure, which is a measure of the total number of years of exposure for PPOs in the survey. Table 9.1 shows this information in tabular format.
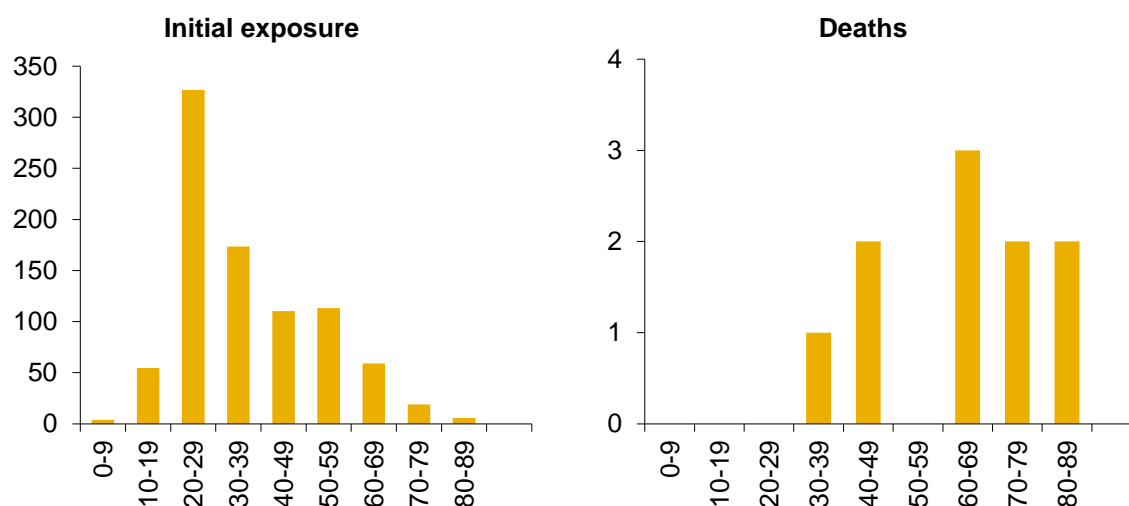
Figure 9.1: Number of male PPOs in the survey and number of male deaths in the survey
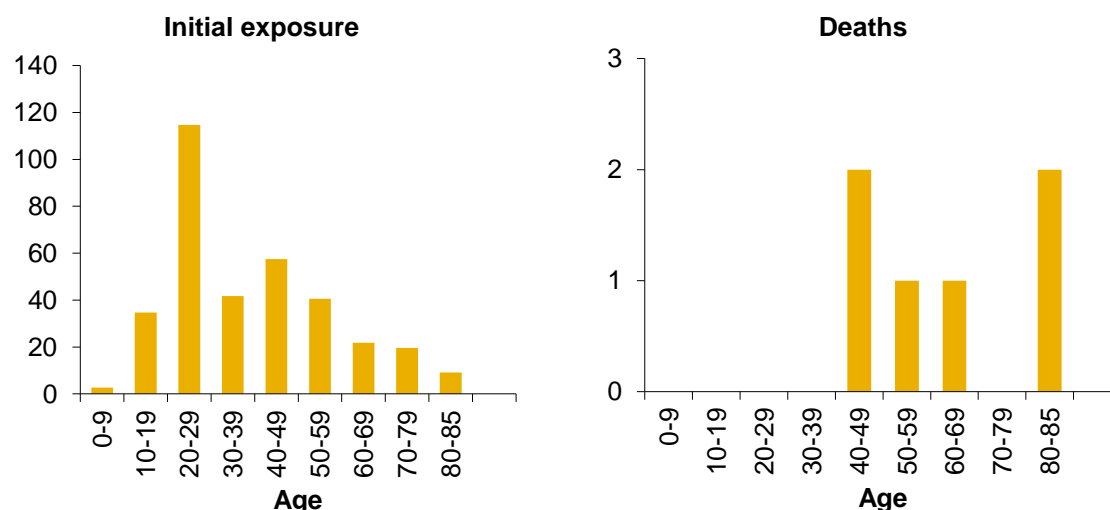
Figure 9.2: Number of female PPOs in the survey and number of female deaths in the survey

9.2   For half of these PPO claimants, the life expectancy at time of settlement was not recorded. For the eight cases where life expectancy was recorded, the life expectancies at the time of settlement cover a wide range of ages from 2 to 47.

9.3   There is not enough data to draw any conclusions as to whether there are any patterns as to the deaths that have occurred. However, for anyone interested table 9.1 below shows how

many years since settlement, how many years since the accident, and the settlement delay of claimant deaths in the survey.

Number of years	Years since settlement	Delay to settlement	Years since accident
0	5	0	0
1	2	1	0
2	5	3	3
3	3	1	1
4	1	5	1
5	0	1	1
>5	0	5	10
Total	**16**	**16**	**16**

Table 9.1: Analysis of Deaths in Survey

9.4   We undertook an analysis that involved calculating the adjustment to the standard Ogden tables, for individuals in the survey, which would be required to produce the number of deaths actually seen over the period. We have assumed that the ratio of actual to expected death rates fits to a Poisson distribution, parameterised based on the actual exposed to risk and the mortality rates from the Ogden tables. By using this method we were able to produce confidence levels around the median result.

9.5   The analysis was subject to a number of significant simplifications and assumptions, for example:

- It was assumed that the cohort was homogeneous in terms of life expectancy. We know that is very unlikely to be the case; some claimants are likely to have a very different prognosis to others as a result of their particular injuries (and lifestyles). For example, those with serious brain injury will be likely to have lower life expectancies, often significantly so, than those with moderate brain injury.

- It was assumed that it was appropriate to apply a single multiplier to the q_xs (the probability of an individual aged exactly x years will die within the next year). In fact we do not know the shape of the mortality curve for these impaired lives, indeed the shape may well be different for different injury types. One particular impact of this may be that it is not appropriate to apply the same multiplier as derived from observing the data at this relatively early stage of the experience to future mortality rates. The reason being that, for these kinds of injuries, mortality (relative to unimpaired mortality rates) is often higher in the early years after the accident.

9.6   In addition the analysis was conducted on a very small sample of claims over a short time period (2006 to 2012), and as such cannot be considered to be particularly credible hence **there is considerable uncertainty surrounding the results** – one additional or one fewer fatality would have a large impact on these figures. Normally pension funds would have much greater sample sizes and as a consequence have significantly narrower confidence intervals.

9.7   Table 9.2 below shows the output of the analysis. The median result suggests that the mortality rate for male PPO claimants is 3.3 times that of the general population and 4.4 times for females. This compares to 3.1 times and 7.9 times for males and females respectively in last year's survey. The model has output confidence intervals around these figures, however it should be noted that *we would expect the confidence intervals to be even broader than that shown below* due to elements of model error as described in Section 9.5 above. However the results do indicate that PPO claimants are likely to have a higher mortality rate than the general population as defined by Ogden table mortality rates.

Percentiles	Male	Female
5th	550%	853%
25th	405%	574%
50th	**327%**	**436%**
75th	264%	331%
90th	218%	258%
95th	195%	223%

Table 9.2: Median and percentile values for the required adjustments to the Ogden tables

9.8   Figure 9.3 below plots the actual number of deaths by age band against those that would have been expected for the survey sample using unimpaired mortality rates based on the Ogden 7 tables. In total there have been 16 actuals deaths against an expected number of 4.4 deaths representing a multiplier of 3.6 times (for males and females combined).
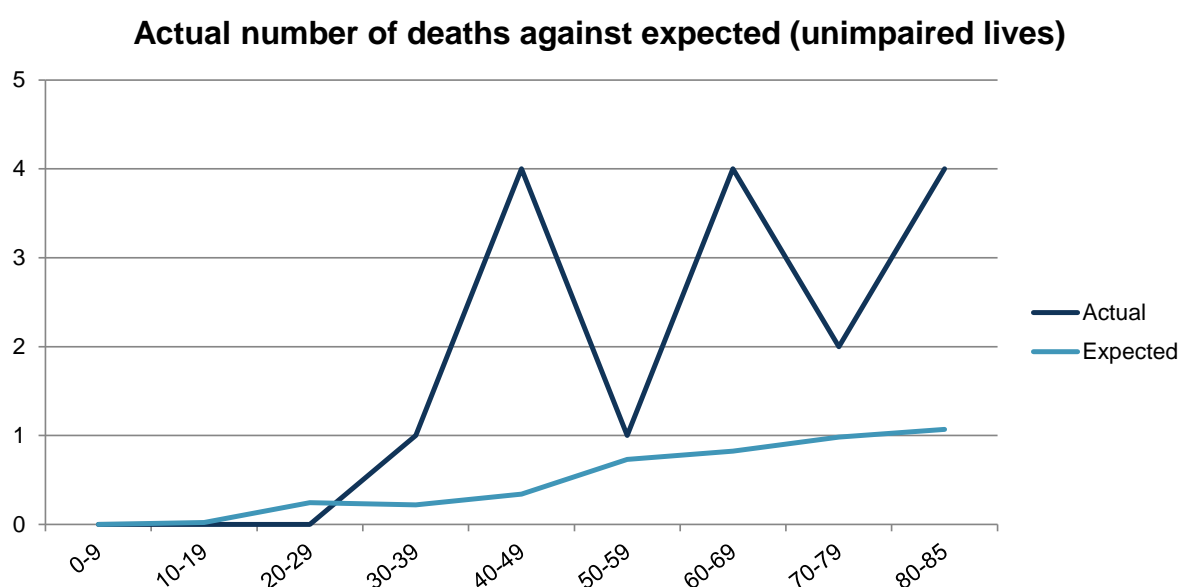
Figure 9.3: Actual number of deaths against expected (unimpaired lives)

9.9   **We would encourage readers to place a limited degree of reliance on these estimates and to reference other indicators and data sources to support any assumptions they are using for their own purposes.** To reiterate; we would advise readers to treat these results with caution due to:

- The small sample size - see Section 9.6

- The simplifying assumptions which have been made in the model (homogeneity of underlying mortality in the cohort and the appropriateness of a single multiplier) – see Section 9.5

- The mortality experience only being considered for those individuals who survive beyond the period it takes for their PPO claim to settle - see Section 9.16

Comparison to Mortality Rates Assumed by Insurers in the Survey

9.10   By assuming the results of the mortality curve for impaired lives are the same as that in the Ogden tables, we have converted the impaired life expectancies provided by insurers in the survey to be expressed as a mortality multiplier.

9.11   Table 9.3 below shows the mortality multipliers for both male and female claimants. The median assumption in the market for males is that the impaired mortality rate is 3.3 times the unimpaired rate, for females it is 3.1 times.

Percentiles	Male	Female
5th	1953%	5001%
25th	579%	683%
50th	**332%**	**315%**
75th	184%	156%
90th	135%	112%
95th	116%	97%

Table 9.3: Median and percentile values for the impaired life expectancies as a multiplier of unimpaired life expectancies

9.12   Figure 9.4 below shows the distribution of these multipliers, it is interesting to note how skewed this distribution is in terms of how long the tail is; for example almost 10% of female PPO claimants have assumed mortality rates of more than 22 times the unimpaired rate. This serves to further illustrate the point that PPO claimants are not a homogeneous group in terms of mortality.

Distribution of Impaired Mortality Multiplier
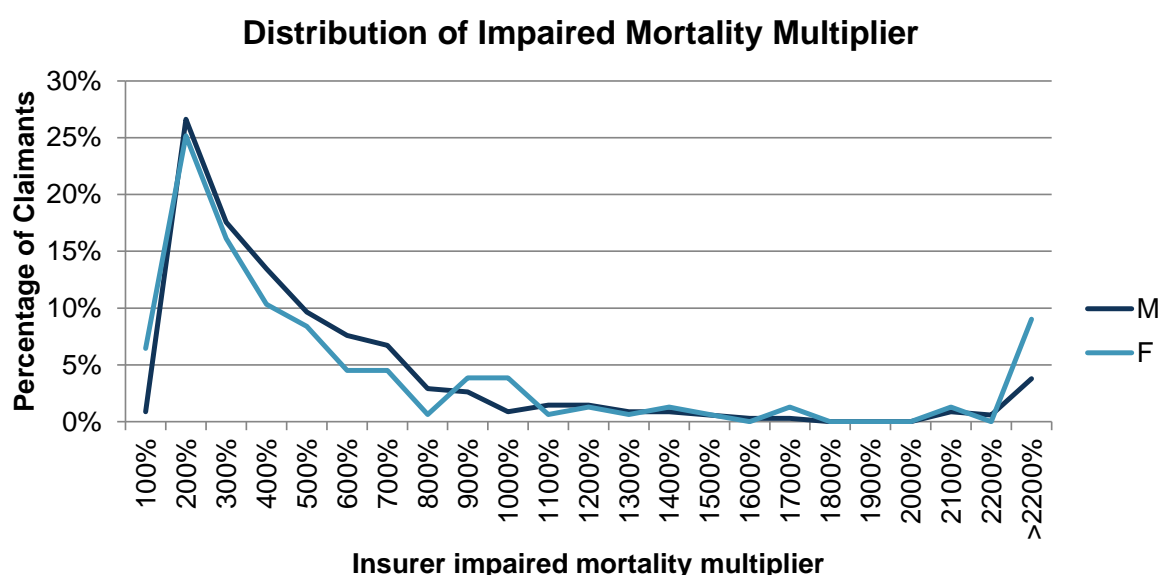
Figure 9.4: Distribution of mortality multipliers split by gender.

9.13   Table 9.4 below demonstrates how the mortality multipliers would translate to the percentage reduction in life expectancy measure for sample male and female lives aged 20, 40, and 60 in 2010.

| | Male | | | Female | | |
| | Age | | | Age | | |
Multiplier	20	40	60	20	40	60
200%	13%	17%	25%	11%	15%	22%
300%	20%	27%	39%	17%	24%	34%
400%	26%	34%	48%	22%	30%	42%
500%	30%	40%	54%	25%	35%	48%
750%	38%	49%	65%	32%	43%	59%
1000%	43%	55%	71%	37%	49%	66%
1500%	51%	63%	79%	44%	57%	74%
2000%	56%	69%	83%	48%	63%	79%

Table 9.4: Reduction in life expectancy to lives aged 20, 40 and 60 implied but the mortality multiplier

9.14   The results from the mortality analysis can also be expressed in terms of future life expectancy. The purple dots on the graph below show the Ogden 7 unimpaired life expectancy for a 34 year old male and female. We then show the 5th to 25th, 25th to 50th, 50th to 75th, and 75th to 95th percentiles of (a) the experience analysis (ie based on analysis of the number of deaths in the survey) in navy blue, and (b) insurer assumptions of life expectancy in aqua.
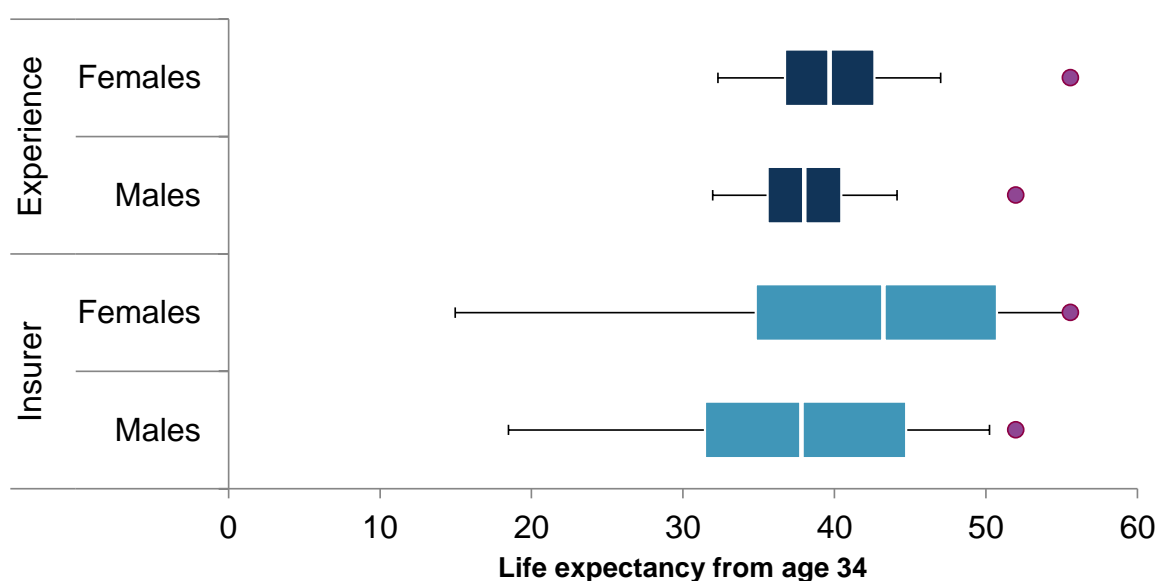
Figure 9.5: Comparison of results from Mortality analysis based on (a) mortality experience and (b) insurer assumptions of life expectancy

9.15   This graph shows the much larger ranges of values around the insurer assumptions of life expectancy in the market compared to the analysis. This is to be expected due to the lack of homogeneity in the underlying mortality of PPO claimants and also the inconsistent approaches taken to estimating the mortality on a case by case basis as discussed in Sections 9.17 and 9.18 below.

9.16   It is also worth reiterating that our analysis assumes it is appropriate to apply a single multiplier to the q_xs. However it is likely that for brain and spinal injuries mortality will be higher in the early years after the injury has occurred, and so given this analysis, in most cases, only covers an early stage of development since the accidents occurred, these results may be overstated. However, there is an average delay before settlement for these claims of six years, which would mitigate this effect.

Difference in Assumed Life Expectancy by Insurer

9.17   It appears that estimation of life expectancy may not be consistent from insurer to insurer. Figure 9.6 below shows the range in the different cumulative distribution of the percentage reduction in life expectancy plotted for each insurer (the smallest insurers have been excluded). It can be seen that there are significant differences in the life expectancy distributions from insurer to insurer; with the MIB assuming the biggest reductions in life expectancy. At least some of this may be explained by different mixes of PPO claim types, but it appears that different approaches to the estimation of life expectancy may be taken by different insurers.

9.18   Percentage reduction in life expectancy is defined as reduction in life expectancy as at the time of settlement as a proportion of unimpaired life expectancy as at the time of settlement.
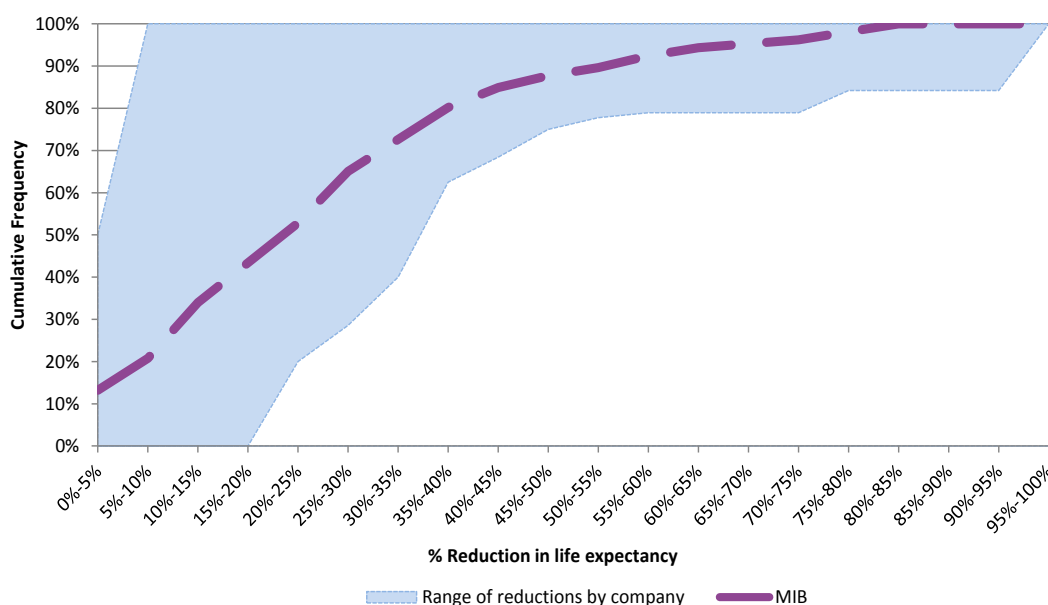
Figure 9.6: Range of difference in cumulative distribution of % reduction in life expectancy by insurer

Mortality Basis

9.19   One of the fields in the survey asked what the basis used to determine the life expectancy was. This year all the contributors (excluding the MIB) provided details on the mortality basis used. The most common response was "mid-range expert opinion". Other mortality bases were cited as:

- "one-expert opinion"
- "agreed life expectancy"
- "unimpaired"/"full life"
- "Ogden 7"
- "Ogden 7 less 'x' years per medical evidence
- "ONS 2008 Mortality with Mortality Improvement"

10. Reserves Held

10.1   This section considers the value of reserves held in respect of PPO claims.

10.2   In order to consider the size of reserves on a consistent basis, we have estimated total PPO costs and reserve values for each of the Motor PPOs in the survey on a cashflow basis, using the same methodology and assumptions for all claims (including stochastic mortality). However, the parameters used (such as life expectancy from settlement) were taken from individual company estimates. We have calculated these estimates using different discount rate assumptions.

10.3   These estimates will not be perfect in that some elements affecting claims size, such as variation orders and indemnity guarantees, will not have been captured. However, details of stepped payments have been incorporated.

Measure of PPOs as a proportion of UK Motor reserves

10.4   We then took our estimates of PPO reserves as at 31 December 2012 and compared them to the reserves held as indicated by the 2012 FSA returns. We calculated the following two measures which are shown in Figure 10.1:

a. $$\frac{Reserves\ of\ PPOs\ in\ payment}{Outstanding\ reserves\ from\ FSA\ returns}$$

b. $$\frac{Reserves\ of\ PPOs\ in\ payment\ plus\ PPO\ IBNR\ estimate}{Outstanding\ plus\ IBNR\ reserves\ from\ FSA\ returns}$$

10.5   To estimate the PPO IBNR component in measure 'b', we used the assumption that the ultimate number of PPOs (i.e. the number including IBNR PPOs) is around between 2 and 4 times the number of PPOs actually currently settled. This benchmark was presented at the reserving seminar by the Third Party Working Party (TPWP) and PPO Working Party (PPOWP) in November 2011, based on relatively crude analysis of private Car comprehensive claims frequencies for claims above £1 million (in 2011 terms) from TPWP research, and PPO propensity rates from the PPOWP survey. However it should be noted that this benchmark will reduce over time, as the number of settled PPOs increases.

10.6   These ratios only used results for the companies that both supplied data to the PPO survey and were in the FSA returns.

10.7   Given the approximations and assumptions inherent in the analysis, the following results are intended to only give a broad indication of the current position, and should be treated with caution.

10.8   The dashed line in Figure 10.1 below shows the settled PPO reserves as a proportion of the outstanding reserves from the FSA returns (measure 'a'). The bars indicate the range if results for the measure include IBNR reserves (measure 'b'). The results are repeated by valuing the PPO reserves for different real discount rates, which are shown on the x-axis.
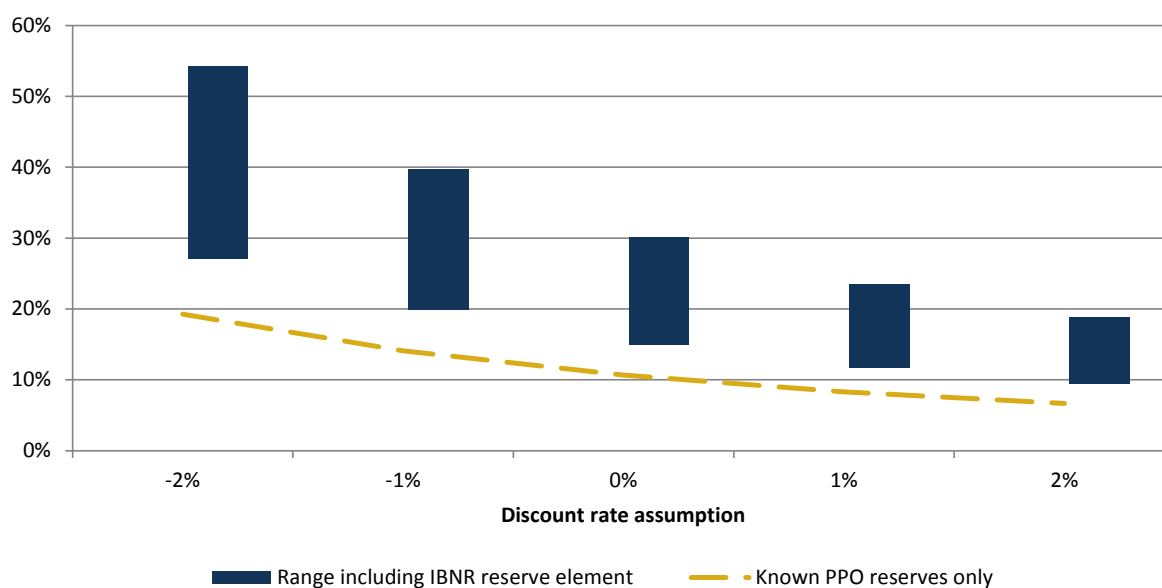
Figure 10.1: PPO reserves as a Proportion of Outstanding reserves from the FSA Returns

10.9   The results suggest that PPOs already in payment may currently make up somewhere between 7% and 19% of UK Motor case estimates, depending on the choice of real discount rate. When IBNR PPOs are taken into account (i.e. claims that have already occurred that will become PPOs in the future) this figure could rise to somewhere between a range of 10% to 30% (assuming a lower IBNR propensity) and a range of 20% to 55% (assuming a higher IBNR propensity) of UK Motor reserves as at the end of 2012, depending on the real discount rate assumed.

Distribution of Reserve Size

10.10   The following graph shows the distribution of our estimate of individual PPO claim reserve size for different real discount rate assumptions.

Distribution of PPO reserves
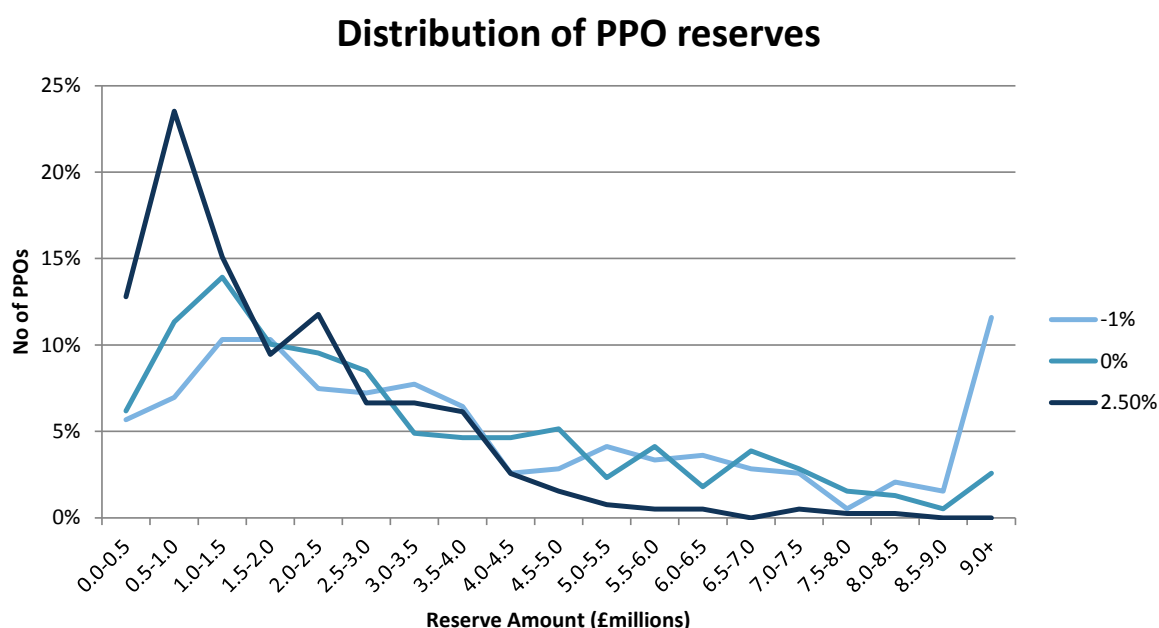
Figure 10.2: Distribution of PPO Reserve Amounts for different real discount rate assumptions

10.11   What is not immediately obvious from this graph is the size of the impact that changing the real discount rate assumption has on the estimate of the PPO reserves.

10.12   Table 10.1 below shows the effect of varying the real discount rate in comparison to using a real discount rate of 2.5% (which is consistent with the current real discount rate used in determining Ogden lump sums, but a different valuation methodology has been used to calculating the Ogden equivalent) for the settled PPOs within the survey. The results are presented in the form of a "Reserve Multiplier", which is the ratio of the total PPO reserves valued at the specified real discount rate relative to the same figure using a 2.5% real discount rate.

10.13   Choosing a real discount rate of 0% increases the PPO reserve estimate by 76% compared to using a real discount rate of 2.5%.

Real Discount Rate	Reserve Multiplier compared to 2.5% real discount rate
-2.0%	3.14
-1.0%	2.31
0.0%	1.76
1.0%	1.37
2.0%	1.10
2.5%	1.00

Table 10.1: Effect of real discount rates on PPO reserves compared to the same estimate using a

2.5% real discount rate

10.14 Figure 10.3 below shows this information in the form of a graph.

Size of PPO Reserves at different Real Discount Rates
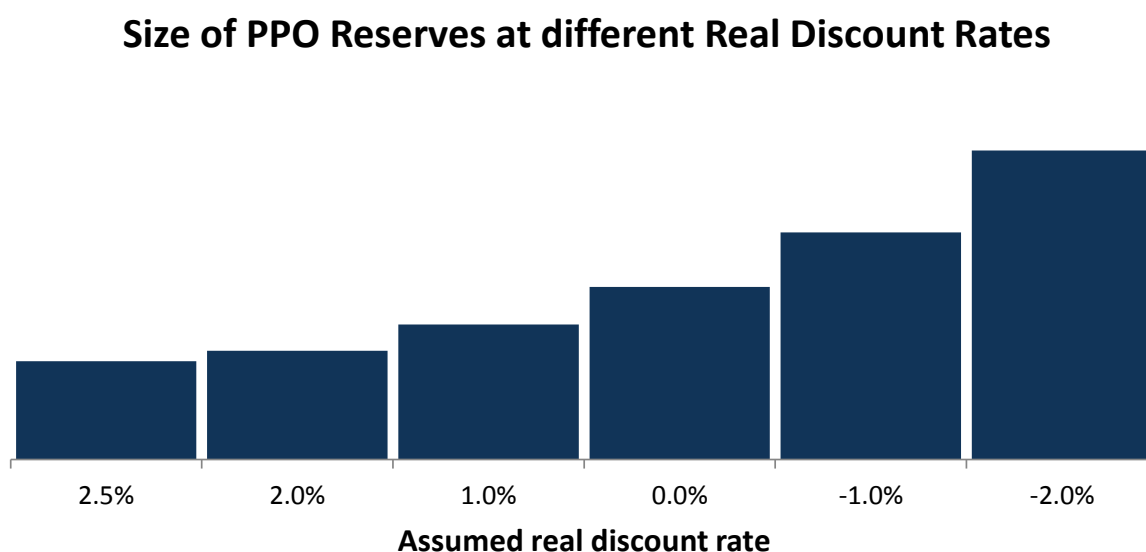
Figure 10.3: PPO reserves for settled PPOs in the survey using different real discount rates

10.15 The effect of the discount rate on the reserve will depend on how long the PPO has been in payment. The average effect of a change in the real discount rate on the total from ground up (FGU) cost of a PPO claim is shown in Table 10.2 below.

Real Discount Rate	PPO Total Cost Multiplier compared to 2.5% real discount
-2.0%	2.04
-1.0%	1.63
0.0%	1.37
1.0%	1.18
2.0%	1.05
2.5%	1.00

Table 10.2: Effect of real discount rates on PPO total cost (from ground up) compared to the same estimate using a 2.5% real discount rate

Comparison of PPO total costs to Ogden equivalent estimates

10.16   Figures 10.4 and 10.5 below show a comparison of the FGU PPO costs (estimated at real discount rates of 0% and 2% respectively) against the estimated FGU costs calculated as if they were to settle as an Ogden lump sum. The Ogden costs were provided by contributors.

10.17   The distribution of points demonstrates the variety in the valuation of PPO costs and/or the equivalent Ogden values.

Estimate of PPO cost against Ogden value at 0% real discount rate
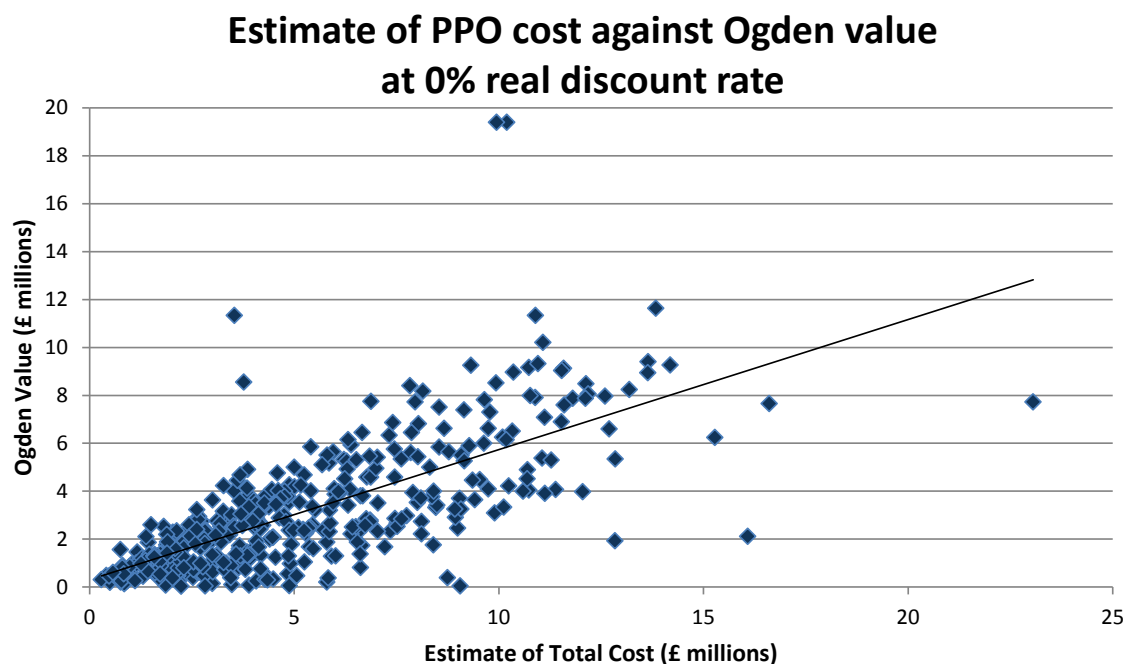
Figure 10.4: Comparison of PPO FGU cost estimate using a real discount rate of 0% against Ogden Value

Estimate of PPO cost against Ogden value at 2% real discount rate
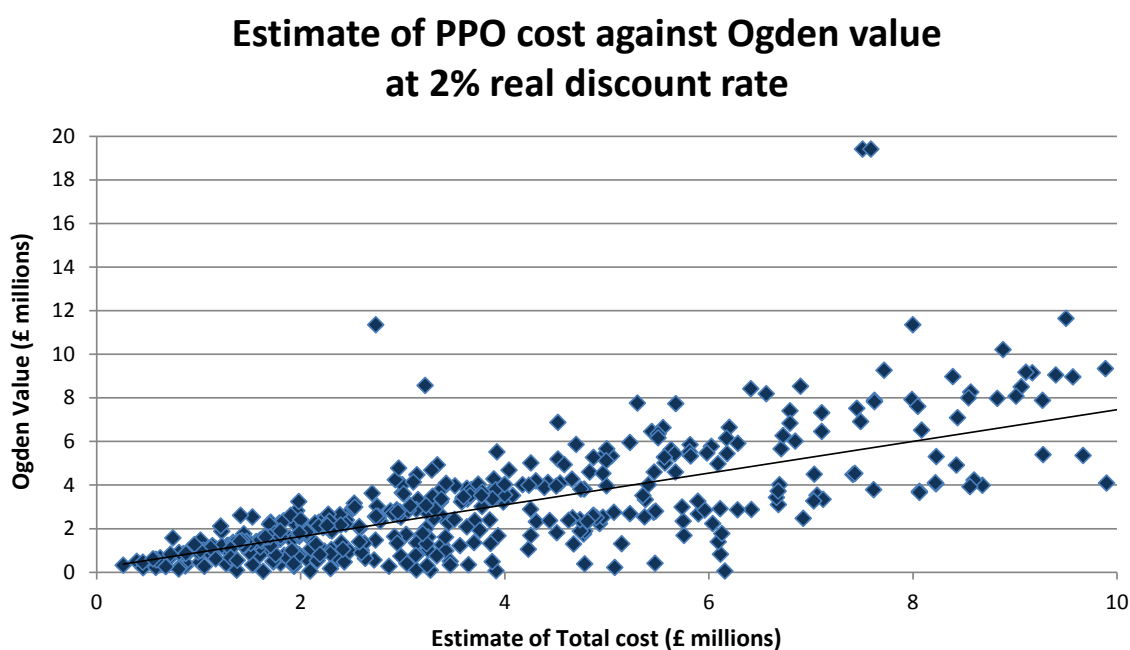
Figure 10.5: Comparison of PPO FGU cost estimate using a real discount rate of 2% against Ogden Value

Comparison to reserves held by the insurer

10.18 Figures 10.6 and 10.7 below show a comparison of the reserves (estimated at real discount rates of 0% and 2%) against the reserves held by the insurer, as stated in the information provided by all contributors to the survey. They show a clear positive correlation between the reserves held and our estimates of the reserves.

Reserve held by insurer compared to common methodology valuation using a real discount rate of 0%
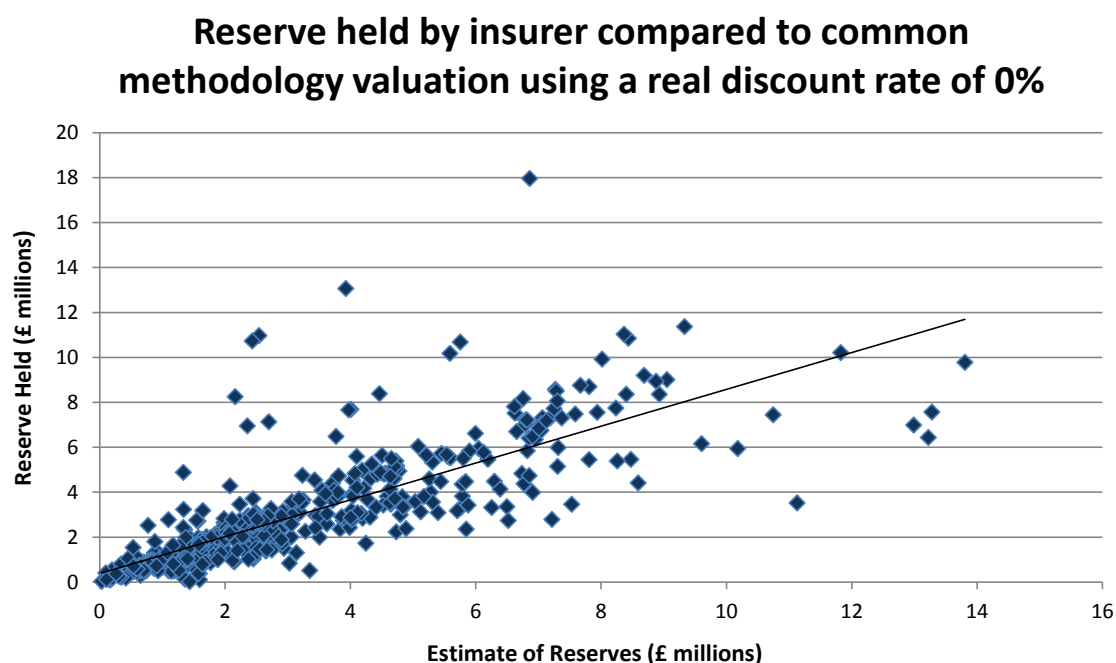
Figure 10.6: Comparison of Reserve estimate using a real discount rate of 0% against reserve held by insurer

Reserve held by insurer compared to common methodology valuation using a real discount rate of 2%
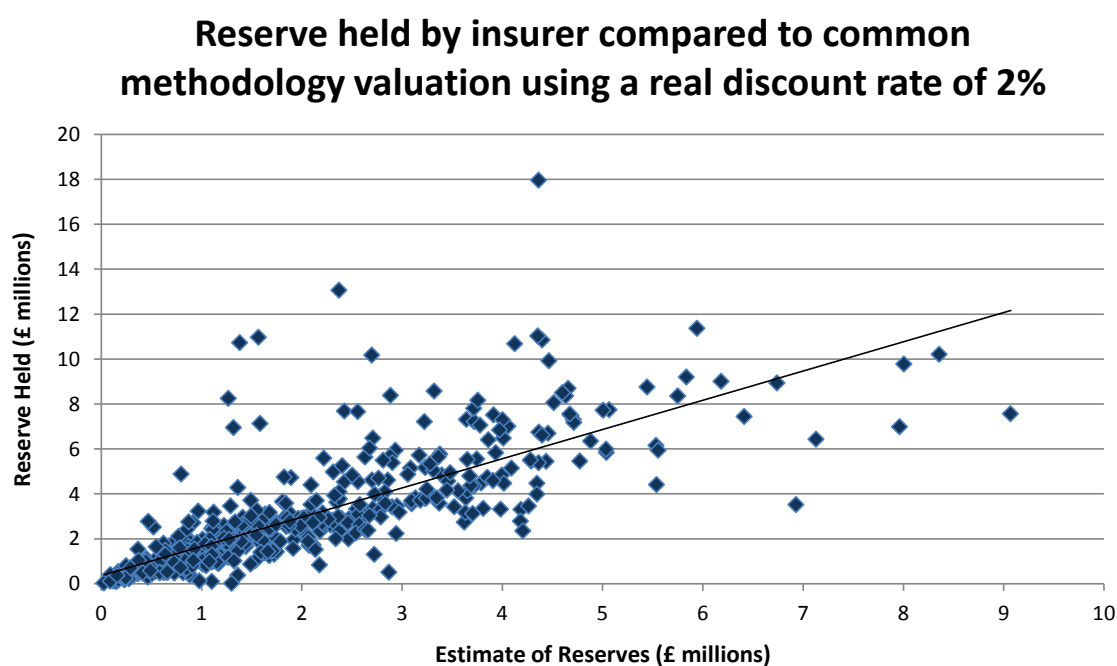
Figure 10.7: Comparison of Reserve estimate using a real discount rate of 2% against reserve held by insurer

Distribution of lump sum as a proportion of total PPO discounted claims costs

10.19 Figures 10.8 and 10.9 below show the distribution of the size of the lump sum as a proportion of the total PPO claims cost (estimated at real discount rates of 0% and 2%). At a 0% real discount rate, the lump sum most commonly makes up 30-40% of the total PPO cost.

Distribution of Lump Sum as a Proportional of Total PPO cost at 0% real discount rate
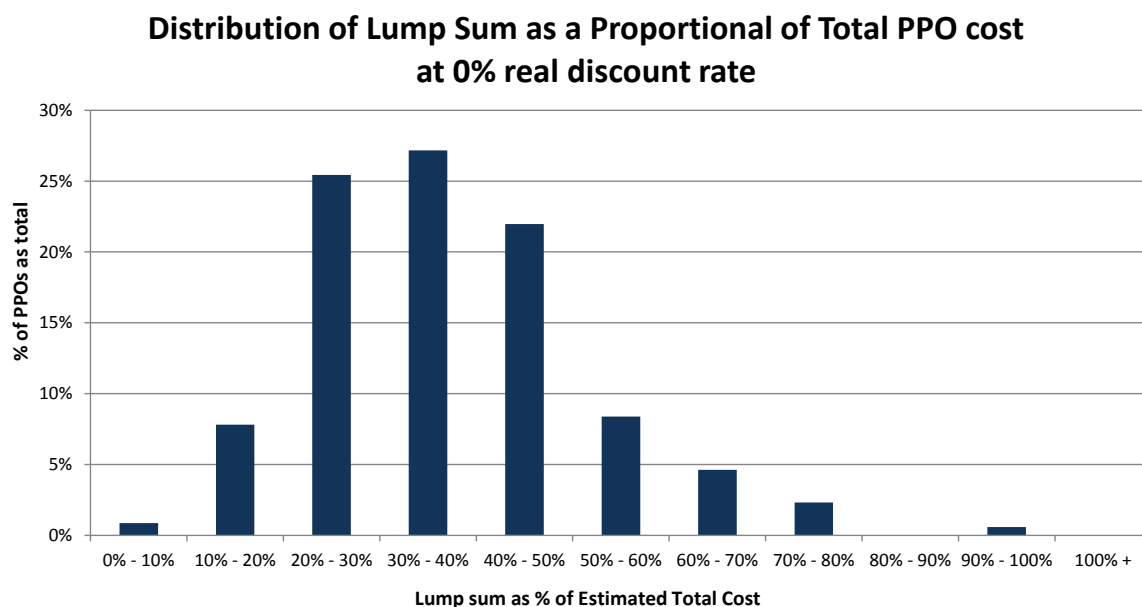
Figure 10.8: Distribution of lump sum as a proportion of Total PPO discounted claim costs, estimated using a real discount rate of 0%

Distribution of Lump Sum as a Proportional of Total PPO cost at 2% real discount rate
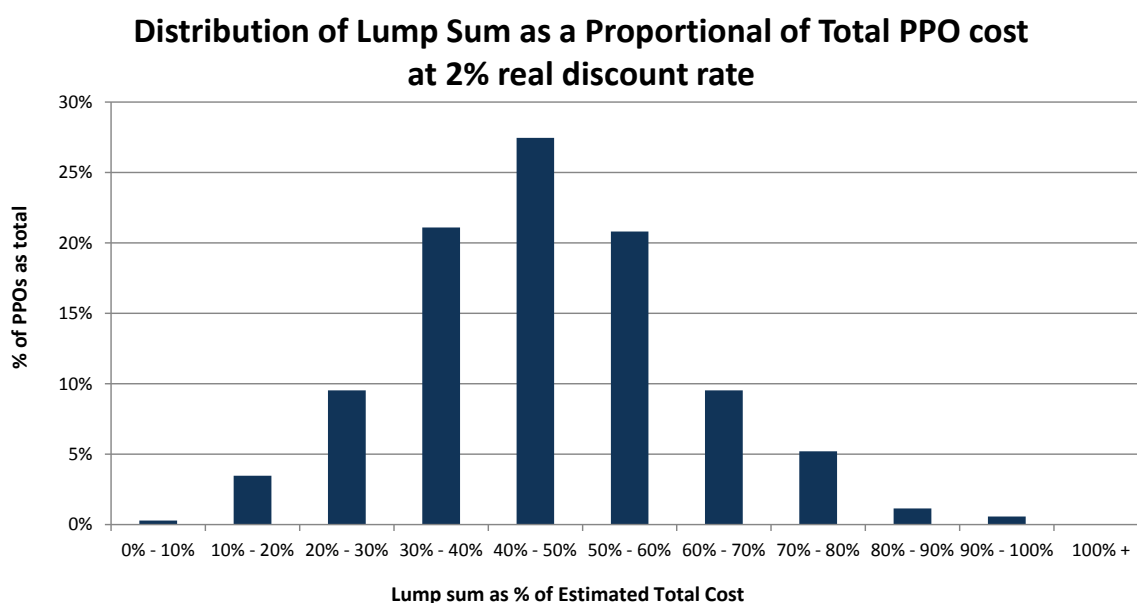
Figure 10.9: Distribution of lump sum as a proportion of Total PPO discounted claim costs, estimated using a real discount rate of 2%

Analysis of total PPO cost against features of the PPO

10.20   The calculation of individual estimates of PPO reserves has enabled us to analyse the size of PPOs by various factors, such as PPO amount and life expectancy. The results of these analyses are shown below.

10.21   Figure 10.10 below shows the distribution of reserves estimated at a discount rate of 1% split by injury type. The distribution appears to be fairly consistent across injury types, noting that there are only 92 spinal injuries compared with 272 brain injuries.

Distribution of Reserve Held by Injury type
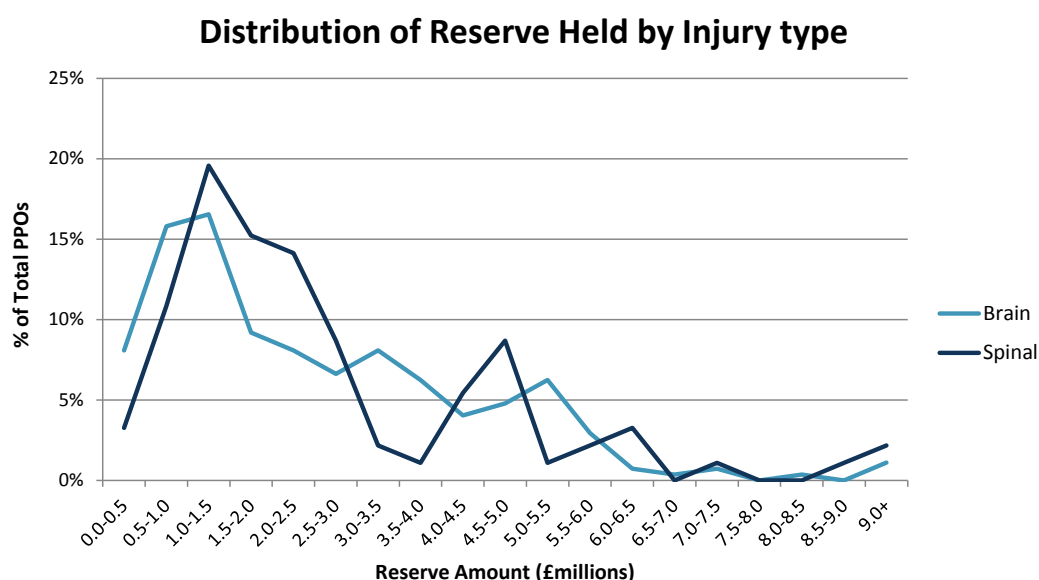
Figure 10.10: Distribution of reserves estimates by injury type using 1% real discount rate

10.22   Figure 10.11 below shows the distribution of reserves estimated for Motor PPOs at a discount rate of 1% split by cover type, i.e. private or commercial Motor. Under each cover type the distributions have a similar shape, however it should be noted there are only 83 commercial PPOs compared to 263 private PPOs.

Distribution of Reserve Held by Cover type
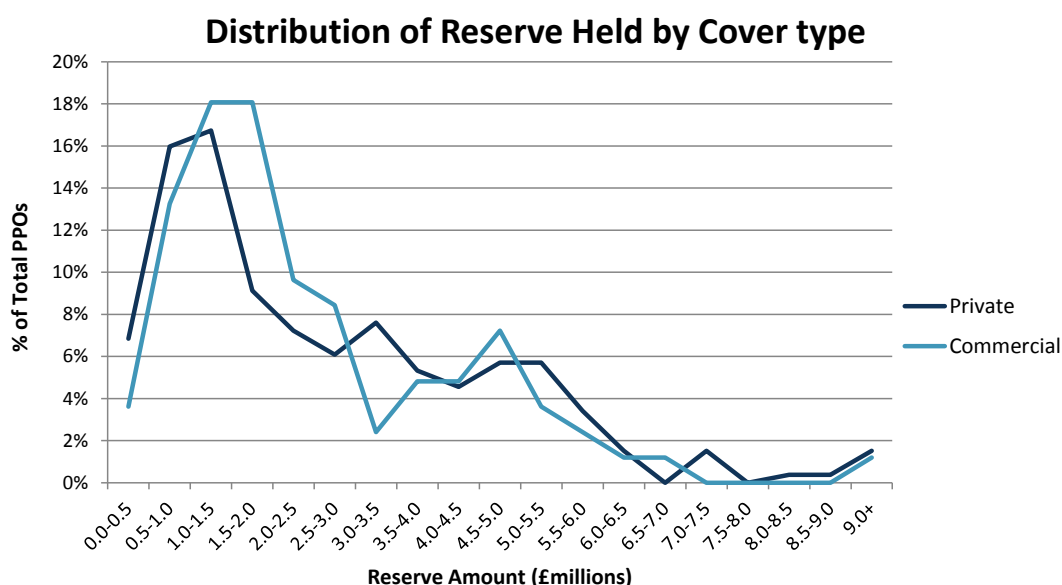
Figure 10.11: Distribution of reserves estimates by cover type using 1% real discount rate

Scatter Plots of reserve estimate against various key factors

10.23   This section analyses the relationship between the reserve amounts estimated at a real discount rate of 0% with various factors including life expectancy and annual PPO amount. The following figures suggest trends, however analysing each factor individually does not tell the full story as it is a combination of all the factors together that influence the reserve amount. For example, two PPOs may have similar reserves estimated at a 0% real discount rate, although one may be for a young claimant who has been awarded a PPO with relatively small annual payments, whereas the other may be a PPO for an older claimant with a larger annual PPO payment.

10.24   Figure 10.12 below shows the relationship between the reserves estimated at a real discount rate of 0% and the life expectancy at settlement date.

Estimate of Reserves against Life Expectancy
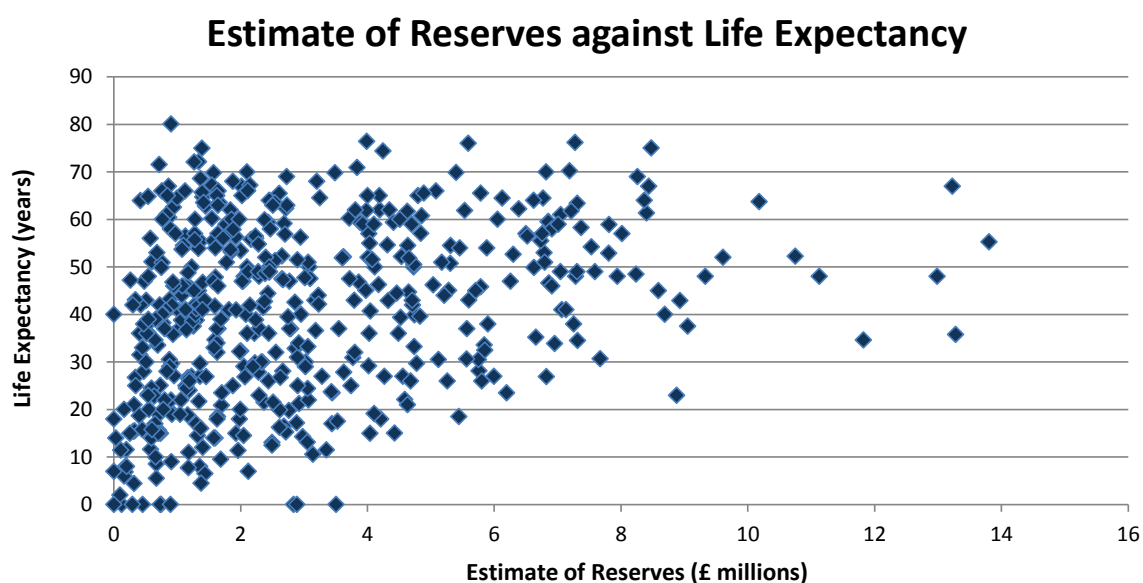
Figure 10.12: Estimate of Reserves using a real discount rate of 0% against future life expectancy at settlement date

10.25   Figure 10.13 below shows the relationship between the reserves estimated at a real discount rate of 0% against the age of claimants as at the settlement date.

Estimate of Reserves against Age of Claimant
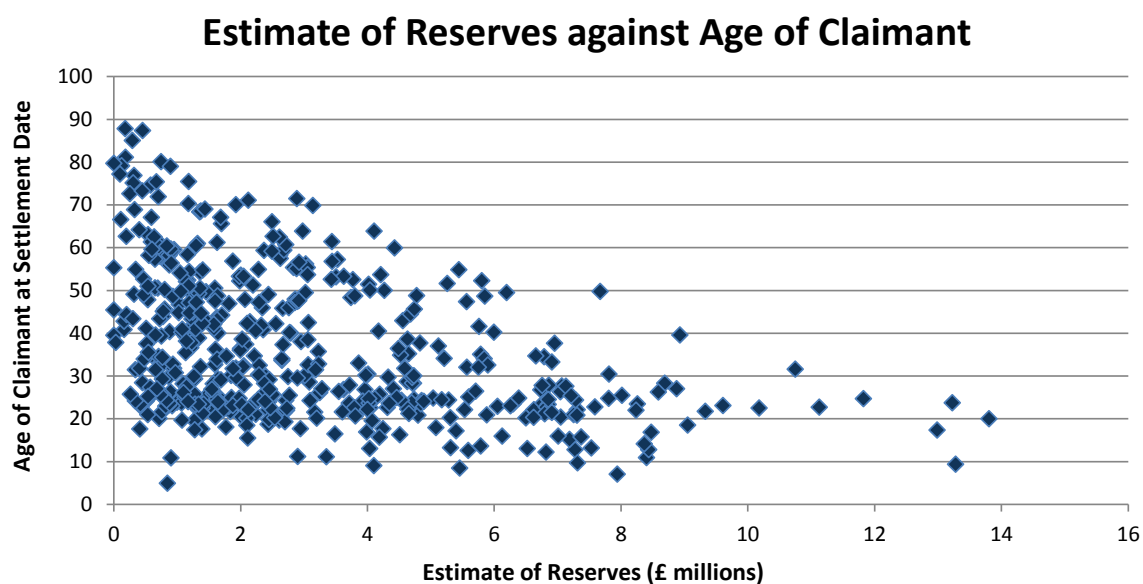
Figure 10.13: Estimate of Reserves using a real discount rate of 0% against age of claimant at settlement date

10.26   Figure 10.14 below shows the reserves estimated at a real discount rate of 0% against the initial annual PPO amount.

Estimate of Reserves against PPO Amount
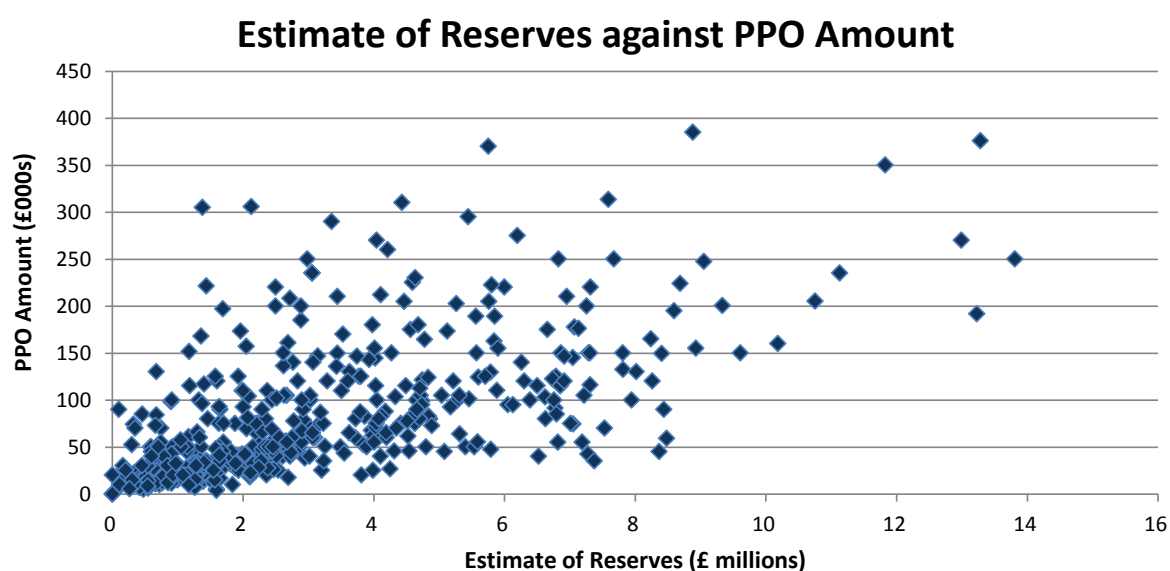
Figure 10.14: Estimate of Reserves using a real discount rate of 0% against annual PPO payment amount

10.27   Figure 10.15 below shows the relationship between the reserves estimated at a real discount rate of 0% and the lump sum value.

Estimate of Reserves against Lump Sum amount
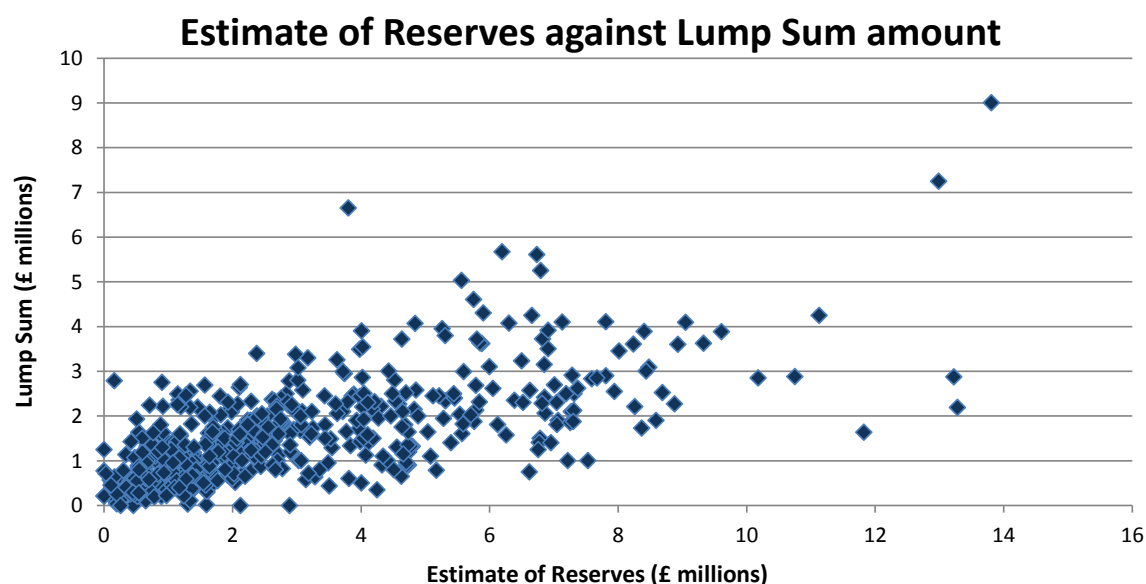
Figure 10.15: Estimate of Reserves using a real discount rate of 0% against lump sum value

10.28   Figure 10.16 below shows the reserves estimated at a real discount rate of 0% against the initial annual PPO payment amount, split by whether the PPO involves stepped payments or not. As expected the estimate of reserves appears to be larger for PPOs with stepped payments compared to PPOs with a similar initial annual payment amount that do not involve stepped payments.

Estimate of Reserves against PPO Amount by Stepped/Non-Stepped payments
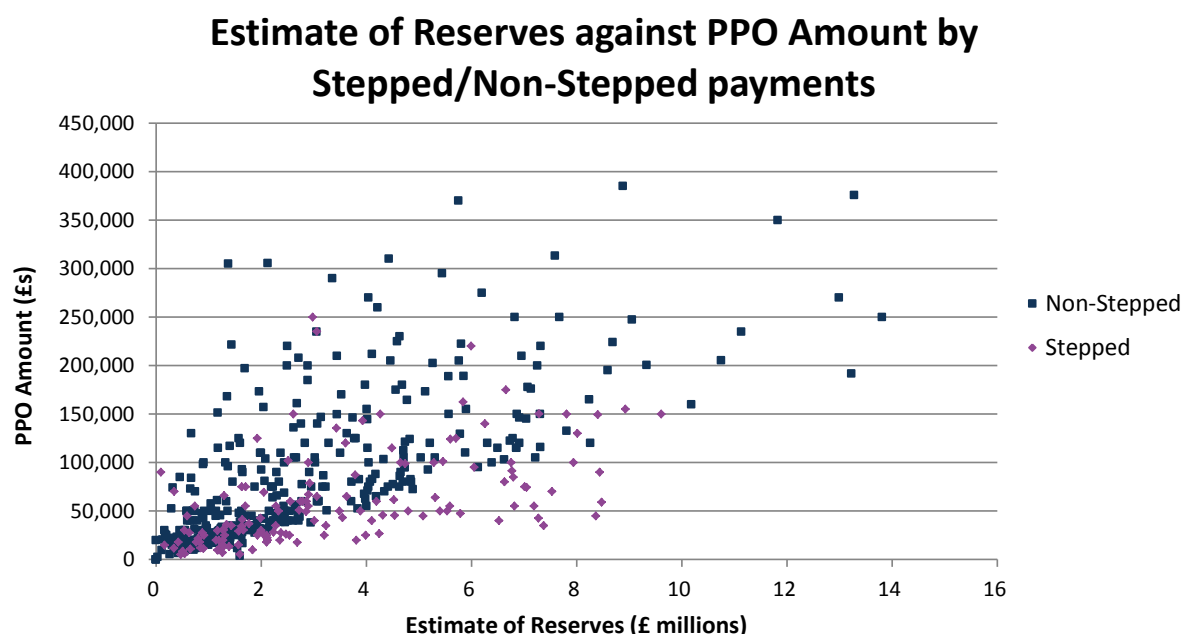
Figure 10.16: Estimate of Reserves using a real discount rate of 0% against annual PPO payment amount, split by stepped/non-stepped PPOs

10.29   Figure 10.17 below shows the relationship between the reserves estimated at a real discount rate of 0% against the delay to settlement.

Estimate of Reserves against Delay to Settlement
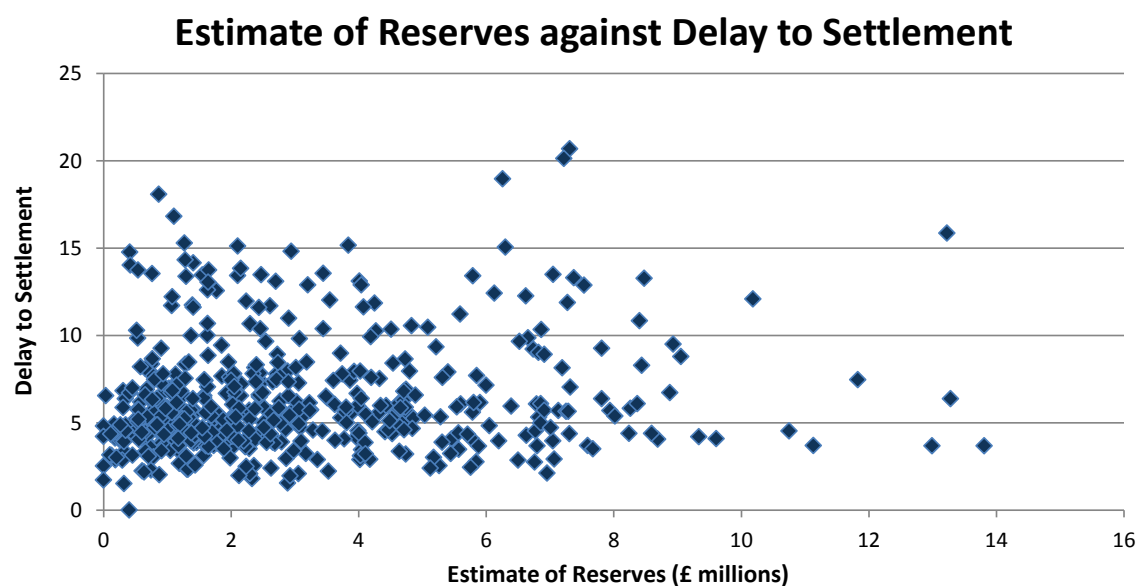
Figure 10.17: Estimate of Reserves using a real discount rate of 0% against delay to settlement

10.30   Other correlations other than just the ones shown above (that are in regards to reserves estimates) were considered. The Pearson's correlation coefficient for these are summarised in Table 10.3 below.

PPO Characteristics	Lump Sum	Initial PPO Payment	Life Expectancy	Age at Settlement	Reduction in Life Expectancy
Lump Sum	x	0.523	0.126	-0.296	-0.108
Initial PPO Payment	x	x	-0.300	0.136	-0.326
Life Expectancy	x	x	x	-0.829	not considered
Age at Settlement	x	x	x	x	not considered
Reduction in Life Expectancy	x	x	x	x	x

Table 10.3: Table of Pearson's correlation coefficients for selected PPO characteristics

10.31   Correlations observed will change depending on the real discount rate assumed in the estimation of the PPO reserve. To demonstrate, this is shown in Figures 10.18 to 10.20 below by comparing the trend lines on the scatter plots of PPO amount against individual reserve estimates on a -2%, 0% and 2% real discount rate basis respectively.
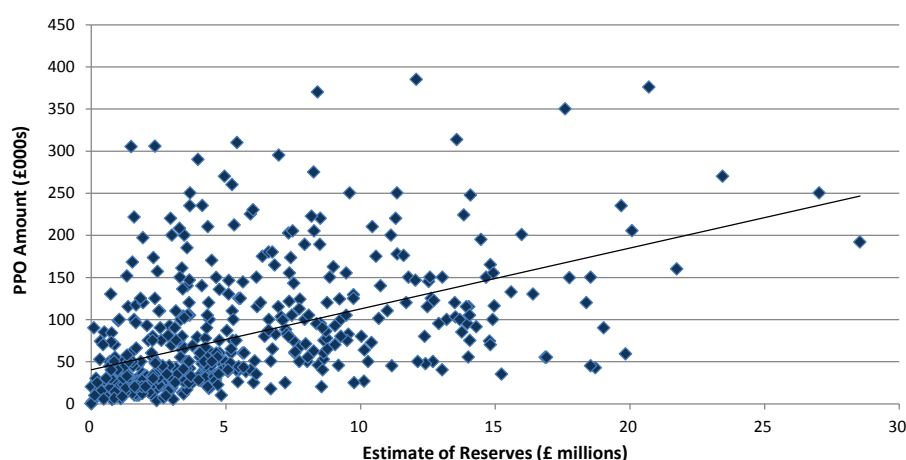
Figure 10.18: Estimate of Reserves vs Annual PPO Payment - using a real discount rate of -2%
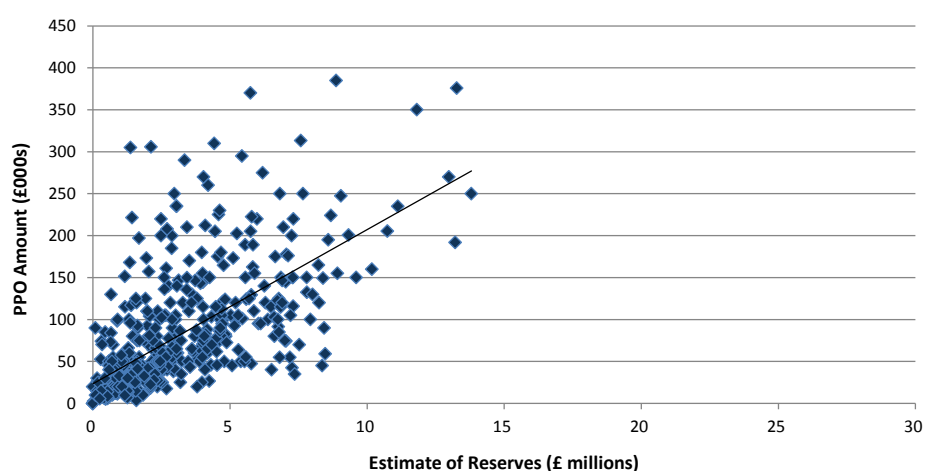
Figure 10.19: Estimate of Reserves vs Annual PPO Payment - using a real discount rate of 0%
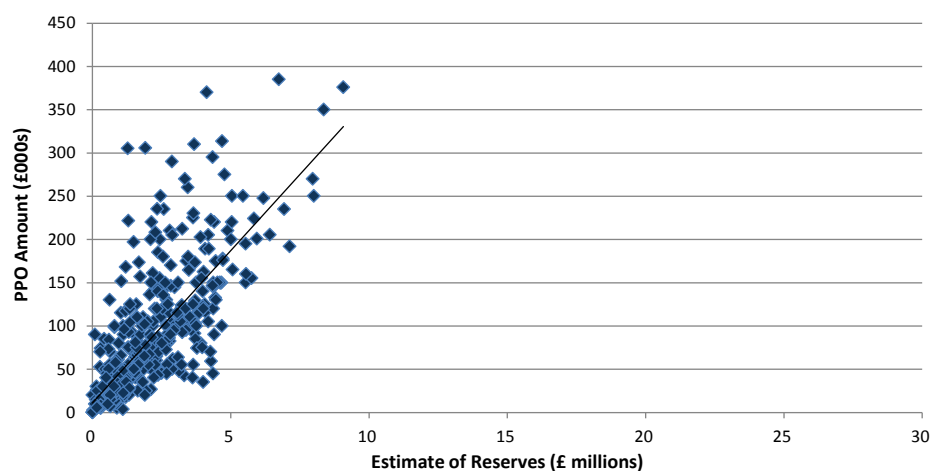
Figure 10.20: Estimate of Reserves vs Annual PPO Payment - using a real discount rate of 2%

11. Qualitative Survey

11.1   We conducted (typically) one-hour telephone interviews with senior actuaries from 14 insurers and 8 reinsurers. Very occasionally respondents did not answer some questions, so total responses will not always sum to the full 14 insurers or 8 reinsurers.

11.2   It was good to learn that the survey is widely used; all but one respondent said that they used the results of the survey. Certainly the support shown each year for the survey is always very high, not least in the time companies give up in taking part in these interviews.

11.3   Propensity is by far the most commonly mentioned measure that is looked at. Other uses given were for best practice and seeing how you compare in the market. Another reason was to sense check model inputs.

Diversity

11.4   If we had to summarise the message coming out of the qualitative survey it would be diversity. Writing up the results is always a challenge as the individual responses tend to vary so much.

11.5   There are a number of reasons why you would expect different insurers or reinsurers to form a, possibly very, different view or approach to PPOs:

- The shape of the companies will be different, some may be virtually UK Motor mono-lines, for others Motor business may only be a small proportion of their overall business. They may be part of a much large international group, or even have a life arm.

- The mix of business may be very different, be it the Motor/Liability cover ratios or the demographics of their client base. Some companies will write very different business to others, eg niche Motor writers.

- Different companies will have a very different attitude to risk attitude or risk appetite, which will be reflected in all areas of their business such as the assumptions made, their investment strategy and the nature of the business written.

- How much of long term outlook a company has will have a big impact on a company's view of PPOs, with balance sheet exposure to PPOs set to increase for decades to come. Companies with shareholders, for example, are also likely to have a close eye on the more short term position. In addition, how many senior managers of today will still be in place in 20 or 30 years' time when the full effects of today's PPOs will be being felt?

11.6   However, the above reasons alone do not explain all the variations observed in this survey and a particular organisation's understanding or appreciation of PPOs does also seem to play a part.

Concern Rate

11.7   We asked how concerned the organisations are about PPOs on a scale of 1 to 5 with 5 being the most concerned. They were then asked to say how they would have answered if they had been asked the same question a year ago.
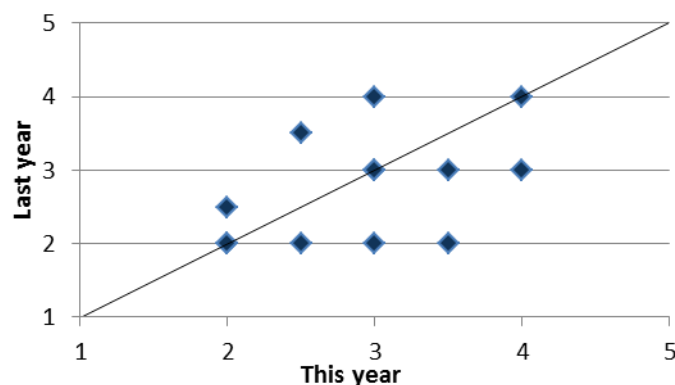
Figure 11.1: Insurers: How concerned are you about PPOs, a) this year, b) last year: Scale of 1 to 5, 5 most concerned

11.8   The diversity of response amongst insurers was apparent in the answers given to this question. However, it is interesting that it appeared not possible to predict where a particular company would be on the above graph given the likely reasons for diversity between companies as set out in Section 11.5 above.

11.9   As you can see from the above graph, a similar number are less concerned than they were a year ago than are now more concerned (three less concerned, five more concerned and five are unchanged). Two said the reason for being more concerned was that they had done capital modelling over the year and undertaken work into the impact of PPOs on the balance sheet. Two of those who were less concerned had also spent time looking at PPOs over the year and were now more comfortable with them, however these companies had not undertaken capital modelling work.

11.10   Only one company specifically cited developments in reinsurance and capitalisation clauses as a reason for being more concerned.
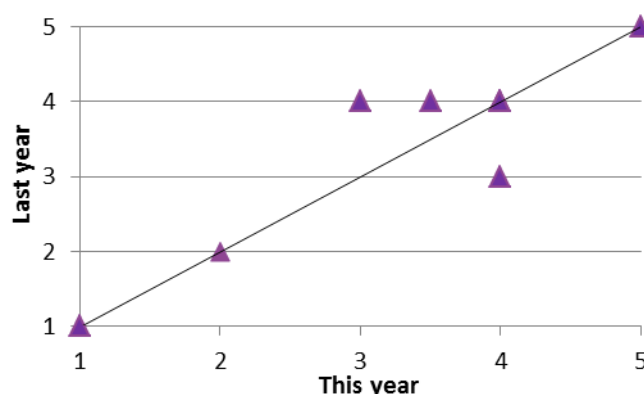
Figure 11.2: Reinsurers: How concerned are you about PPOs, a) this year, b) last year: Scale of 1 to 5, 5 most concerned

11.11   There is a similar story with reinsurers with arguably an even more diverse range of opinions if anything.

Solvency II

11.12   Overall when we asked how much Solvency influenced the approach taken to PPOs the response was very low key, with all the reinsurers in the survey saying it had no impact, as well as four of the insurers. When the insurers did cite an impact it was different in almost every case ranging from operational considerations to two opposing comments on the standard formula, to two actually saying the impact will not be great, but for different reasons.

11.13   It was surprising that very few respondents mentioned the Long-term Guarantees (LTG) package. This will be written into Solvency II legislation in the near future and as such is likely to be very difficult to change going forward. At the moment it looks like the impact of Solvency II may well be that companies will have to value PPOs on a risk free rate, which will have a significant impact, especially in one or two decades' time when PPOs are likely to be much a larger proportion of some companies' balance sheets than they are now. Two companies said they were already using a risk free rate to value PPOs and one commented that they had just completed the SII EIOPA assessment.

Risk transfer

11.14   Respondents were provided with a list of possible risk transfer options and then asked their opinion on them:

- Standard reinsurance/retrocession

- Loss Portfolio Transfers/Adverse Development Covers

- Hedging products (some overlap with Investment question)

- Impaired life annuities (or any other means of transferring longevity risk to another market)

- Pooling arrangement

- Government-sponsored market body or statutory funding.

11.15   Overall, and perhaps surprisingly, there was a lukewarm reception to these risk transfer options as shown by companies' appetite for them as shown in the graph below.
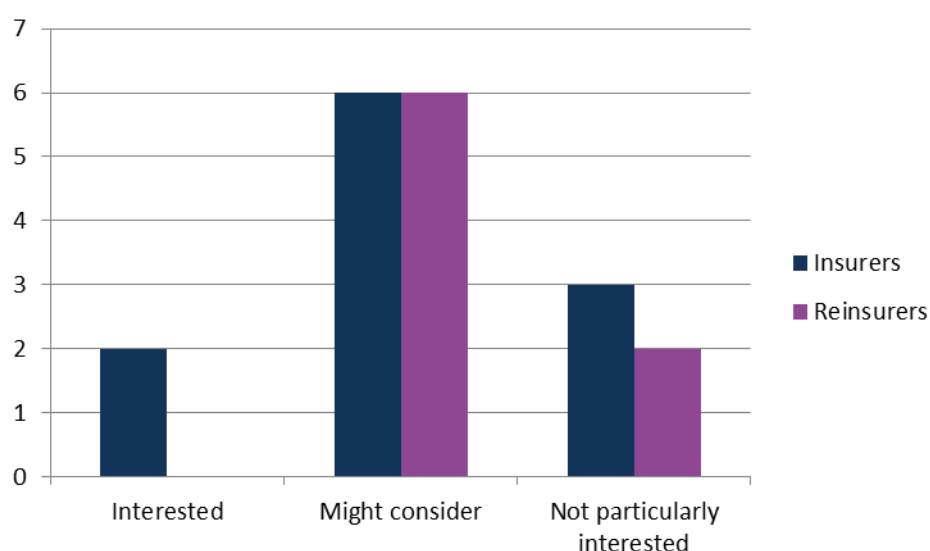
Figure 11.3: Respondents appetite for risk transfer options

11.16   Of those that said they might consider a risk transfer option most said that their interest would depend on the price and terms of any deal. Three specifically mentioned they would not be interested in a pooling type arrangement as they felt they might lose some competitive advantage by sharing in others' experience.

11.17   The biggest reason cited for the lack of take-up of risk transfer options was price. Other reasons cited were that there was currently no market and there was not enough volume yet.

Investment Strategy

11.18   Only three insurers and one reinsurer said they had specifically changed their investment strategy as a result of PPOs, and one other said they hadn't yet but would be definitely doing so soon. No respondents had changed their investment strategy in the last year as a result of PPOs. One respondent commented that they would like to see the government issuing longer term gilts.

11.19   No insurers in the survey had purchased an annuity for a PPO.

Reinsurance

11.20   We asked insurers what the starting retention limit of their excess of loss reinsurance program was. As expected there was a diverse range of responses, though all agreed that they had not changed their retention limit over recent years specifically as a result of PPOs. Very few companies had any Motor quota share reinsurance, and if they did the reasons for doing so had nothing to do with PPOs.
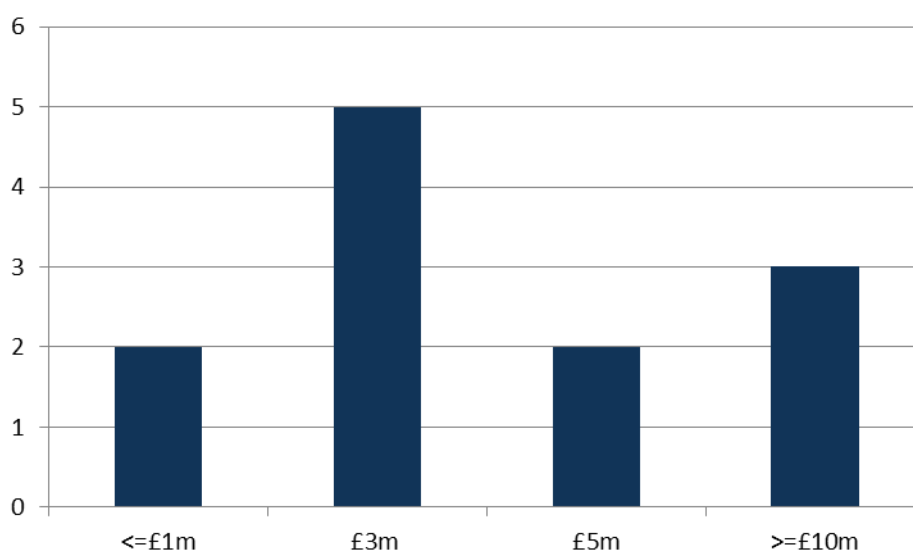
Figure 11.4: Insurers: Reinsurance retention limits

Capitalisation clauses

11.21   A capitalisation clause allows (or even compels) the reinsurer to settle an individual PPO liability as a lump sum with the insurer, usually on a pre-agreed basis, once such an award has been made/agreed.

11.22   Very few (less than 20%) of the respondents had capitalisation clauses and of the three that did two said that less than half of placement was on capitalised basis (the third did not provide this information). The reason for accepting the capitalisation clauses was cited as the price reduction offered.

11.23   This did not tie up with the reinsurer response, where use of capitalisation clauses looked a little more usual. This is likely to be due to the fact that Motor insurers included in the survey tended to be those larger insurers with the bigger market share, smaller insurers may be more likely to have had a capitalisation clause last year.
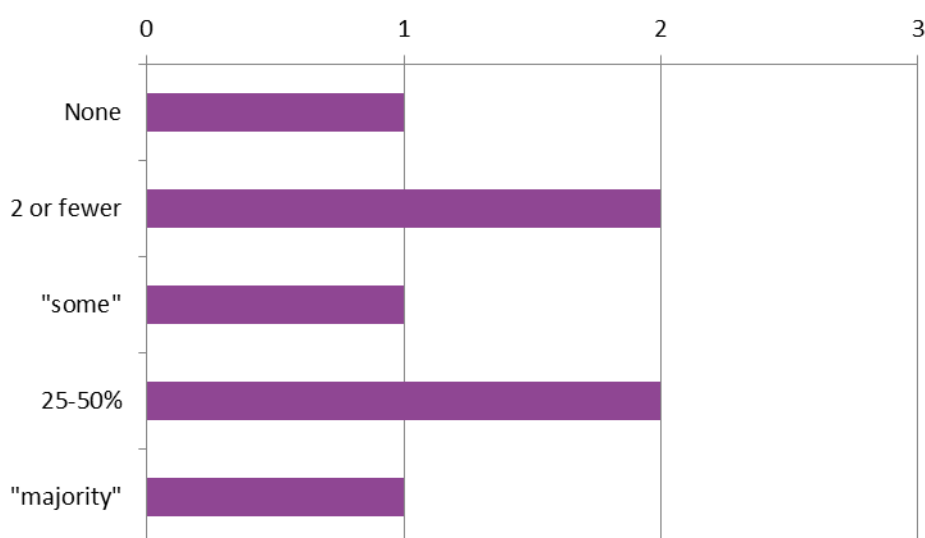
Figure 11.5: Reinsurers: Number of capitalisation clauses written last year

11.24   Reinsurer appetite for capitalisation clauses was not as great as we had anticipated, given the noise surrounding them in the market last year, with only a minority insisting or preferring capitalisation clauses.
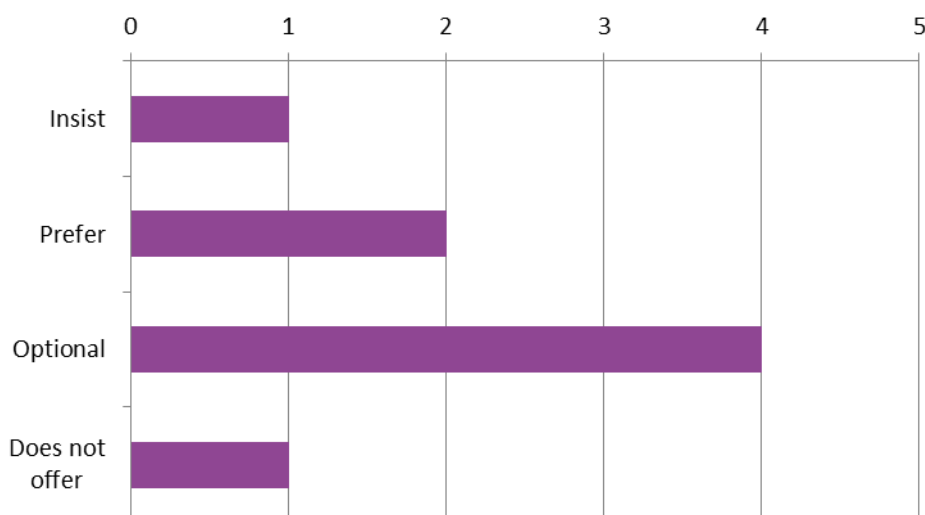
Figure 11.6: Reinsurers: Do you insist on a capitalisation clause in your reinsurance contract?

11.25   We also asked companies whether they took the cost of capital into account when pricing the cost of reinsurance.
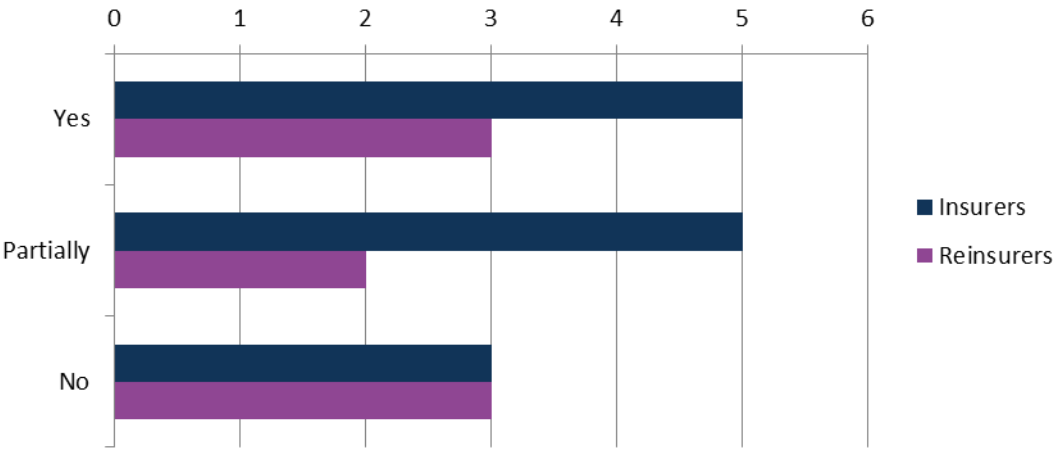
Figure 11.7: Do you take the cost of capital into account when pricing reinsurance?

11.26   The responses were again diverse amongst insurers and reinsurers. It appears that from this response that significant elements of both the insurance and reinsurance markets may not yet have a good understanding of the impact on the cost of capital that PPOs have and may not be reflecting it in their reinsurance pricing and purchasing decisions.

Methodology and assumptions

Reserving assumptions

Discount rate
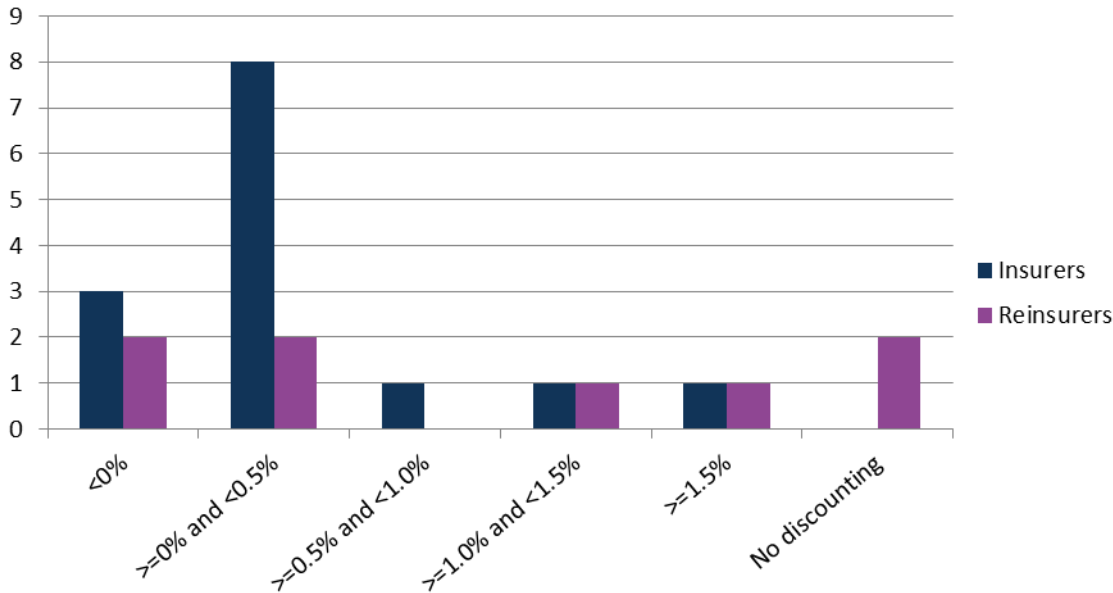
Figure 11.8: What real discount rates do you use when estimating reserves?

11.27   The rate referred to here is the real rate used to value PPOs, ie. the investment rate after the ASHE based inflation rate has been taken into account.

11.28   Whilst there seems to be a clustering around 0%, there is a very wide range of assumptions. This range is even broader for reinsurers with assumptions ranging from -2.5% to 2.5%. In some cases, for example, where a yield curve is being used to determine the investment return, it is very difficult to pin-point a single central number for the overall rate used.

11.29   Despite the apparent clustering around 0% for the real rate companies are using to reserve PPOs, the logic behind the choice of rate varies substantially. For example if we look at the choice of rate used to discount for investment return we see a wide range of responses with almost as many insurers taking a conservative approach of using a risk free rate as those actually using a rate commensurate with the assets backing the PPO liabilities.
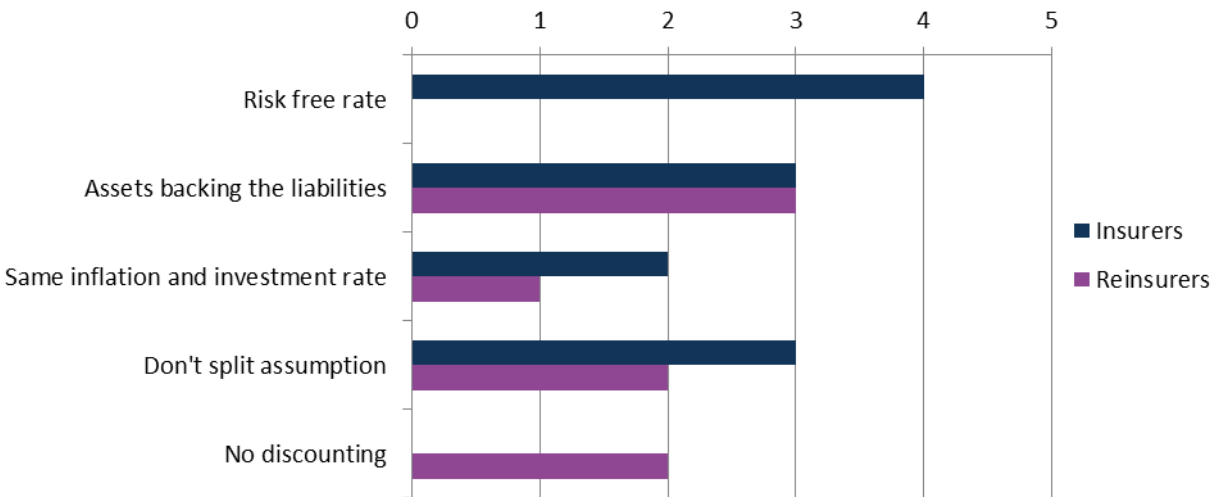
Figure 11.9: What investment rate assumption do you use when discounting PPO reserves?

11.30   Many respondents did not have a specific separate assumption for ASHE, those that did used a figure between 3.5% and 4.5%. Three insurers made an assumption based on the level of ASHE relative to RPI, which was between 1% and 1.5% above RPI.
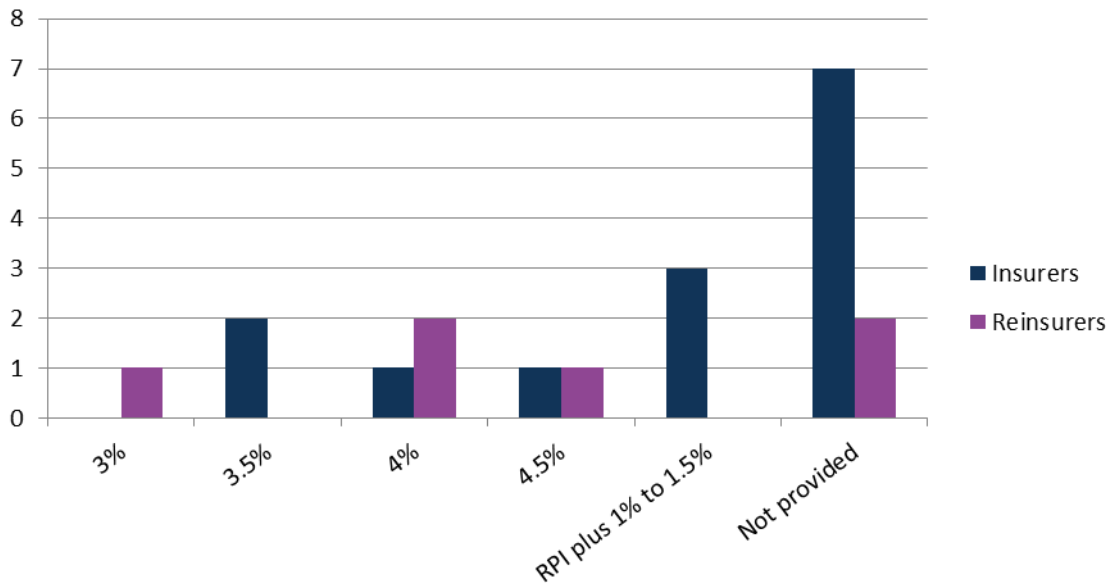
Figure 11.10: What ASHE inflation rate assumption do you use?

11.31   Only two of the insurers we also spoke to last year had changed their approach to discounting over the year.

Mortality

11.32   The method used to apply impaired mortality assumptions can have a significant impact on the results. The graph below shows how a minority of respondents are still using an annuity certain method, however the application of this continues to become more sophisticated with more respondents using multiplier and additive adjustments than they were a year ago, though insurers are more likely to be using these approaches that a year ago.
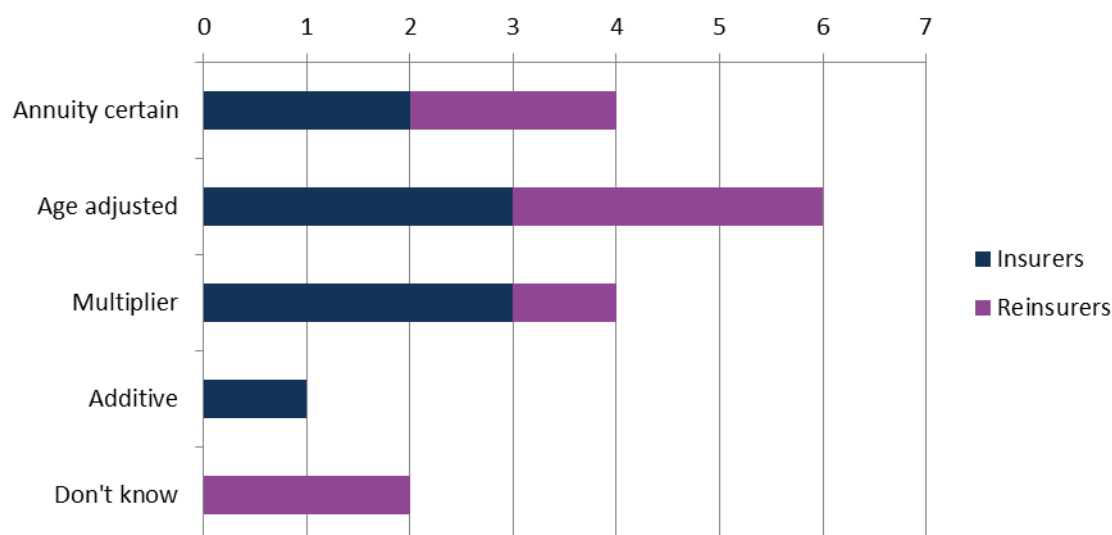
Figure 11.11: What method do you use to adjust for mortality impairments?

11.33   As discussed in Section 9.17 it appears that the estimation of life expectancy may not be consistent between insurers due to differences in the life expectancy assumptions.

Monitoring open large claims and PPO propensity

11.34   Universally every insurer monitored large claims in some way. Not all reinsurers monitor large claims, this was primarily due to data availability which varied from reinsurer to reinsurer. There were differences in the way this was done and how the output was used.

11.35   Eight companies assign a probability to each large claim of it turning into a PPO. Six insurers and three reinsurers have moved toward use of objective measures to predict which claims would turn into PPOs. What was interesting was that these measures, or triggers, were not consistent across the market with different insurers using different triggers. The two most commonly mentioned last year were size of care costs and injury type.

11.36   Four insurers and one reinsurer monitor the accuracy of these predictions, though a number who did commented that there was not enough data to draw any conclusions from. Again respondents commented on how difficult individual cases can be to predict, one reinsurer said "Recently one that was predicted as 100% PPO settled as a lump sum."

Reserving Methodology

11.37 For known PPOs ten out of twelve insurers, and all reinsurers, use a cashflow approach.

IBNR

11.38 As has been seen in previous years of this survey, market practice varies widely and is too numerous to cover all permutations here. Variations in practice are even more diverse for reinsurers than insurers with no two reinsurers in the survey having the same response.

11.39 Something that is common is for companies to undertake a cashflow model based on their list of large claims with their assessment of the likelihood of them becoming a PPO. This approach is relatively widespread, which is interesting given the lack of certainty over the probability parameters used as discussed in Section 11.35 above.

11.40 For IBNYR, or total IBNR (including IBNER), a numbers and average approach, or similarly a propensity and uplift approach, is common. However the way the elements within the approach, such as the average amount or uplift, are derived varies a great deal, from a single percentage blanket uplift to an uplift calibrated from the cashflow model of the particular company's mix of PPOs.

11.41 Four insurers either do nothing for the IBNYR element or hold an overall IBNR lump sum for large claims which covers PPOs too.

Capital modelling
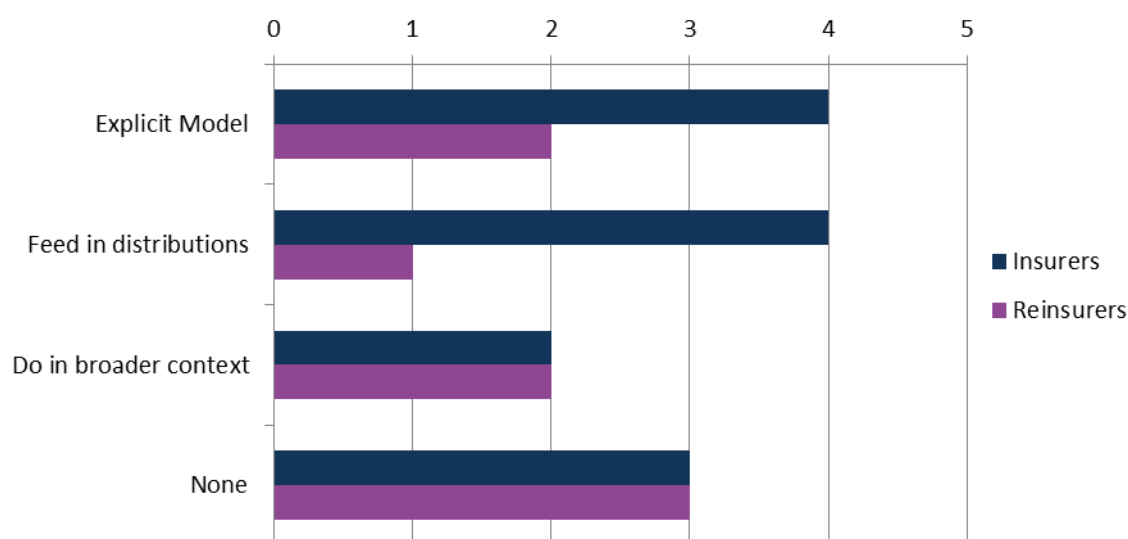
Figure 11.12: How do allow for PPOs in your capital modelling?

11.42 More and more companies now use an explicit PPO model, and of those that said they currently feed in PPO distributions to their capital model two were due to develop an explicit model this year.

11.43 All those that had developed an explicit PPO model for capital purposes were including the cost of capital in their reinsurance pricing.

Communicating uncertainty

11.44   Ten of the insurers said they scenario tested to measure uncertainty for PPOs, only one insurer used their capital model output, and two said they used a bootstrap technique. For those using scenarios, eight said they tested on the discount rate, seven for longevity and four for propensity.

11.45   Most reinsurers also used some sort of scenario testing but this is less common than with insurers – it is often not the first thing mentioned but spoken of in conjunction with other less quantitative measures, eg discussing the broad issues.

11.46   Interestingly one insurer commented that they model balance sheet projections at future positions such as 4, 10 and 40 years.

Pricing

11.47   Pricing is very different for insurers and reinsurers, with the impact being much less for insurers. Hence insurer and reinsurer responses are shown separately.

Insurers

11.48   No companies currently do an explicit adjustment, most say it is implicit in their large claims pricing, or is in implicit in the loss ratio that feeds into the pricing process. Two companies said they have an explicit uplift or adjustment to their large claims pricing for PPOs.

Reinsurers

11.49   Responses varied considerably; from using past market rates, to looking at propensity by cedant, to frequency and severity models with loadings to lump sums, to full detailed cashflow models incorporating a number of explanatory factors. As was shown earlier a significant proportion of reinsurers in the survey do not take into account the cost of capital when pricing.

12. Summary Statistics

12.1   The tables below provide summary statistics taken from all non-MIB PPOs in the survey for the following characteristics:

- Age of claimant at settlement
- Delay from accident date until settlement date
- Future life expectancy at settlement date
- Initial annual PPO Payment (summed across all heads of damage)
- Lump sum payment

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	35.1	28.5	17.2	1.0	346
Delay Until Settlement	6.4	5.6	3.4	1.5	346
Future life expectancy at settlement	43.5	46.1	18.1	-0.4	340
Life Expectancy Reduction	9.7	7.9	9.6	1.2	340
Annual PPO Payment (£)	85,153	60,000	72,358	1.4	346
Lump Sum (£)	1,815,276	1,638,024	1,145,970	1.6	343

Table 12.1: Summary statistics for Motor PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	34.1	26.1	17.2	1.1	263
Delay Until Settlement	6.3	5.5	3.3	1.7	263
Future life expectancy at settlement	44.6	47.2	17.4	-0.5	258
Life Expectancy Reduction	9.9	8.1	9.4	1.2	258
Annual PPO Payment (£)	80,155	55,200	69,633	1.7	263
Lump Sum (£)	1,831,254	1,643,460	1,126,435	1.5	261

Table 12.2: Summary statistics for Private Motor PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	38.4	35.1	16.7	0.7	83
Delay Until Settlement	6.7	5.7	3.5	1.0	83
Future life expectancy at settlement	40.0	42.3	19.8	-0.1	82
Life Expectancy Reduction	9.1	7.7	10.2	1.3	82
Annual PPO Payment (£)	100,989	75,000	78,305	0.8	83
Lump Sum (£)	1,764,419	1,600,000	1,204,631	1.8	82

Table 12.3: Summary statistics for Commercial Motor PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	35.5	29.6	17.6	0.8	165
Delay Until Settlement	5.8	5.0	3.0	1.7	165
Future life expectancy at settlement	42.1	42.9	17.7	-0.3	162
Life Expectancy Reduction	10.9	8.5	10.5	1.1	162
Annual PPO Payment (£)	82,387	55,000	73,730	1.6	165
Lump Sum (£)	1,776,833	1,611,776	1,046,920	0.8	164

Table 12.4: Summary statistics for Private Comprehensive Motor PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	29.7	24.5	14.0	1.8	58
Delay Until Settlement	7.2	6.1	3.4	1.8	58
Future life expectancy at settlement	50.3	52.3	14.3	-1.1	57
Life Expectancy Reduction	8.6	7.6	6.9	0.4	57
Annual PPO Payment (£)	77,319	65,500	54,384	1.5	58
Lump Sum (£)	1,987,963	1,927,557	890,972	0.5	58

Table 12.5: Summary statistics for Private Non-Comprehensive Motor PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	46.2	50.5	16.2	-0.4	42
Delay Until Settlement	5.1	4.4	2.6	2.1	41
Future life expectancy at settlement	28.3	25.5	14.3	0.9	42
Life Expectancy Reduction	12.1	10.2	13.2	2.4	42
Annual PPO Payment (£)	70,458	48,750	68,043	1.5	42
Lump Sum (£)	1,204,129	1,100,000	772,587	0.7	40

Table 12.6: Summary statistics for Liability PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	34.9	28.1	17.1	1.0	272
Delay Until Settlement	6.8	5.8	3.5	1.4	272
Future life expectancy at settlement	45.1	48.3	18.4	-0.5	268
Life Expectancy Reduction	8.3	6.4	9.4	2.0	268
Annual PPO Payment (£)	77,818	55,000	64,251	1.4	272
Lump Sum (£)	1,643,865	1,500,000	1,078,086	1.7	269

Table 12.7: Summary statistics for Brain injury PPOs

	Mean	Median	Standard Deviation	Skewness	Sample Size
Age at settlement	39.9	37.4	17.7	0.3	92
Delay Until Settlement	4.7	4.4	2.3	2.3	92
Future life expectancy at settlement	32.7	32.2	14.5	-0.1	91
Life Expectancy Reduction	14.8	12.7	10.0	1.1	91
Annual PPO Payment (£)	106,522	76,875	86,477	1.1	92
Lump Sum (£)	2,206,420	2,012,500	1,205,987	1.5	90

Table 12.8: Summary statistics for Spinal injury PPOs

13. Survey of Members' Views

Introduction

13.1   We asked members of the Institute and Faculty of Actuaries to tell us their own personal views in relation to PPOs.

13.2   This was a web-based survey, through SurveyMonkey.com, with invitations to take part posted on the front page of the profession's website as well as through the General Insurance Newsletter. The questions of the survey are given in Appendix A. Given the nature of the survey, it must be borne in mind that this is not a random sample and may be expected to exhibit certain biases.

Breakdown of Respondents

13.3   There were 158 responses, the vast majority of which, 114, were from General Insurance and of these, 59 respondents worked for primary insurers. Whilst the 158 responses represent less than 1% of the Institute and Faculty membership, we understand that this is considered to be a good response rate for such surveys.
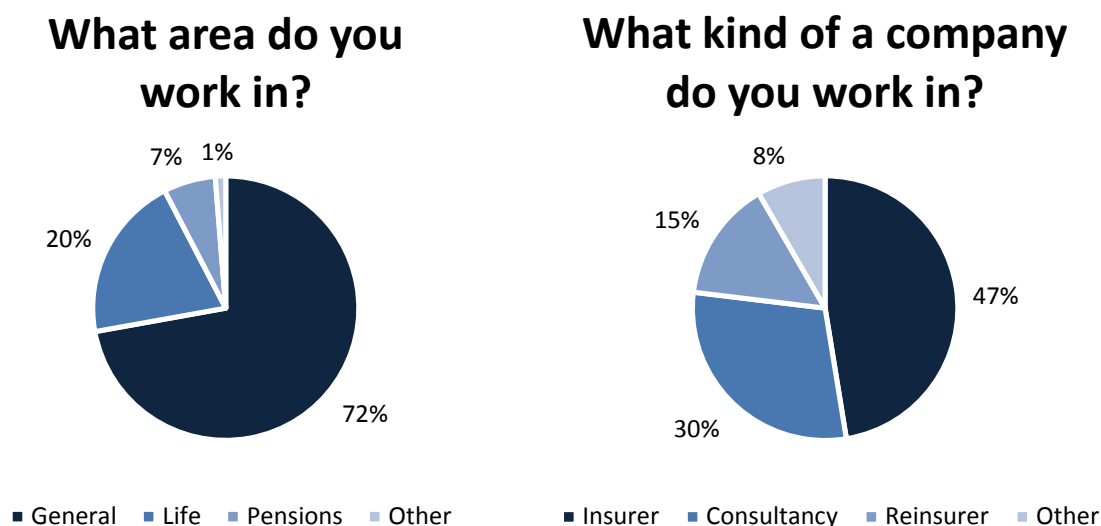
Figure 13.1: Areas Within Which Respondents are Employed

13.4   Of the respondents, 69% were qualified and the majority had more than 10 years' of experience as shown in Figure 13.2.

How long have you been working in the actuarial profession?

- ■ Less than 1 year
- ■ 1 to 3 years
- ■ 3 to 5 year
- ■ 5 to 10 years
- ■ 10 to 20 years
- ■ 20 to 30 years
- ■ More than 30 years
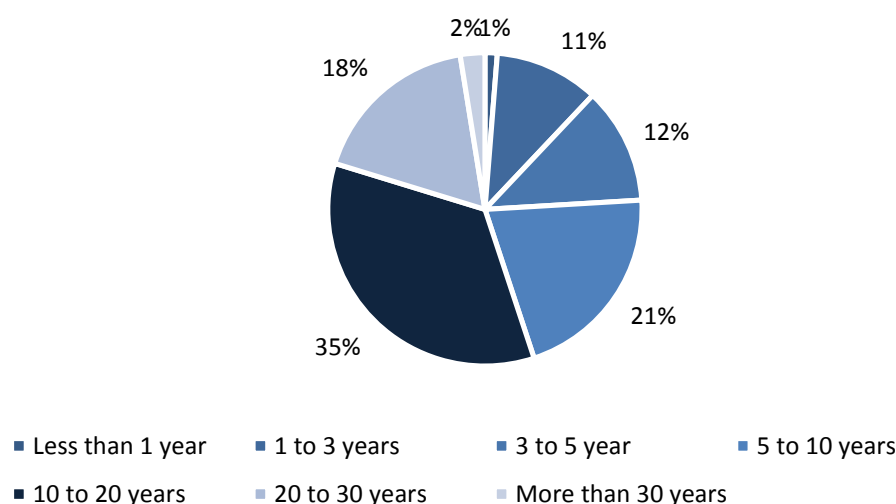
Figure 13.2: Experience of Respondents

13.5   There was a spread of responses from various employment positions, with many respondents dealing with PPOs in their own role, as demonstrated in Figure 13.3. Those in more junior positions and those with only 1 to 3 years of experience had a marginally lower propensity to dealing with PPOs in their day to day work. Overall, 58% of respondents dealt with PPOs in some way within their role. This figure rose to 65% for those who had heard of PPOs and 74% for those working in General Insurance.

Do you deal with PPOs in any way in your own role?
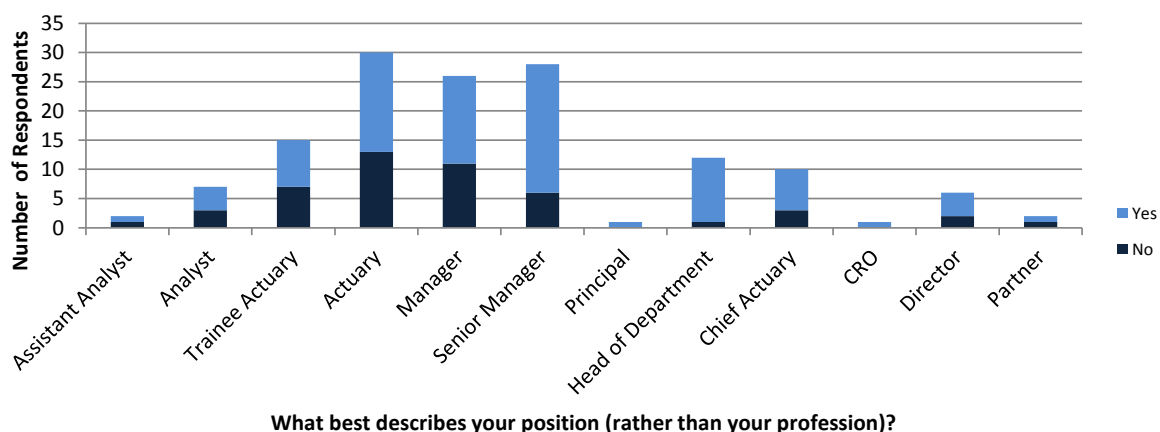
Figure 13.3: Positions of Employment and Involvement in PPOs

13.6   Within the group of respondents working within General Insurance, more than two thirds worked for companies writing classes of business from which PPOs can arise. Ignoring the 23% of respondents in GI who work for consultancies (and we would not normally expect such companies to 'write' any business at all), only 5 of the 76 respondents working for insurers or reinsurers stated that they did not write this type of business.

Do you work for a company writing UK Motor and / or UK Liability insurance?

- No - Yes: Insurance - Yes: Reinsurance - Yes: Both Insurance and Reinsurance
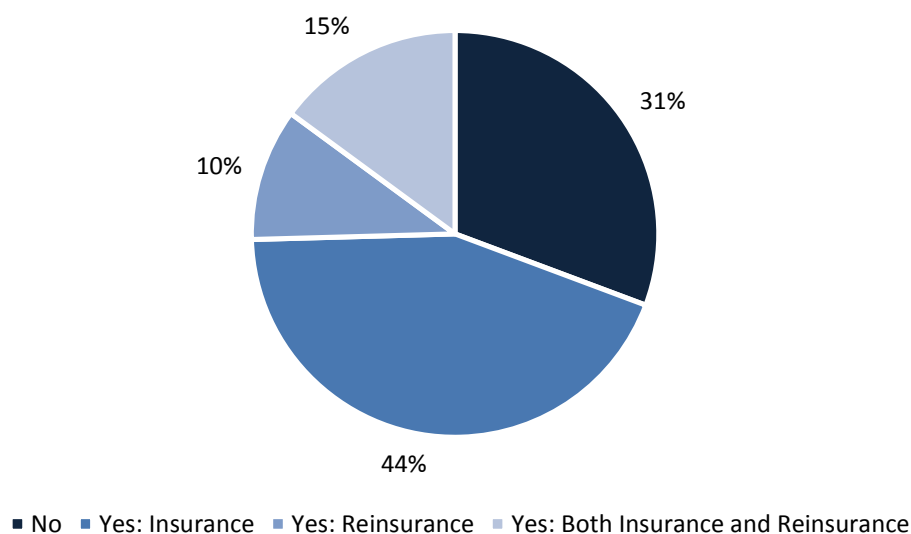
Figure 13.4: Exposure to PPO classes

13.7   Within the group of respondents working within General Insurance, there was a spread of exposure to different areas of work, though many respondents worked in reserving, as demonstrated in Figure 13.5

What area do you principally work in?

- Reserving - Mixed - Pricing - Capital Modelling - Risk - General Management - Other
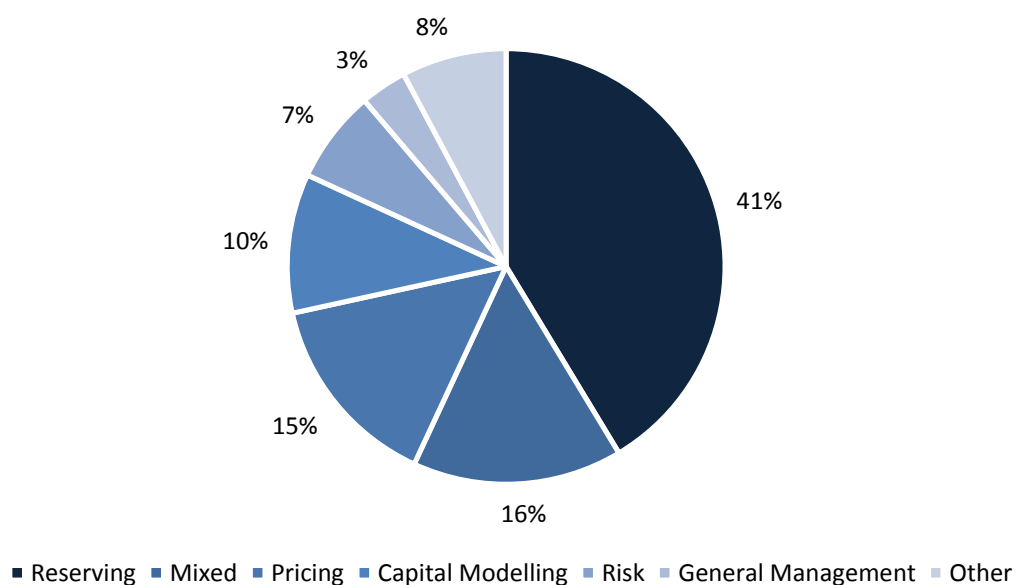
Figure 13.5: Principle Areas of Employment

PPO Awareness

13.8 All respondents from General Insurance were aware of PPOs. Unsurprisingly, significant proportions outside of General Insurance were unaware. Given the small volumes involved, there were no particularly clear indications as to whether the lack of awareness was linked to the level of seniority or experience of respondents.

Have you heard of and are you aware of PPOs?
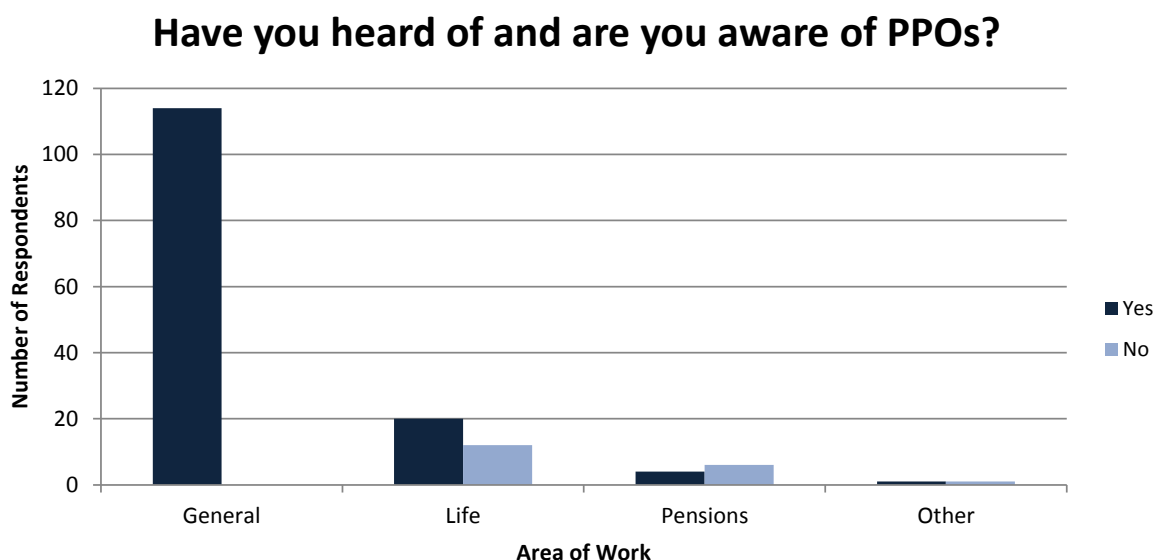
Figure 13.6: PPO Awareness

13.9 All comments after this point are based solely on the responses of those who were aware of PPOs.

13.10 Perhaps unsurprisingly, respondents with more experience recall having heard about PPOs earlier than those with fewer years' of experience.

When do you first remember hearing about PPOs?
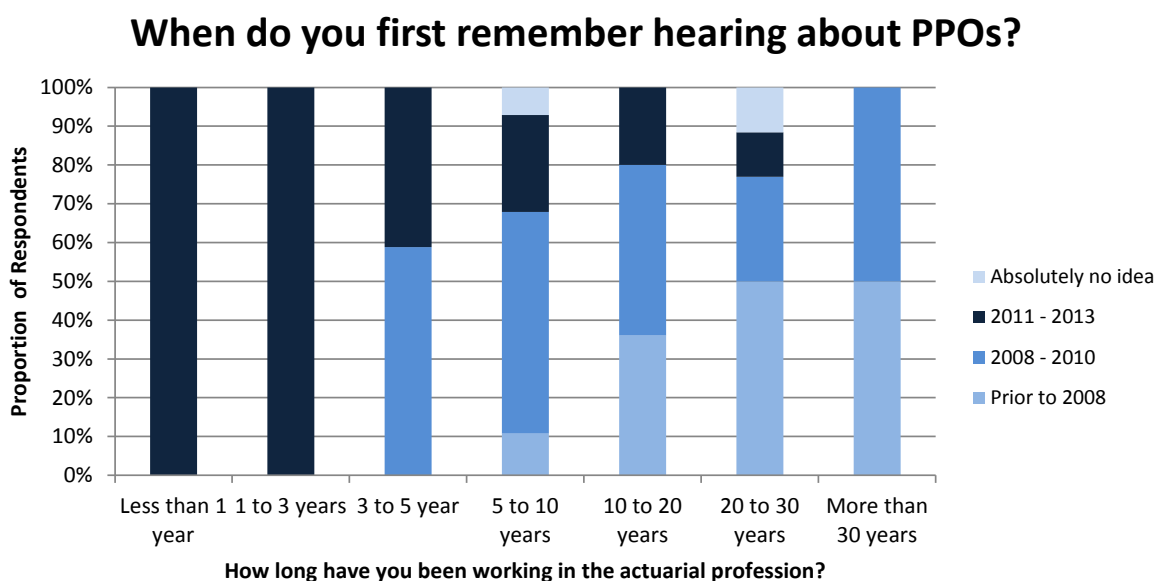
Figure 13.7: When Respondents Became Aware of PPOs

13.11   The majority of respondents first heard about PPOs through their own organisation, though a significant proportion became aware through discussions with other actuaries or from the Institute and Faculty of Actuaries.

How did you first hear about PPOs?

- Internally within your organisation
- Discussion with other actuary
- Institute and Faculty of Actuaries presentations / papers
- Legislation changes
- Newspaper / TV
- Other
- Other organisations presentations / papers
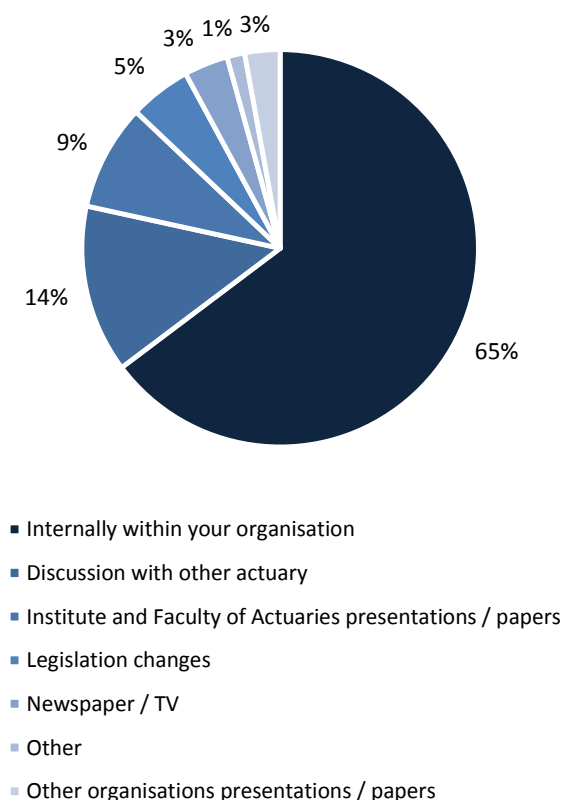
Figure 13.8: Where Respondents First Heard of PPOs

13.12   When comparing where actuaries first heard of PPOs to the actuaries' experience, it appears that more experienced actuaries make more use of a network of other actuaries as a source of information, as well as from the Institute and Faculty of Actuaries and directly from the legislation itself.

How did you first hear about PPOs?

How long have you been working in the actuarial profession?

- Internally within your organisation
- Discussion with other actuary
- Institute and Faculty of Actuaries presentations / papers
- Legislation changes
- Newspaper / TV
- Other
- Other organisations presentations / papers
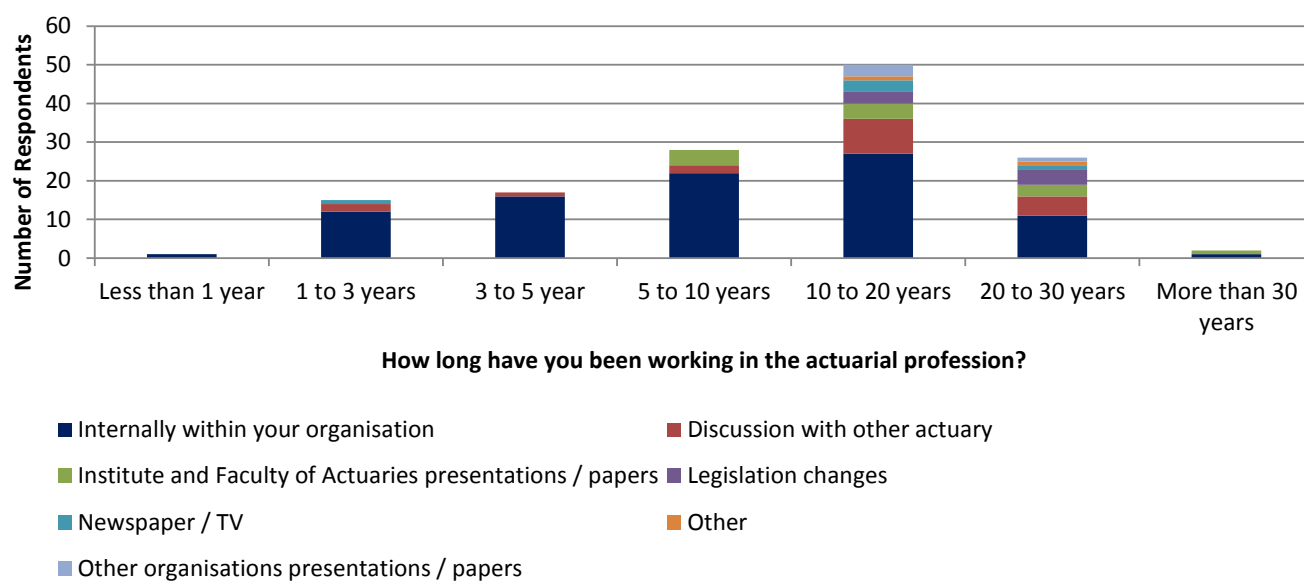
Figure 13.9: Where Respondents First Heard of PPOs by Experience

13.13   Only 3% of General Insurance respondents felt that management were insufficiently aware of PPOs, with 80% believing them to be sufficiently aware or very aware of PPOs. The responses are shown in Figure 13.10 below.

What do you consider to be the level of management awareness of PPOs?:

- Insufficiently aware
- Slightly aware
- Sufficiently aware
- Very aware
- Not sure
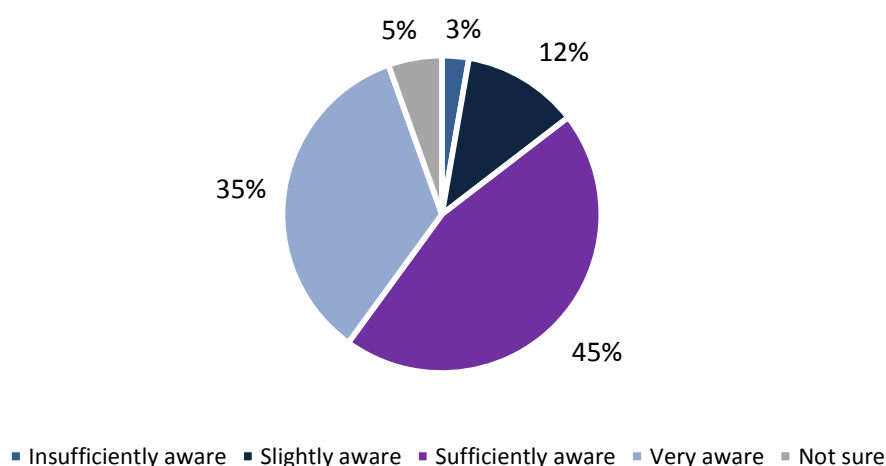
Figure 13.10: Management Awareness of PPOs

Actuaries' Views of the Impact of PPOs on Society

13.14   The vast majority of actuaries felt that PPOs would increase the cost of their own Motor insurance a little. A number of respondents noted the impact of additional uncertainty on capital costs as well as the potentially increased cost of claims – both in terms of direct costs and the valuation bases used for reserving purposes. Within those who did not believe their personal insurance costs would increase, the main theme of the reasoning (ignoring those who do not pay for Motor insurance in the UK) centred on the materiality of PPOs in relation to other costs and the level of competition being a more significant driver.

Do you think PPOs will impact the price of your personal motor insurance?

■ No   ■ Not sure   ■ Yes a little   ■ Yes a lot   ■ (blank)
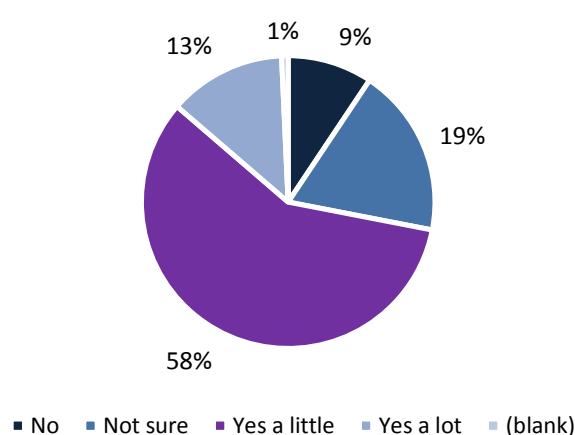
Figure 13.11: Impact on the Cost of Insurance

13.15   There was a broad consensus amongst respondents that PPOs were a good thing for society.

Do you generally think PPOs are good or bad thing for society?

■ Bad   ■ Good   ■ Not sure
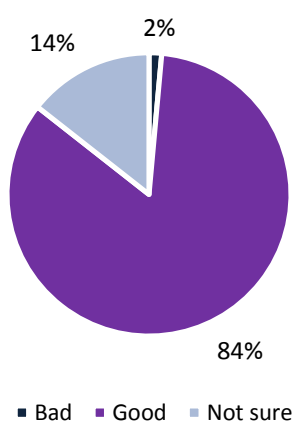
Figure 13.12: Are PPOs Good for Society?

Actuaries' Views of the Impact of PPOs on Insurers

13.16   Three quarters of respondents felt that PPOs should rank as one of top three concerns for insurers writing UK Motor or UK Liability business. However, PPOs did not rank as one of the top three personal concerns for more than two thirds of respondents. In the case that the issue of PPOs was not a top three personal concern, two thirds still felt that it should be a top three concern for the relevant insurers. This proportion was similar regardless of whether the respondent dealt with PPOs in their own role. For those where PPOs were a top three concern, almost all felt that it should rank as a top three concern for relevant insurers.

		Do PPOs rank in your current top three concerns within your own role?	
		No	Yes
Do you think PPOs should rank in the current top three concerns for the insurers writing UK Motor or UK Liability business?	No	32	3
	Yes	62	40

Table 13.1: Top Three Concerns

13.17   For respondents with up to ten years' of experience, 82% believed that PPOs should be a top three concern for relevant insurers. This compared to only 69% for those with more than ten years' of experience. For those with more than twenty years' of experience, only 54% believed this ought to be a top three concern.

13.18   A higher proportion of those working in consultancies felt that PPOs should be in the top three concerns for relevant insurers than for those working in other General Insurance companies, as demonstrated in figure 13.13.

Do you think PPOs should rank in the current top three concerns for the insurers writing UK motor and UK liability business?
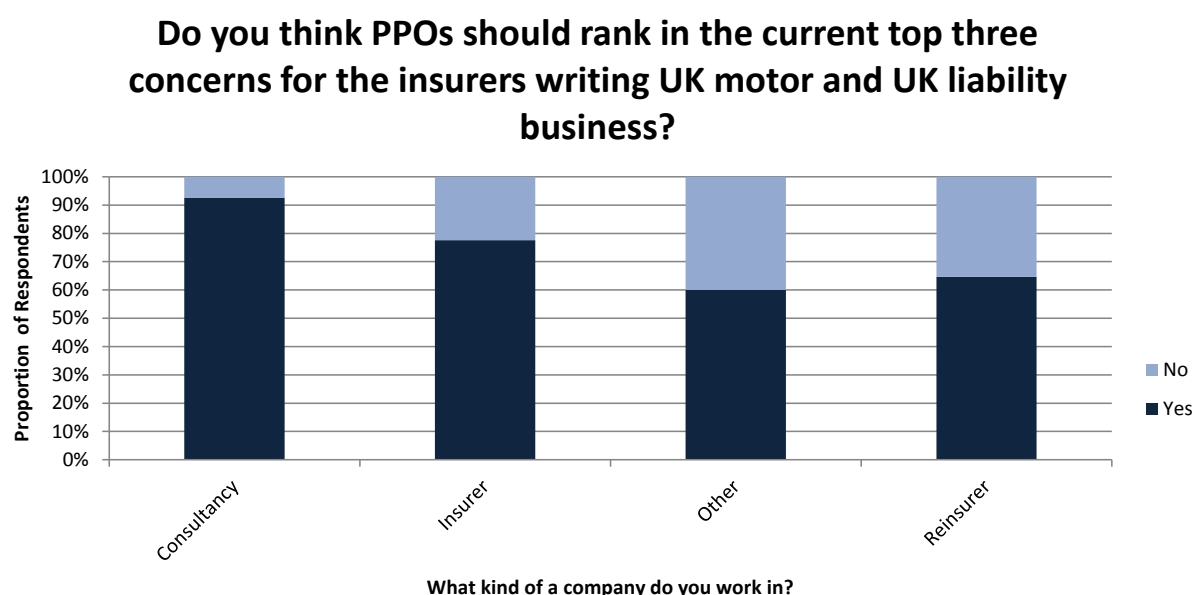
Figure 13.13: PPOs as a Top Three Concern by Company Type

13.19   There was no notable difference of opinion on whether PPOs should be a top three concern between the areas of work that those in General Insurance were employed in (Pricing, Reserving etc…).

13.20 Within General Insurance, those focussed principally on Pricing, Reserving or Capital Modelling placed PPOs in their top three concerns more often than those in other areas, or where their responsibilities were mixed across disciplines. This is shown in Figure 13.14 below.

Do you think PPOs should rank in the current top three concerns for the insurers writing UK motor and UK liability business?
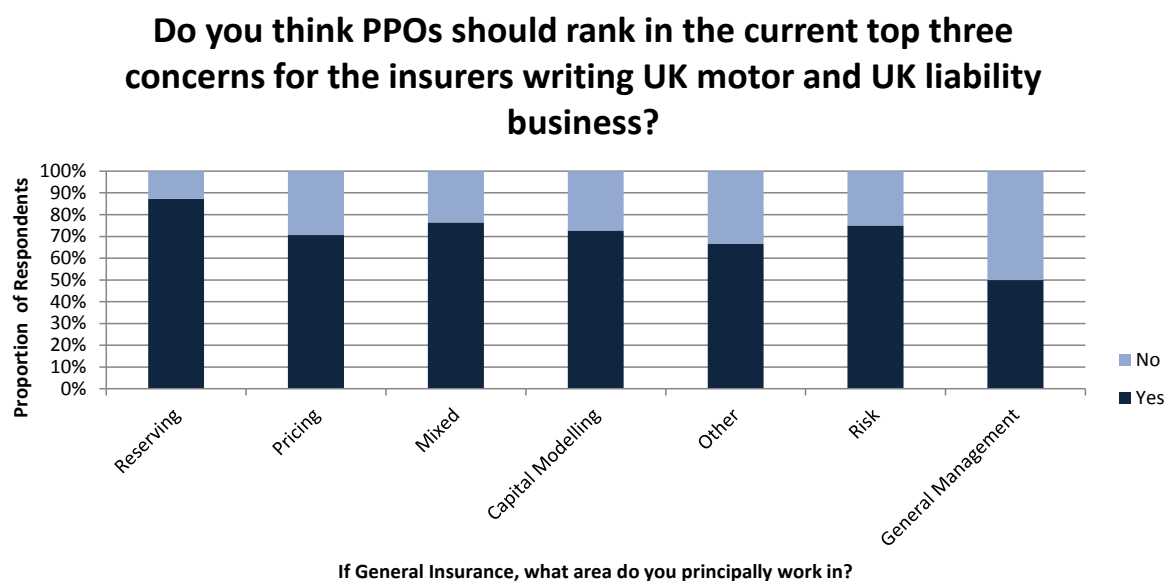
Figure 13.14: PPOs as a Top Three Concern by Principle Area of Employment

13.21 There was no notable trend in the proportion of respondents ranking PPOs in their top three personal concerns across the number of years' experience they had, or in the position of employment they held.

13.22 A wide variety of reasons was given for PPOs being amongst their top three concerns. Some respondents noted that the reason for this being a concern was that valuing PPOs for Pricing, Reserving or Capital purposes was a significant or key part of their job. Where more specific reasons were given, these tended to focus on:

- The long tailed nature of the liabilities
- The difference in nature of these claims to that which General Insurers normally deal with (ie that they are closer to those seen by Life Insurers)
- Increasing frequency of PPOs
- Uncertainty around mortality
- Uncertainty around inflation
- Uncertainty around investment returns
- Finding matching investments
- Ramifications of the timespan over which the uncertainty applies and the cyclical nature of getting it wrong within pricing assumptions
- Appropriateness of discounting assumptions and the impact on current pricing
- The significant capital requirements and the feedback into pricing
- Extreme sensitivity and systemic nature of all assumptions and areas of uncertainty

13.23   When respondents were asked to identify some of the top three other concerns that relevant insurers may have, there was, understandably, a broad range of areas mentioned. We have grouped these into broad areas that were felt to be similar or intrinsically linked. These are shown in Table 13.2 below. Areas which were mentioned once by a single respondent and which were felt to be unique or stand-alone are not shown.

Areas of Concern to Insurers	Number of Times Identified as a top three concern
Profitability, Underwriting Cycle, Soft Market, Premium Rates, Competition, Competitive Pressure on Rates, High Loss Ratios	24
Tort/Legal Reforms, Legislative Changes, Competition Commission Review, Uncertainty over Conduct Risk, Treating Customers Fairly, Regulation, Financial Conduct Authority Investigations, Market Reforms	22
Fraud, Whiplash, Compensation Culture, Increase in Litigiousness, Claims Per Accident, Claims Farming	20
Inflation, BI Inflation, Court Award Inflation	9
Interest Rates, The Economy, Investment Returns, Duration of Assets, Ogden/Discount Rates	8
Pricing, Pricing Sophistication, Obtaining Competitive Advantage	7
Retention, Sales, Premium Growth, Customer Selection, Ability to Distinguish Product	6
Solvency II, Capital	5
Expenses, Cost Base	5
Gender Directive	3
Replacing Ancillary Income Streams	2
Telematics	2
Corporate Culture, Corporate Structure	2
Reserving, Reserving Uncertainty	2

Table 13.2: Areas of Top Three Concern

13.24   Of those respondents who did not believe that PPOs ranked in the top three concerns for relevant insurers, nine out of every ten of them believed that PPOs ranked in the top 10 concerns. This was the case whether or not the respondent worked directly with PPOs or not.

13.25   Whilst 74% of respondents felt that PPOs ought to rank in the top three concerns for relevant insurers, only 43% of respondents felt that the issue would rank in the top three in twenty years' time. Most respondents who felt it should not be a top three concern now were of the view that this would still be the case in twenty years' time. Almost a half of those who felt it should rate as a top three concern now thought that it would not be in twenty years' time. The breakdown is shown in Table 13.3 below.

		Do you think PPOs will be a top 3 concern for insurers writing UK motor and UK liability business in the future (20 years' time)?		
		No	Yes	Total
Do you think PPOs should rank in the current top three concerns for the insurers writing UK Motor or UK Liability business?	No	22%	4%	26%
	Yes	35%	39%	74%
	Total	57%	43%	100%

Table 13.3: PPOs as a Top Three Concern - Now and in Future

13.26   Reasons given as to why PPOs would be a significant concern in future tended to centre on:

- The increasing number and propensity of PPOs and the resulting size of PPO reserves as a proportion of overall reserves
- Valuation difficulties
- Uncertainty impacting on the size of capital requirements
- Investment returns and the challenges of matching and hedging risk
- ASHE inflation

13.27   Of those respondents who did not believe that PPOs would rank in the top three future concerns for relevant insurers, 70% of them believed that PPOs would rank in the top 10 concerns. This was the case whether or not the respondent worked directly with PPOs or not.

13.28   Respondents generally felt that the impact of PPOs would be negative on their company over the next five years. This was not the case for those working in Life companies, where marginally more respondents felt the impact would be positive in some way. We highlight that this is based on a very low number of responses from within the Life sector. Figure 13.15 shows the split of views by company sector.

What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?
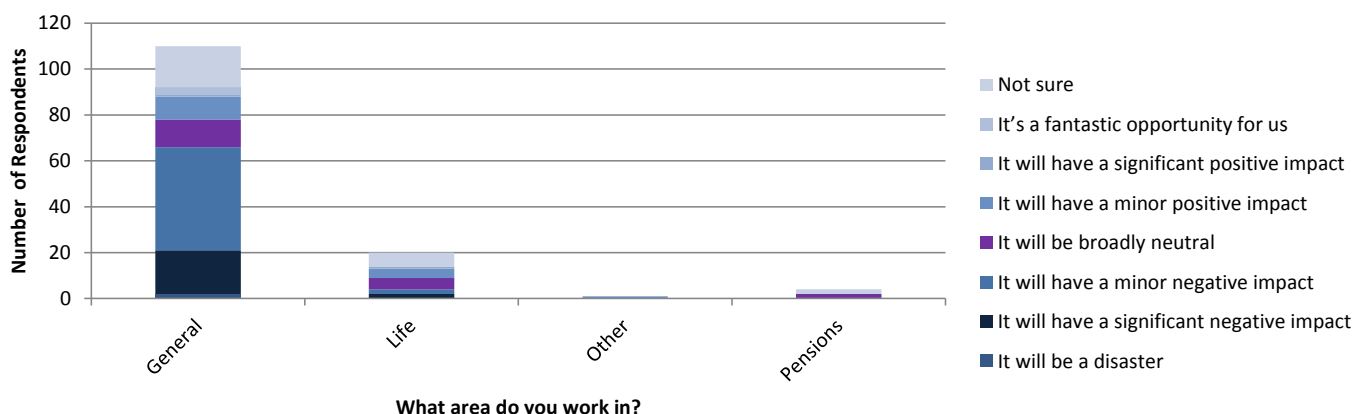
Figure 13.15: Impact of PPOs

13.29 For those respondents working in General Insurance, Figure 13.16 shows their views of the impact on their company against those respondents' number of years of experience in the profession. There was a tendency for a slightly more pessimistic outlook for those with more years of experience.

What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?
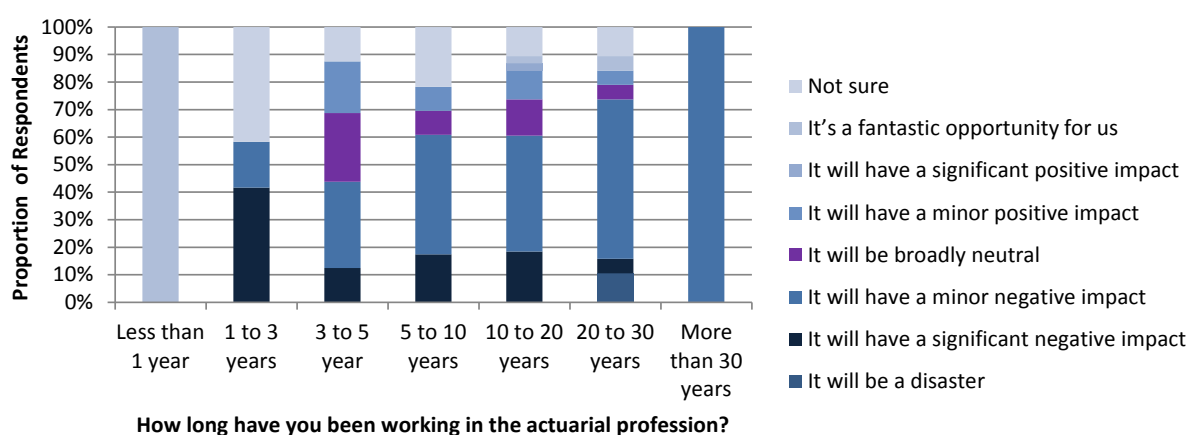
Figure 13.16: Impact of PPOs by Experience

13.30 Figure 13.17 shows the same data by employment position. No clear conclusions can be drawn from comparing the same responses by employment positions, though it is notable that a significant proportion of 'Actuaries', 'Managers' and 'Senior Managers' felt that the impact would be positive. Also, more than 20% of 'Chief Actuaries' were unsure what the impact would be.

What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?
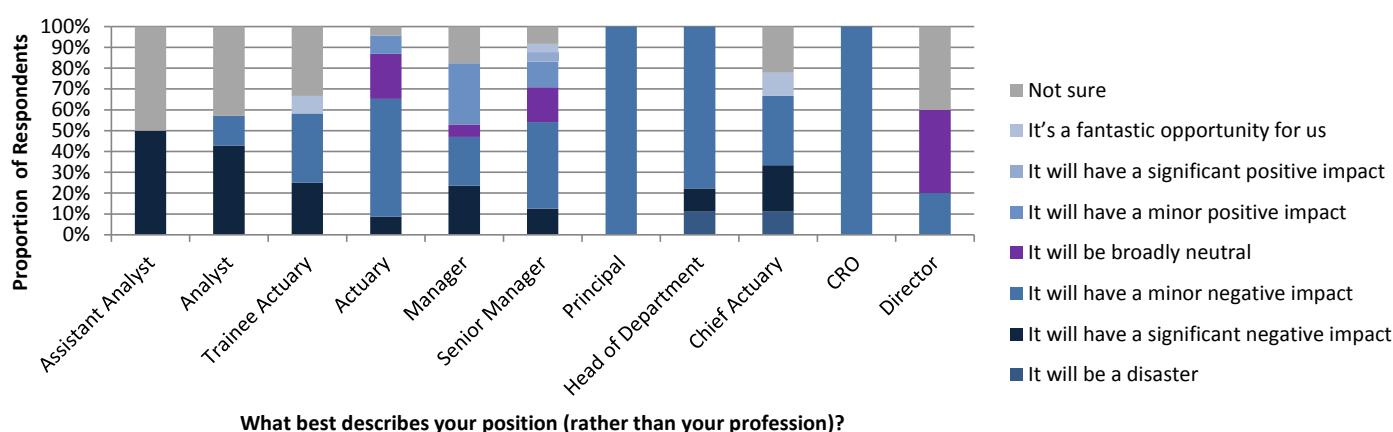
Figure 13.17: Impact of PPOs by Positions of Employment

13.31   Again, looking only at those working in General Insurance, the views of the impact are shown
         in Figure 13.18. Those working in Pricing and Capital Modelling tended to be slightly more
         pessimistic in their outlook.

What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?

If General Insurance, what area do you principally work in?
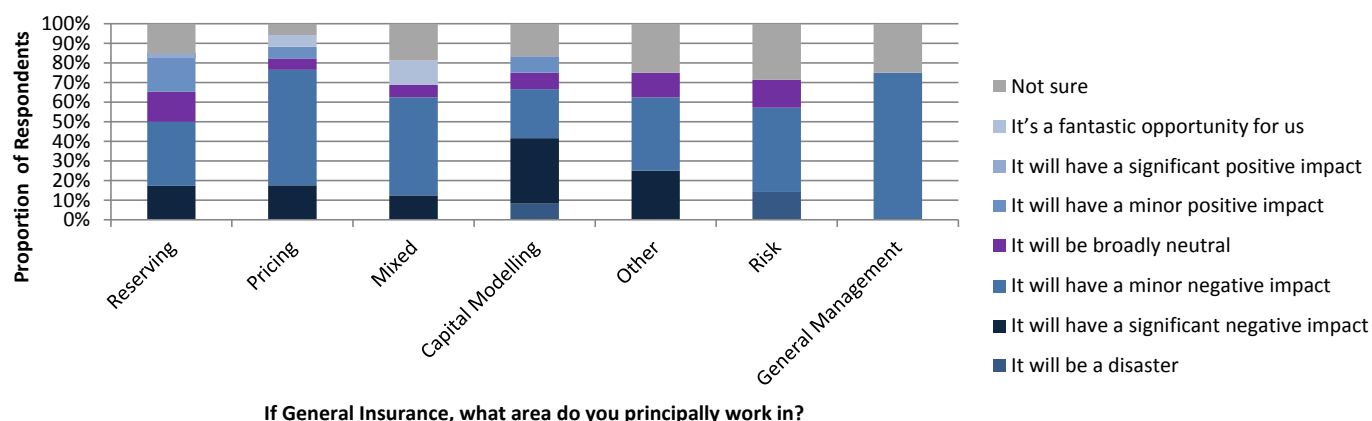
Figure 13.18: Impact of PPOs by Area of Work

13.32   Those respondents working for consultancies tended to be more optimistic, with more
         respondents believing that there would be a positive impact on their company than a negative
         one. Figure 13.19 shows the breakdown by type of company.

What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?

What kind of a company do you work in?
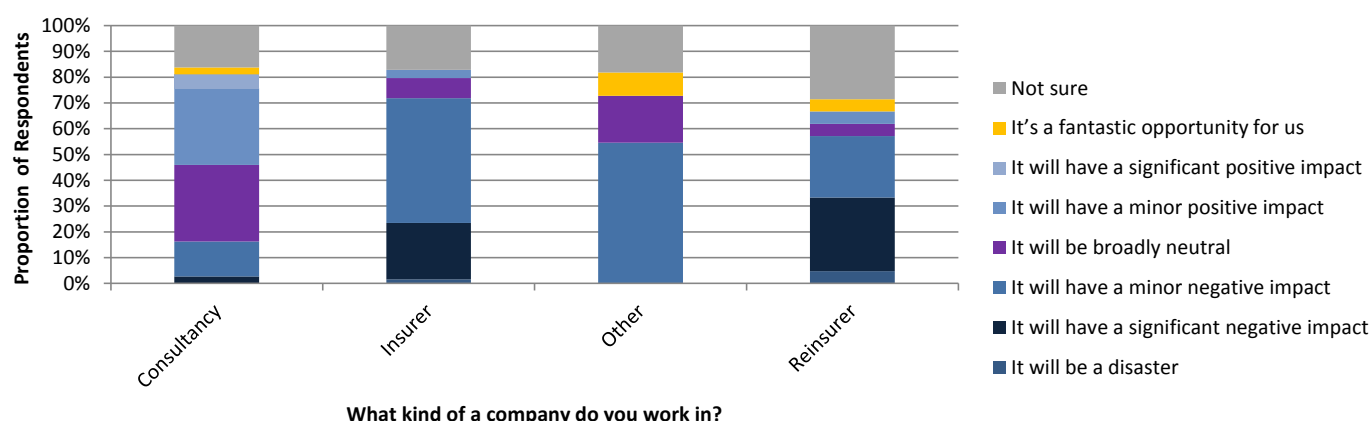
Figure 13.19: Impact of PPOs by Type of Company

13.33   Respondents felt that PPOs would impact on a wide range of areas, though significantly fewer
         thought that they would impact upon either bad debt or systemic risk.

Given your knowledge of PPOs do you think they impact on any of the following areas?
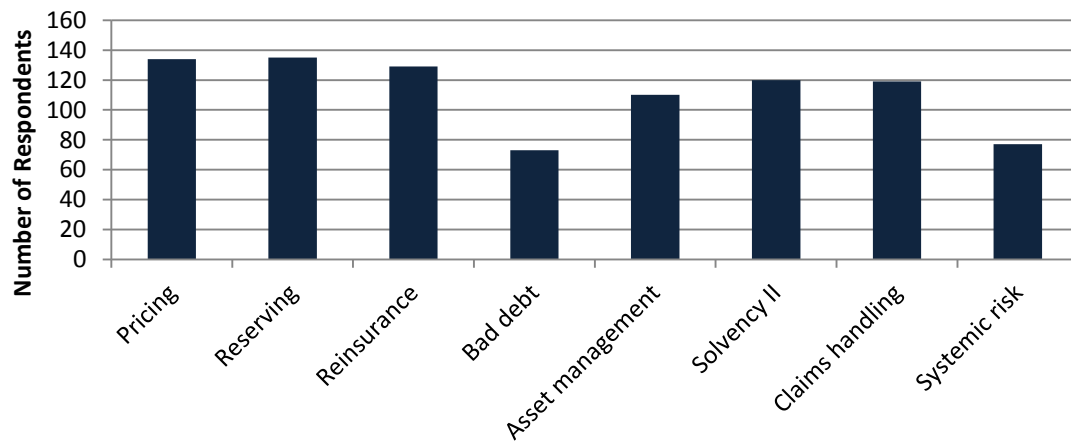
Figure 13.20: Areas Impacted by PPOs

13.34   There was no notable difference in the views of areas impacted across experience of respondents, the position they were in, or indeed the area they were employed in (Pricing, Reserving etc…).

Actuaries' Views on How Their Companies Approached PPOs

13.35   Figures 13.21 shows how respondents believe their company prices their PPOs relative to the market. Those who were able to provide a response largely thought their company priced at the same level, or more conservatively than the market.

How Respondents Believe Their Company Prices PPOs Compared to The Market
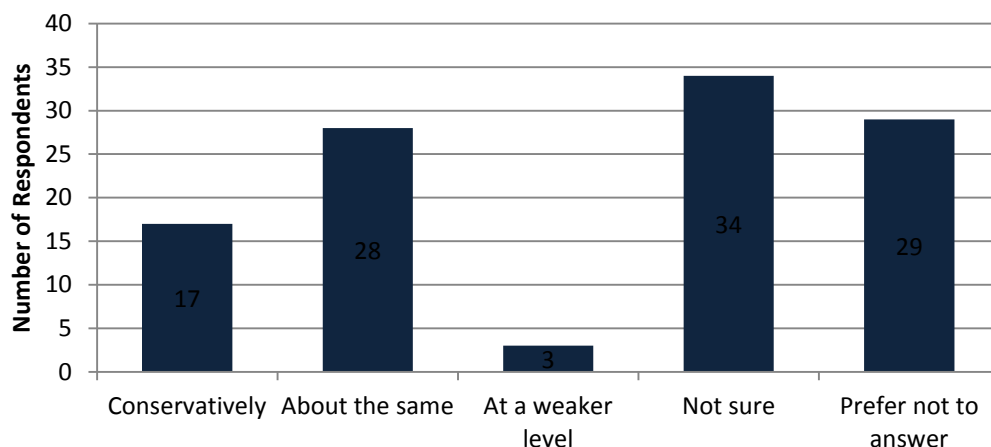
Figure 13.21: PPO Pricing Relative to the Market

13.36   Figures 13.22 shows how respondents believe their company reserves their PPOs relative to the market. Those who were able to provide a response largely thought their company reserved at the same level, or more conservatively than the market.

How Respondents Believe Their Company Reserves PPOs Compared to The Market
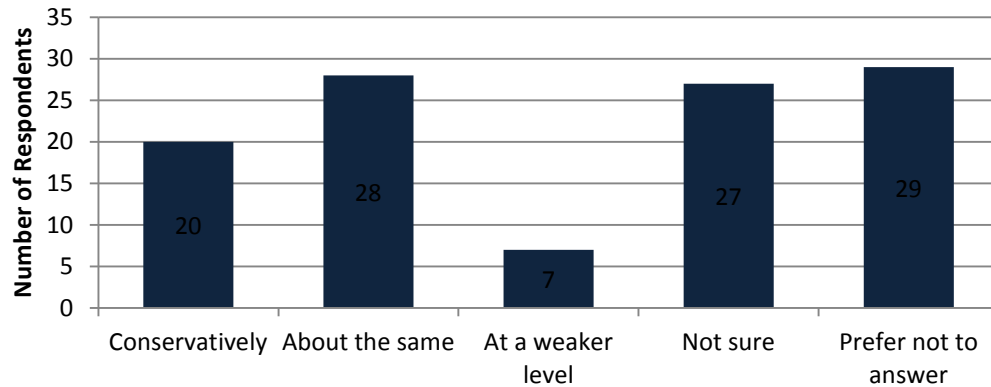
Figure 13.22: PPO Reserving Relative to the Market

13.37   Figure 13.23 shows how respondents believe their company holds capital for PPOs relative to the market. Those who were able to provide a response largely thought their company held capital at the same level, or more conservatively than the market.

How Respondents Believe Their Company Holds Capital for PPOs Compared to The Market
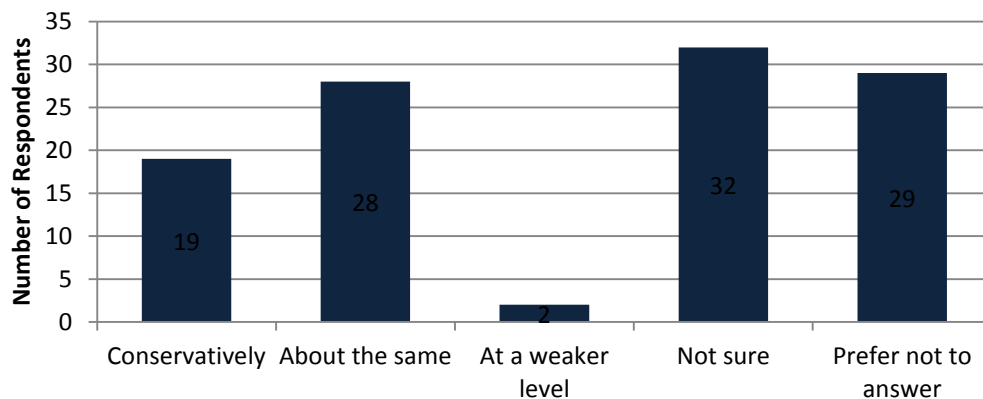
Figure 13.23: Capital Held for PPOs Relative to the Market

Actuaries' Views on Preparedness for Solvency II

13.38   Only responses from those working in General Insurance are analysed in this section.

13.39   When asked if Senior Management were aware of the Solvency II Long Term Guarantee Package, there was a fairly even distribution amongst the responses as demonstrated in Figure 13.24

How aware is the senior management in your company of the impact of the Solvency II Long Term Guarantee package?
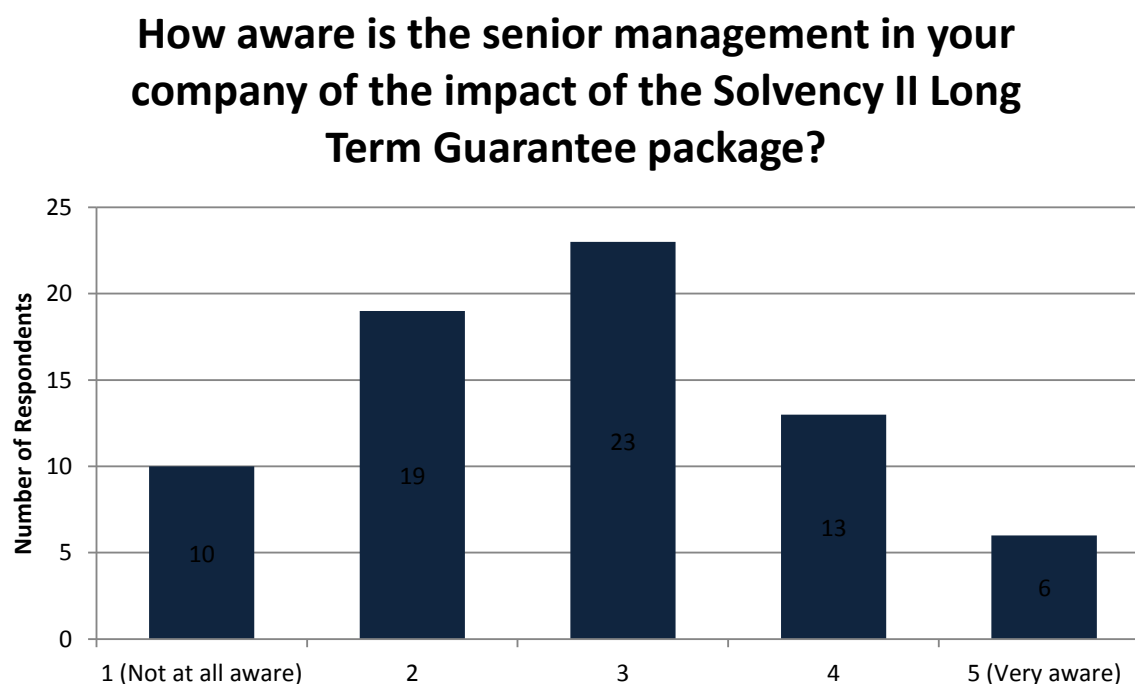
Figure 13.24: Senior Management Awareness of SII LTG Package

13.40   When asked if there was concern within respondents companies around the impact of the Solvency II Long Term Guarantee Package, there was a fairly even distribution amongst the responses as demonstrated in Figure 13.25, though the balance was slightly weighted towards the less concerned end.

How concerned is your company about the impact of the Solvency II Long Term Guarantee package?
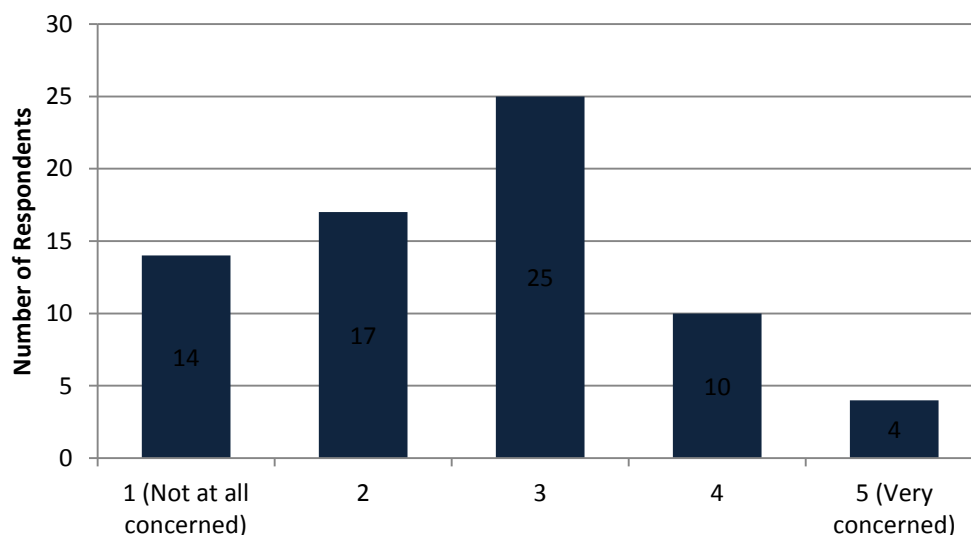
Figure 13.25: Concern around SII LTG Package

13.41   In relation to Solvency II, 75% of respondents noted that their company did not intend to lobby for a relaxation of the rules on cashflow matching and/or ensuring that there are transitional measures applicable to General Insurers.

13.42   Whilst we have included the responses from those working for consultancies in this section, the results were similar whether or not they were excluded.

Actuaries' Views of the Support Provided by the Institute and Faculty of Actuaries

13.43   The most common response when asked about the amount of information provided by the profession was that it was 'about right' (37%) as demonstrated in Figure 13.26. Together with the 18% who responded that the level of support was 'pretty good' it suggests that the profession is responding to members' needs. However, a significant proportion (30%) felt that there was not enough support.

If your day to day role involves PPOs, what do you think about the level of support and information provided to you in this area by the profession?

- ■ I don't think there is any
- ■ I don't think there is enough
- ■ It's about right
- ■ It's pretty good
- ■ There's too much information/discussion on this
- ■ I don't really care either way
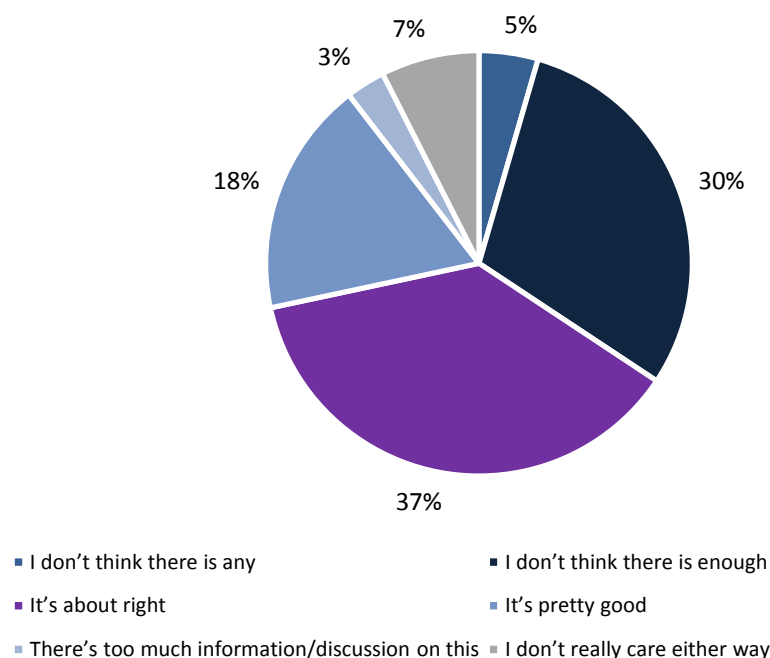
Figure 13.26: The Level of Support Provided

13.44   The proportion that thought there wasn't enough support, or that there was no support reduced with the number of years of experience as demonstrated in Figure 13.27

If your day to day role involves PPOs, what do you think about the level of support and information provided to you in this area by the profession?

How long have you been working in the actuarial profession?

- ■ I don't really care either way
- ■ There's too much information/discussion on this
- ■ It's pretty good
- ■ It's about right
- ■ I don't think there is enough
- ■ I don't think there is any
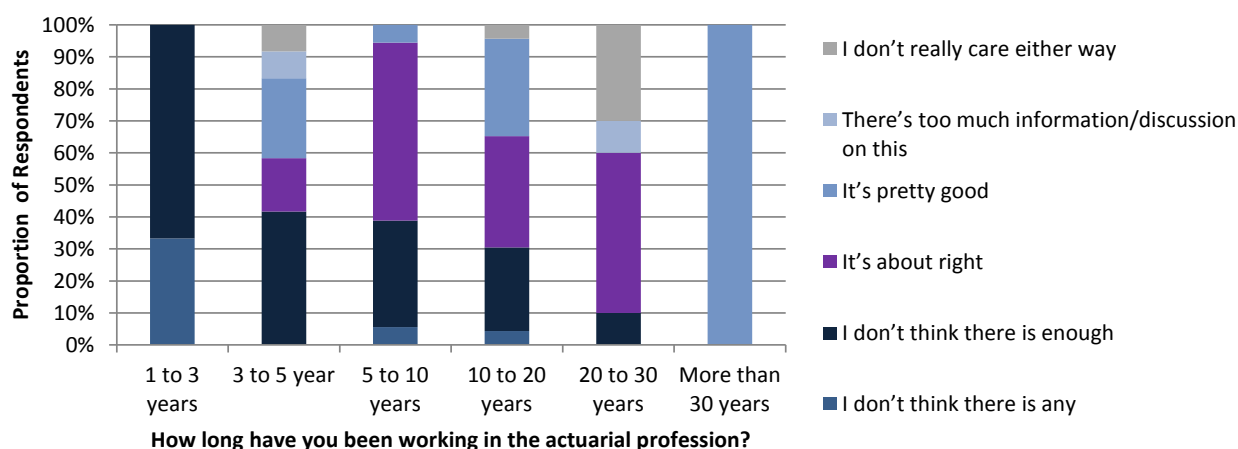
Figure 13.27: Level of Support Provided by Experience

13.45   When asked what level of support respondents felt could be provided by the GI Board, the vast majority were in favour of some support in each of the three main areas (Pricing, Reserving and Capital Modelling). There was a small proportion supporting a Practice Note, but significantly more support for Guidance and Training. The smallest proportions were in favour of doing nothing. The responses are shown in Figure 13.28.

13.46   Figure 13.28 also suggests that there is a greater appetite for support in Reserving and Capital Modelling and a slightly lower appetite for further support in the Pricing area.

What level of guidance do you think the GI Board should provide?
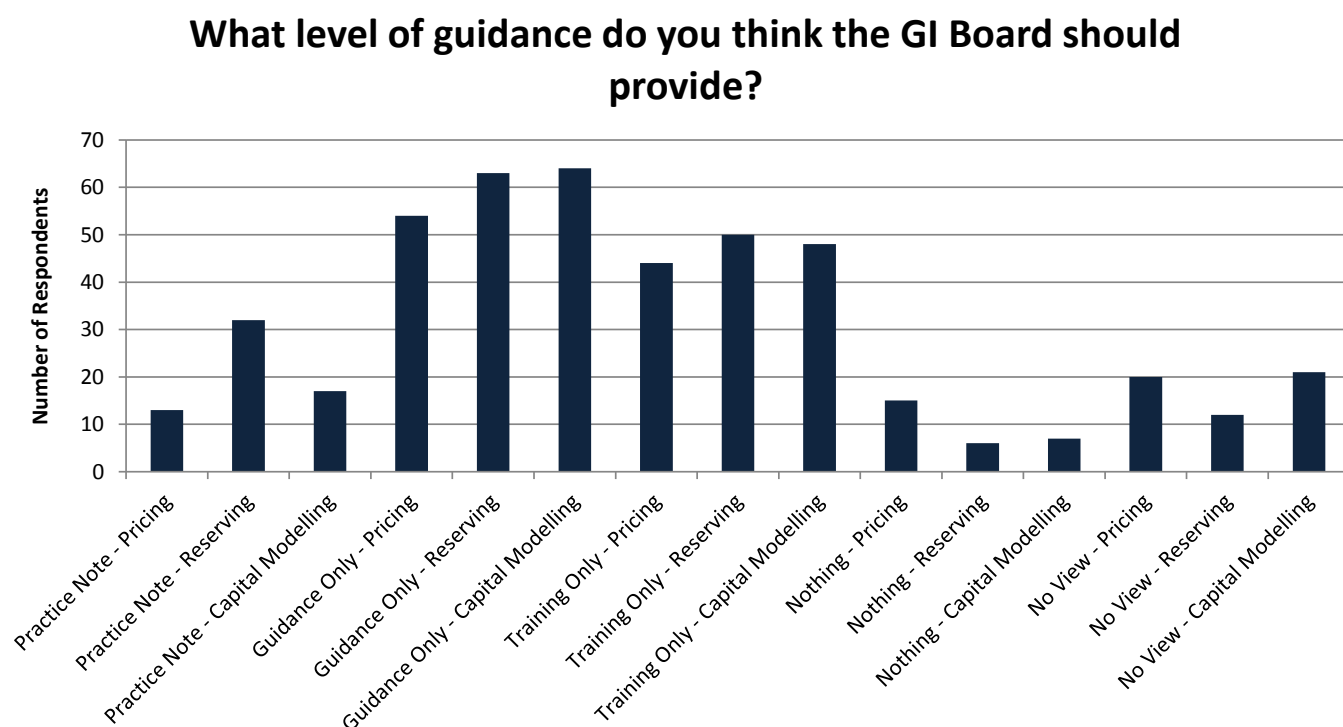
Figure 13.28: Appetite for Support from the GI Board

13.47   The appetite for support from the GI Board in the form of a Practice Note was stronger for those respondents with the fewest years of experience, with the most experienced respondents being less in favour of a Practice Note.

What level of guidance do you think the GI Board should provide?
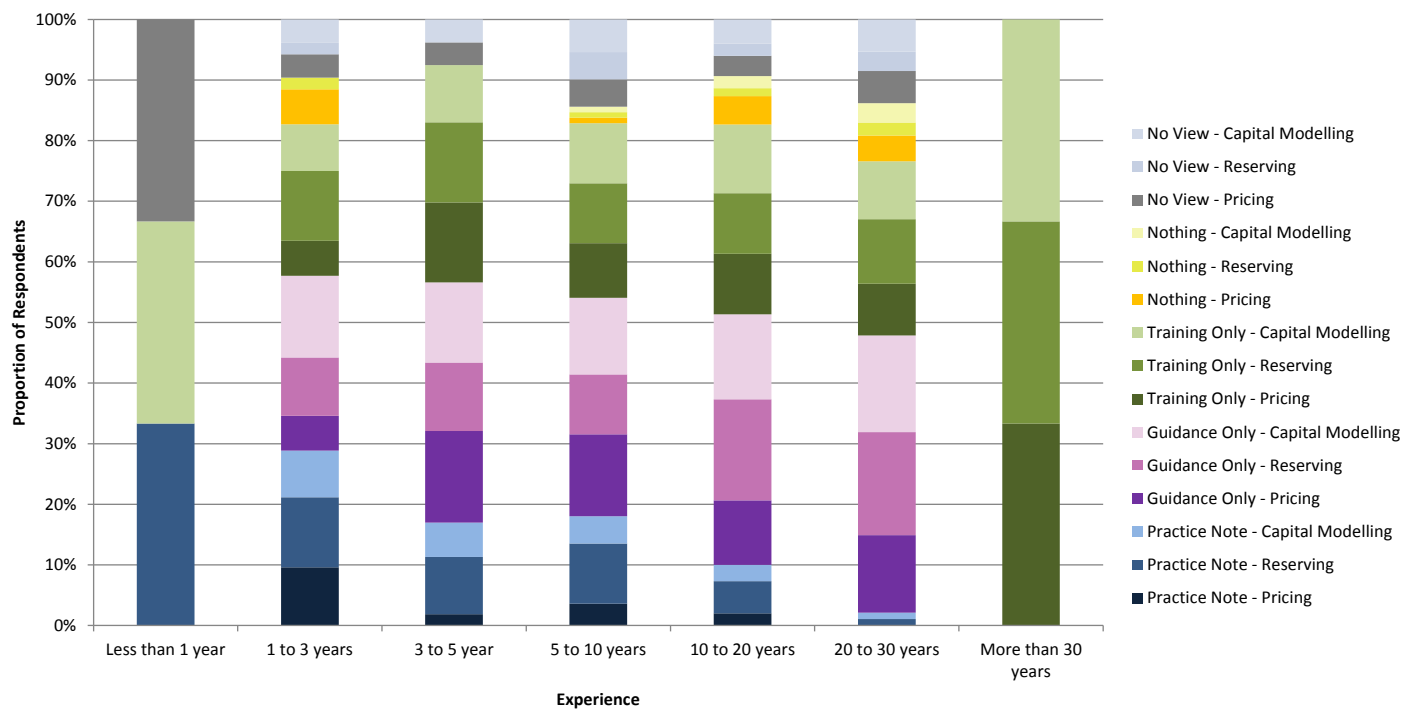
Figure 13.29: Appetite for Support from the GI Board by Experience

14. Impaired Life Investigations

14.0 Introduction

14.0.1   This year we have continued to progress our understanding into the mortality underlying PPOs. The working party's 2010 paper provided a comprehensive introduction to impaired life adjustment methodologies. Furthermore, the 2012 paper discussed the need for better injury categorisation for large claims in the UK, provided an overview of the work carried out by the working party to gather more data from GP databases, and discussed a medical research paper on the outcome of head injury cases in Glasgow that were followed over a 13 year period (McMillan et al, 2011).

14.0.2   Over the past year we have continued to analyse available sources of data relevant to PPO injuries in order to strengthen our understanding of the impact of injury on rates of mortality. Below we set out the results of our analysis into life expectancy based on data from New Zealand for exposure between 1999 and 2012. We have also updated our investigation into mortality rates based on this year's UK PPO survey data (this is shown under the PPO survey section), and compare the findings of these two analyses below.

14.0.3   With the UK data we are progressing the work that has already been started and will be adding data from the HES (Hospital Episodes Statistics) database to the GP data. We are also looking into getting more detailed data along the same lines as the New Zealand data from the state of Victoria in Australia. We hope that if we see similar trends in a number of different studies that will enable us to start drawing conclusions and build up a picture of the mortality profile and characteristics of PPO claimants.

14.0.4   We repeat our recommendation for insurers to better record injury classifications again this year. The evidence from the New Zealand data shows that severity of injury has a significant impact on mortality rates. Unfortunately we do not currently have this level of categorisation for brain injuries in the survey data as not enough companies currently record this information. At the end of this section we have included the definition of the categorisations used in New Zealand.

14.0.5   At the end of this section we conclude by discussing the application of the elements examined here to the reserving of PPO claims.

New Zealand Road Traffic Accident mortality experience

14.1.   Executive summary
14.2.   Background
14.3.   Data
14.4.   Methodology
   -    Impairment adjustment methods
14.5.   Limitations
14.6.   Results
14.7.   Comparison of UK and NZ findings
14.8.   Applications for reserving of PPO claims
14.9.   References

   Appendix B – Detailed Results
   Appendix C - Injury Definitions
   Appendix D - New Zealand Mortality Tables

14.1 Executive Summary

14.1.1 The New Zealand government has been providing compensation cover for all bodily injury claims incurred since 1974. Data is available on the mortality outcome between 1999 and 2012, for accidents that occurred since 1974. Whilst the data covers exposure for over a decade in respect of accidents that occurred over almost a four decade period, this is still a small sample size upon which to base conclusions on, and care should be taken not to place undue reliance on the results presented here. In addition, there are a number of features of the data, including how the data has been recorded, that affect the reliability and relevance of the data for assessing the mortality of UK PPO claimants.

14.1.2 These results are intended to be used in conjunction with knowledge of other similar studies and should not be relied upon in isolation. In particular, (re)insurers considering the findings contained in this paper should take into account how their own portfolio may differ from the population in this survey, for example in terms of the age profile and injury severity of the claimants (particularly for reinsurers who may only provide cover for the larger PPO claims}.

14.1.3 The analysis suggests that:

- Spinal injuries overall have higher mortality rates than brain injuries.

- Severity of injury is significant to mortality outcomes.

- There is not enough data to comment definitively on the shape of the mortality curve and hence make a recommendation regarding what impairment adjustment is most appropriate. However:

    - If applying a multiplier adjustment, there is some evidence that this should reduce by age, particularly for more severe injuries. This is likely to be because older claimants are more likely to die from other causes.

    - Over the long term, there was no specific evidence that claimant mortality rates moved closer to standard rates of mortality as time since the accident increased. However, this finding is not conclusive and this is an area where more research would be useful.

- Whilst there is very limited data available to date on UK experience, there is no evidence to suggest that the UK experience is not comparable to the overall New Zealand experience to date. Comparisons have been made at an overall level only, as the UK data does not contain sufficient injury type information.

- Trends in US spinal experience are broadly comparable to the New Zealand experience.

14.2   Background to the Investigation

14.2.1   The transfer of longevity risk from the claimant to the insurer is of particular importance when valuing PPO liabilities and leads to a requirement for non-life insurers to make assessments and assumptions in relation to the future mortality rates of PPO claimants. Actuarial techniques to estimate liabilities where cash flows are dependent upon the survival, or otherwise, of a recipient are well established in both the pension and life assurance fields of work. However, there are a number of specific considerations in the case of PPO claimants that make the assessment of PPO liabilities more difficult. These include:

- The volatility in experience an insurer can expect from having only a small number of PPO claimants.

- The small number of previous investigations worldwide into the mortality experience of individuals with severe bodily injuries, such as brain and spinal injuries. This makes estimation of expected future mortality rates extremely difficult. There is also a shortage of data available to enable further investigation into expected mortality rates, owing in part to the rarity of occurrence of very severe bodily injuries. Whilst there is an established market in impaired life annuities, these are not relevant to younger individuals and relate mainly to impairments such as heart disease, cancer and conditions related to smoking, that are not directly relevant to PPOs. The results of the UK PPO survey show that around 70% of all PPOs relate specifically to brain injuries and around 20% to spinal injuries.

- There will be a range of injury severities, even amongst individuals with the same injury classification. This is important when considering the results of any mortality investigation in setting mortality assumptions for a specific claimant.

- Many studies cite time since accident as having a significant impact on mortality rate, especially during the first year since the accident. Evidence for the impact of time since accident at longer periods is very limited. McMillan et al (2011) suggested that head injury has an impact on life expectancy for many years after the accident and that the impact was more pronounced if the accident occurred at younger ages.

- There is greater uncertainty in relation to future improvements in mortality rates amongst PPO claimants than amongst the general population. In particular, improvements in medical care will have more of an impact on the mortality rates of PPO claimants than on the general population, which will include healthy individuals who may have only limited need for medical assistance.

14.2.2   Non-life insurers typically base their assessment of expected mortality rates for new PPO claimants upon the opinion of a medical expert at the time that a claimant is granted a PPO award. The medical expert may give an opinion on the future life expectancy of the PPO claimant, and the insurer will often then adjust standard population mortality rates in order to obtain a life expectancy estimate that is in line with the opinion of the medical expert. There can be significant differences in the estimate of life expectancy for the same life between different medical experts.

14.2.3   The 2012 PPO survey indicated that insurers are now including clauses in their PPO contracts in relation to the possibility of requesting an update on the medical condition of the claimant at a future date. However, it is still likely to be the case that an insurer will receive limited updates on changes in the medical condition of the claimant over their remaining lifetime.

14.2.4   It is therefore important for the insurer to have an understanding of the typical range of mortality rates amongst PPO claimants. This will also help the insurer to take a view on the overall life expectancy estimates of medical experts.

14.2.5   Knowledge of expected mortality rates will also be useful in estimating liabilities for future PPO claimants, for pricing, capital modelling and reserving of incurred but not reported PPO claims.

14.3   Data

14.3.1   The New Zealand Government has been providing compensation cover for claims relating to accidental bodily injury since 1974, through the New Zealand Accident Compensation Corporation ("ACC"). All bodily injury claims occurring in New Zealand are paid by the government under the scheme. Private insurers cover the property damage elements of claims. Data relating to ACC claimants resulting from a motor accident have been provided to the PPO Working Party by the ACC. The data has been used to investigate mortality rates of claimants with the most serious brain and spinal injuries. Observed mortality rates for these claimants should be more relevant to the selection of mortality assumptions for UK PPO claimants than the other injuries covered by the ACC. It is, however, likely that there will be some differences between the injury types included in the investigation and the typical injuries of PPO claimants.

14.3.2   Whilst the New Zealand compensation scheme has run since 1974, the data only includes claimants who were still alive in 1999. This means that whilst the data includes accident dates earlier than 1999, there is no information available on the mortality rates experienced during the period from 1974 to 1999. For someone whose accident occurred before 1999, there may therefore be an element of selection in observed mortality rates as in general it would be expected that healthier individuals would have survived up to 1999. This means that the results may be biased for older claimants, as those who have already survived for a number of years may have a lower mortality rate (if time since accident has an impact on the mortality rate).

14.3.3   There was also a re-assessment of brain injury classification in 2007, which led to a significant number of additional claimants being classified as having a brain injury. This could mean that less serious brain injuries have been included in the data for accidents occurring since 2007.

14.3.4   Details of how the above data issues were allowed for are included in Section 14.4 below which discusses the Methodology.

14.3.5   There were 2,219 claimants included in the investigation, of whom 1,640 are male and 579 are female. This contributed a total of 20,600 years of exposure, of which around 15,000 years related to male exposure, based on the investigation period which covered the time period from June 1999 to March 2012.

14.3.6   The graphs below summarise the data used in the analysis:
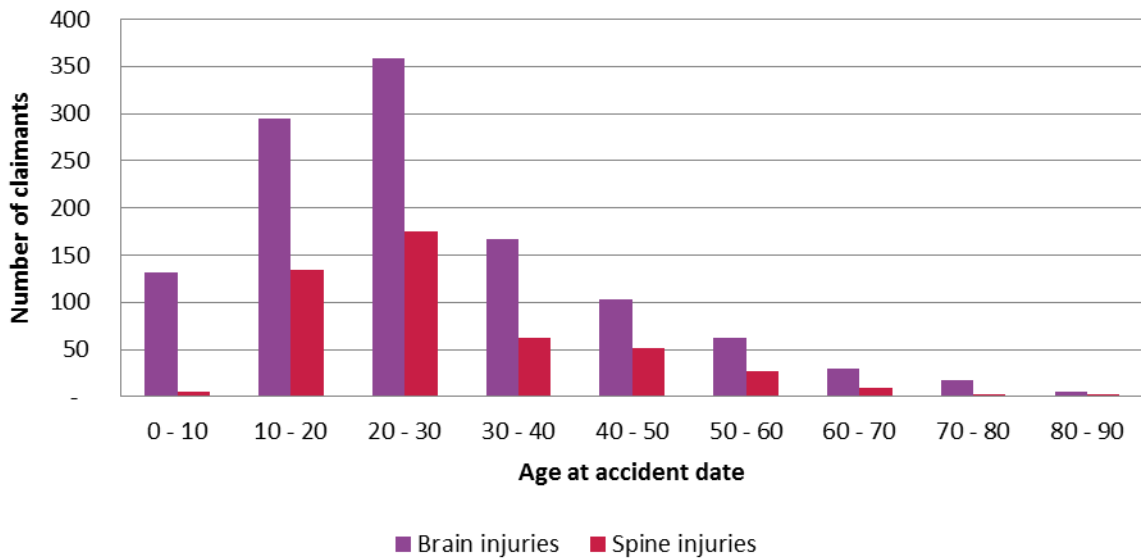
Distribution of male claimants by age at accident

Figure 14.1: Distribution of male claimants by age at accident

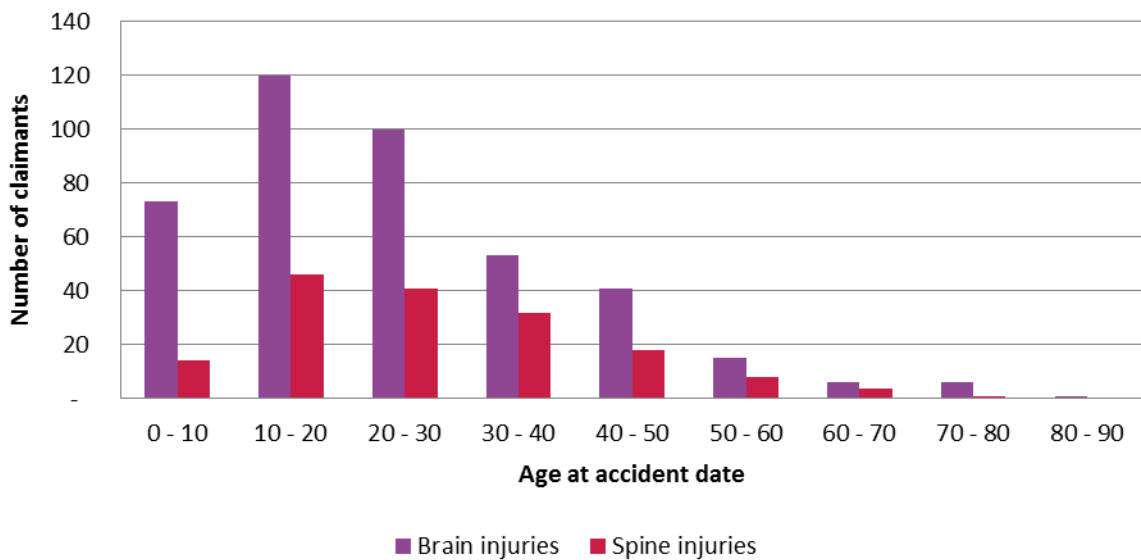# Distribution of female claimants by age at accident

Figure 14.2: Distribution of female claimants by age at accident

14.3.7   The data for each claimant includes:

- Date of birth
- Gender
- Date of accident
- Date of death (where applicable)
- Injury type
- Employment status.

Injury definitions

14.3.8   The following injury types, which were considered to be most relevant to PPO claimants, were included in the mortality investigation:

- Spinal
    - High Level Tetraplegia.
    - Low Level Tetraplegia.
    - Paraplegia.
- Brain
    - Severe Brain Injury.
    - Moderate Brain Injury.

14.3.9   Full definitions and information relating to the categorisation of each type of injury are included in Appendix C.

14.4   Methodology

14.4.1   The data was categorised into groups according to gender and the five injury types outlined above. Claimants were then grouped into ten year age bands, as the data volume was insufficient to assess the impact of injury on mortality rates at each individual age. However, when calculating the expected number of deaths, exact age at time of exposure was allowed for. The broader data groupings were only used when estimating the impact of injury on mortality rate.

14.4.2   The age groupings were based on the age at the time of exposure. So, for example, an individual who was aged exactly eight at time of injury and who was alive for five years during the period of investigation would contribute two years of exposure to the "0 – 9" age grouping and three years of exposure to the "10 – 19" age grouping, with the ages referring to age in complete years.

14.4.3   As a result of the much lower volume of data available in respect of female claimants, the majority of the analysis focussed on male claimants. However, analysis was also performed on the data for female claimants using a broader grouping for injury type, to give a high level comparison to the male claimant analysis.

14.4.4   As there is no record of deaths that occurred prior to 1999, exposure during this period of time was not included in the analysis. Claimants with accident dates pre 1999 were included in the investigation, but only their contribution to exposure from 1999 onwards was allowed for.

14.4.5   There was a re-classification of brain injuries in 2007 which led to a number of individuals being admitted to the scheme a few years after the accident occurred. It may be the case that a broader definition of brain injury has been used since 2007 and hence there may be more claimants with less serious injuries included in the data for accidents that occurred from 2007 onwards. The proportion of the total brain injury exposure that relates to post 2007 accidents is low. There is not enough data available to conclude whether there is a

difference in experience between pre and post 2007 accidents and the data does not include information to adjust for any re-classification. No specific allowance has been made in the analysis for the re-classification of brain injuries.

14.4.6   The observed rates of mortality were compared to New Zealand population mortality tables. These tables are based on experience over the years 2005 to 2007. The graph below shows the expected mortality rates based on these mortality tables.
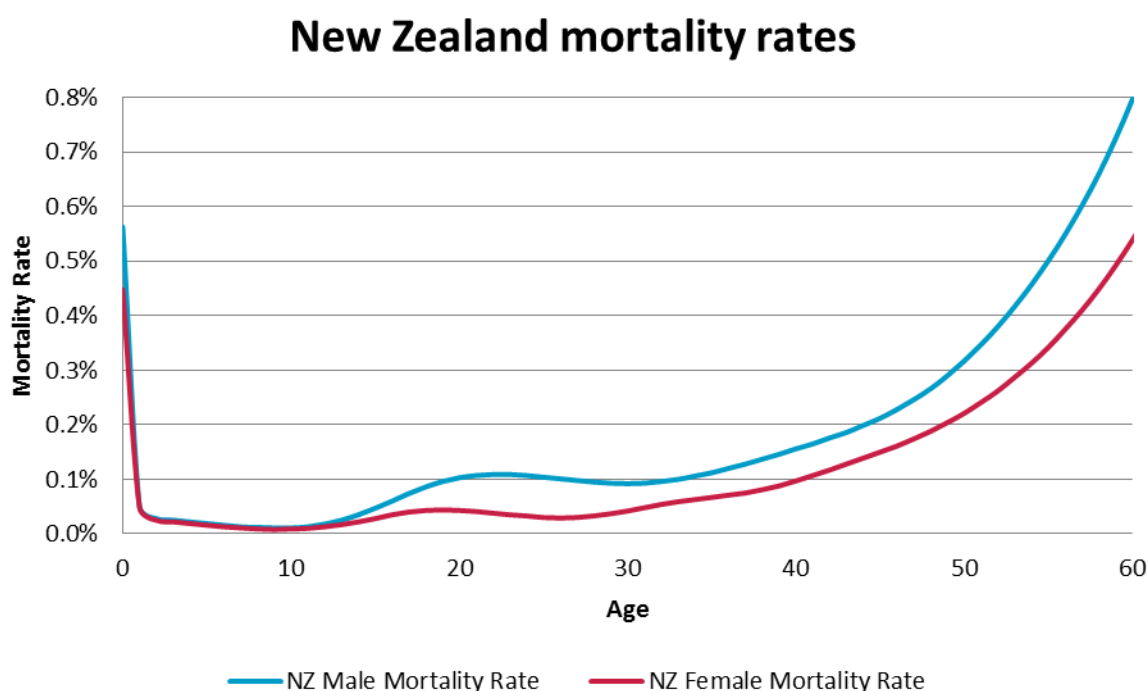
Figure 14.3: New Zealand mortality rates

14.4.7   For each age band, observed multiplicative and additive mortality adjustments were calculated and plotted on a graph. In addition, for the entire observed age range of 0 to 90 years old, a single, constant multiplicative adjustment and a single, constant additive adjustment was calculated. A further graph was plotted to show the impact on expected mortality rates of using both the constant multiplicative and additive adjustments, focussing on the age range 0 to 60 years, with the actual observed mortality rates shown as a comparison.

Impairment adjustment methods

14.4.8   The mortality rate, q_x, is defined as the probability that an individual aged exactly x years will die during the next year. To estimate q_x as part of a mortality investigation, the following calculation is performed:

$q_x =$ <u>Observed number of deaths for individuals aged between x years and x + 1 years</u>
Number of years of exposure for individuals aged between x years and x + 1 years

14.4.9   For an individual with serious injuries, there are a number of possible outcomes during the period of a mortality investigation:

- Individual survives.
- Individual dies as a direct result of the serious injuries sustained.
- Individual dies as a result of causes unrelated to the serious injuries sustained, for example owing to another health condition.
- Individual dies as a result of a combination of the serious injuries sustained and other, unrelated causes.

14.4.10 The impact of the serious injury on mortality rates is estimated by assuming that, had a serious injury not occurred, the individuals included in the investigation would experience standard New Zealand population rates of mortality (specific to each individual's age and gender). The number of deaths arising as a result of the serious injury is assumed to be the difference between the observed number of deaths and the expected number of deaths, based on the total exposure and standard rates of mortality. This can then be used to estimate the impact of the serious injury on mortality rates.

14.4.11 To allow for serious injury, a number of different adjustments to standard mortality rates can be made. This allows standard mortality tables to be adapted for use in calculations where mortality estimates are required for PPO claimants. The appropriateness of each adjustment will depend upon the pattern of additional mortality caused by the serious injury.

14.4.12 There are three commonly used adjustments to standard mortality rates, $A_{x,t}$, $B_{x,t}$ and $C_{x,t}$:

$$Q_{x,t} = A_{x,t} \times q_{x+Bx,t} + C_{x,t}$$

- q_x is the standard rate of mortality, at age x, in the mortality table being adjusted.

- $q_{x,t}$ is the adjusted rate of mortality, at age x and time t.

- $A_{x,t}$ – Multiplicative adjustment. A multiplicative adjustment that does not vary by age would be used if the additional mortality rate resulting from the injury was expected to vary by age to the same extent that standard mortality varies by age.

- $B_{x,t}$ – Age adjustment. An age adjustment on its own would be used if the mortality of an individual was expected to be equivalent to the mortality of an average person (with standard population mortality) who is x years older than the individual. This adjustment is commonly used to allow for the effect of chronic conditions such as diabetes.

- $C_{x,t}$ – Additive adjustment. An additive adjustment that does not vary by age would be used if the absolute impact of the injury on mortality was expected to be independent of age.

Mortality rates - age 20, life expectancy 43 years
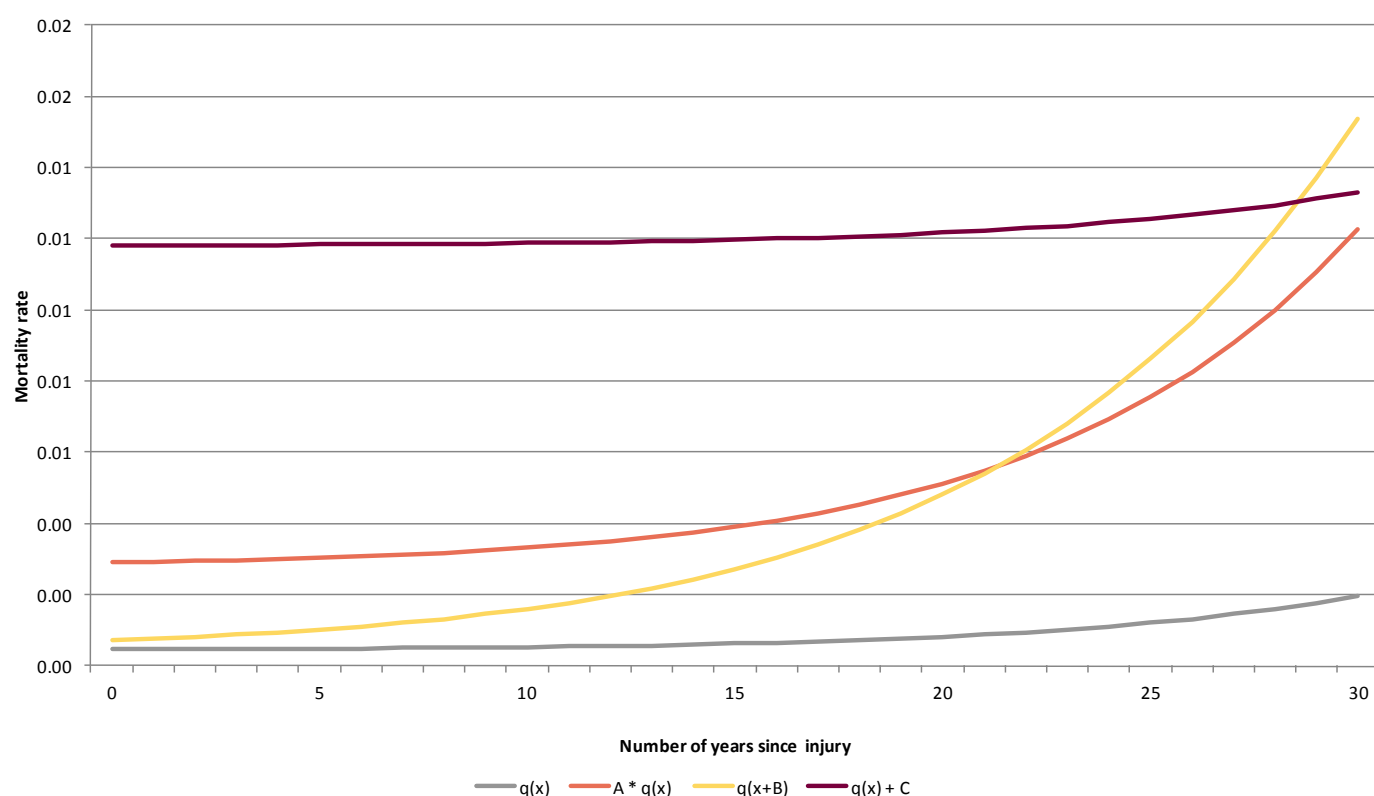
Figure 14.4: Mortality rates – age 20, life expectancy 43 years

14.4.13 These adjustments were discussed in detail in the PPO working party's 2010 paper.

14.4.14 Age adjustments ($B_{x,t}$) were not considered as part of this investigation. This method has been used in the life industry for a long time, partly because it is administratively convenient. However, medical research does not tend to express extra mortality in this way and for traditional life insurance annuities it has been found that an age adjustment does not necessarily mirror an appropriate pattern of mortality over time.

14.4.15 The main reason for not considering age adjustments in the New Zealand investigation is that adjustments to mortality rates are required for all ages of claimant. At older ages, there are more stable increases in mortality as age increases and so if, for example, a pension annuity provider needs to allow for the greater expected mortality at age 65 of a smoker, an age adjustment may be appropriate. However, at younger ages, age adjustments do not always produce the required result. For example, the rate of mortality is very similar between the ages of 2 and 13. Applying age adjustments to very young claimants may therefore make little difference to expected mortality rates over the first few years since injury.

14.4.16 There are also some cases where an age adjustment can lead to a reduction in expected mortality compared to standard mortality appropriate for an individual's age. For example, based on the male New Zealand mortality tables, using an age adjustment of +5 years would lead to a lower expected rate of mortality for the time a claimant is aged between 21 and 27.

14.4.17 Even if very large age adjustments are used, the impact on mortality is unlikely to be sufficiently large for the youngest claimants, as mortality rates remain low in the general population for many years. Using large age adjustments can also cause problems at older ages, where the adjusted age may then be sufficiently high for the assumed mortality rate to be close to or equal to one, which may not be appropriate.

Factors that may affect the adjustment choice

Age dependence

14.4.18 As part of the investigation into New Zealand serious injury mortality rates, observed multiplicative and additive adjustments have been calculated for 10 year age bands to give an insight into whether a constant adjustment or an adjustment that varies with age is likely to be most appropriate.

14.4.19 Multiplicative adjustments are effectively an estimate of the relative increase (or decrease) in mortality rates in comparison to base mortality rates. Broadly speaking, standard rates of mortality increase exponentially with age. If the mortality rate arising from severe injury has a different relationship with age than for standard mortality, then multipliers will not be the same at each age. For example, if the mortality rate arising from serious injury increases more strongly with age than for standard mortality, this would cause multipliers to be higher at older ages than at younger ages. Conversely, if the mortality rate arising from serious injury increases less strongly with age than for standard mortality, or if it does not increase with age, then this would cause multipliers to be lower at older ages than at younger ages.

14.4.20 A young, healthy individual could be expected to be better able to survive the impact of serious injury than an older individual. Therefore it could be expected that the mortality rate arising from a serious injury will increase with age (and so additive adjustments will be higher at older ages).

14.4.21 There are a number of factors which could mean lower multipliers are appropriate at older ages, particularly for the most severe injuries:

- For the most serious injuries, the severity of the injury may be more significant to the survival outcome than the age of the injured person. There may therefore be less of a difference between the mortality rate of a young and old person who have both experienced a very serious injury than for standard population mortality.

- For the most serious injuries, the relationship of mortality with age is also constrained by the laws of probability. The standard New Zealand mortality table used in this investigation predicts that a male aged 70 is 23 times more likely to die in the next year than a male aged 30. If a male aged 30 experienced a very severe injury such that he had a 10% chance of death over the next year, then clearly a 70 year old male experiencing the same injury could not be 23 times more likely to die in the next year.

- Another consideration is that at older ages (where standard mortality is high) and for severe injuries, there is more overlap between the serious injury as a cause of death and other causes of death. If an older person dies of serious injury, it is more likely than for a younger person that the person would have died at that age anyway through other unrelated causes. Similarly, for someone with a serious injury who dies of causes unrelated to the serious injury, it is more likely than for a moderately injured person that the seriously injured individual would have died of their injuries that year, had he/she not already died of unrelated causes.

Time since accident

14.4.22 A further consideration arises as to whether the mortality rate of a seriously injured person moves closer to the mortality rate of a person who has suffered no injury as time since injury increases. Certainly it would make sense that over the first few days or weeks following injury, the observed mortality rate would be materially higher, owing to individuals who have sustained extremely serious injuries impacting upon the observed mortality rate. However, there is greater uncertainty over the longer term impact on mortality and whether, once an injured individual's condition has stabilised, their mortality remains at a consistent elevated level or continues to improve (compared to standard mortality) over time.

14.4.23 Aside from the fact that the condition of a seriously injured person should stabilise over time, improvements in medical care may also have an impact. Whilst the standard of medical care may be most critical in the hours and days following injury (and so won't be relevant to PPO claimants owing to the settlement delay), improvements to care over the long term may also have an impact on mortality rates as the time since injury increases.

Accident hump

14.4.24 Standard mortality rates for both genders show an 'accident hump', which relates to a period of elevated mortality during early adulthood as a result of a higher frequency of accident occurrence at these ages. The accident hump is much more pronounced for males than for females. For both brain and spinal injury, the New Zealand data shows higher mortality multipliers for females than for males in the age range 20 to 29. However, part of the reason for this is that standard mortality rates in this age range are much lower for females than for males. The higher multiplier for younger females will reflect at least in part the fact that amongst the general population, accident frequency is greater for young males than young females, and therefore the higher multiplier does not necessarily indicate that females are more vulnerable than males to death following serious injury.

14.4.25 In addition to the impact of the accident hump, male mortality rates are higher than female mortality rates across all ages. This could also affect the comparative serious injury multipliers if the difference between male and female outcomes amongst seriously injured individuals is not as pronounced as the difference between male and female standard population mortality.

14.4.26 One potential problem with using a multiplier adjustment to mortality is that the accident hump is amplified, which is unlikely to be a realistic reflection of underlying mortality rates for seriously injured individuals. For an individual who already has very serious injuries, it is likely that the ability of the individual to take risks or take part in dangerous activities will be constrained by their injury. The pattern of mortality rates for a seriously injured individual therefore would not be expected to show a large accident hump.

Appropriateness of the base mortality table

14.4.27 Clearly the value of any mortality adjustments will depend in part upon the selected base mortality table. The appropriateness of any one mortality table will depend upon the reason for requiring life expectancy estimates and, specifically, should be related to the characteristics of the underlying population. For example, individuals who take out life assurance typically have greater life expectancies than the general population, owing to factors such as higher socio-economic status. It would not therefore be appropriate to use general population mortality tables to estimate liabilities in relation to life assurance products, as mortality rates are likely to be over-stated.

14.4.28 There may be reasons why the pre-injury rate of mortality amongst PPO claimants is different to that of the general population. However there is insufficient data available to draw any conclusions on this. It is possible that there could be differences in social-economic status between PPO claimants and the general population, for example. The McMillian paper specifically commented on this, making the point that other studies "do not include comparators that are matched to the demographics of the head injured, who are often young, male and from socially deprived backgrounds". However, in the case of the New Zealand investigation, the data available meant that no allowance could be made for a number of characteristics, such as socio-economic status, that might be expected to affect pre-injury rates of mortality. It was therefore assumed that pre-injury rates of mortality were in line with standard New Zealand population tables for each claimant.

14.5 Limitations

14.5.1 As previously discussed, the investigation is based on very limited data, and care should be taken not to place undue reliance on the results shown. Both the level of detail in the data and the volume of data available have limited the extent to which heterogeneity could be removed in selecting the data groupings. The limited volume of data also means that the results of the investigation are very sensitive to the occurrence or absence of individual deaths. Whilst the results are valuable in the sense of giving an indication of potential trends and in assessing whether or not the results support previous studies, in terms of statistical significance the only definitive conclusion that should be made is that serious injury results in increased rates of mortality.

14.5.2 There are a number of issues which limit the reliance that can be placed on the analysis carried out. The most significant of these is the volume of data available. Other issues which are important to consider include:

- The heterogeneity that will exist amongst groups of claimants. Owing to the level of detail available in the data, no allowance was made in the investigation for a number of characteristics that would be expected to impact upon mortality, such as the existence of other underlying health conditions, socio-economic status, smoker status, diet or other lifestyle choices.

- Differences in injury severity between claimants with the same injury classification. Brain and spinal injuries are complex conditions, and there will potentially be a large amount of heterogeneity in injury severity amongst claimants with the same injury classification.

- Differences between UK and New Zealand injury classification. The injury severity for each injury classification in New Zealand may be different to the severity of an average PPO claimant. This may partly explain the observed differences in PPO claimant frequency and ACC claimant frequency for brain and spinal injuries, which is discussed later in the paper.

- Whilst the UK and New Zealand are both well developed countries with high standards of medical care, there will be differences in environment that limit the extent that the

observed mortality experience is relevant to expected mortality rates for UK PPO claimants. Examples include:

- There may be differences in road conditions and driving standards between the UK and New Zealand. This may affect the proportion of accidents that are severe. For example, New Zealand has a higher proportion of rural roads, where severe accidents are more common. It may be the case that a higher proportion of brain and spinal injuries arising from New Zealand accidents relate to extremely severe injuries.

- As New Zealand is a more rural country than the UK, the average distance to the nearest hospital may be greater than for the UK. Longer delays in receiving medical treatment could impact on the long term survival prospects of claimants, so mortality rates could be higher amongst New Zealand claimants. Conversely, the immediacy of medical treatment in the UK may mean that a greater proportion of individuals with extremely severe injuries are able to survive to the point of settling a claim, which could have the impact of increasing average mortality rates amongst UK PPO claimants.

- There may also be differences in the quality of medical care or in views on best practice treatment (particularly for the most severe and complex conditions) which may lead to differences in observed mortality rates between the two countries. However, as both countries are well developed, it would not be expected that there would be significant differences in medical care between the UK and New Zealand.

- The mortality rates observed in the investigation are compared to standard New Zealand tables, which were based on observed population mortality rates over the years 2005 to 2007. The mortality investigation considered mortality experience of seriously injured claimants over the period 1999 to 2012. As rates of general population mortality are generally improving over time, this means that the comparison to standard mortality rates is slightly inaccurate as the standard mortality table has not been adjusted to allow for year of exposure.

- There are differences between UK and New Zealand population mortality tables. As previously highlighted, the UK and New Zealand are both well developed countries, with a high standard of living and good medical care. As such, mortality rates amongst individuals with serious injuries and amongst the general population could be expected to be broadly comparable between the two countries. However, the base mortality tables are not exactly the same, and this will have some impact on the results of the investigation. In particular, New Zealand mortality tables show a more pronounced 'accident hump' than the UK Ogden mortality tables, particularly amongst males.

- There are also specific data issues which affect the results, as outlined in Section 14.3.

14.5.3 This is not intended to be an exhaustive list, and there may be other issues that place constraints on the reliability of the results of the investigation.

14.6   Results

14.6.1   The following investigation results are discussed below:

- Type of impaired adjustment to apply

- Brain vs Spinal injuries

- Severity of injury

- Gender

- Employment status.

Type of impaired adjustment to apply: Male - Spinal - High tetraplegia

14.6.2   As an example, the following section includes discussion of the effect of different impairment adjustments on male lives in the study with spinal, high tetraplegia injuries.

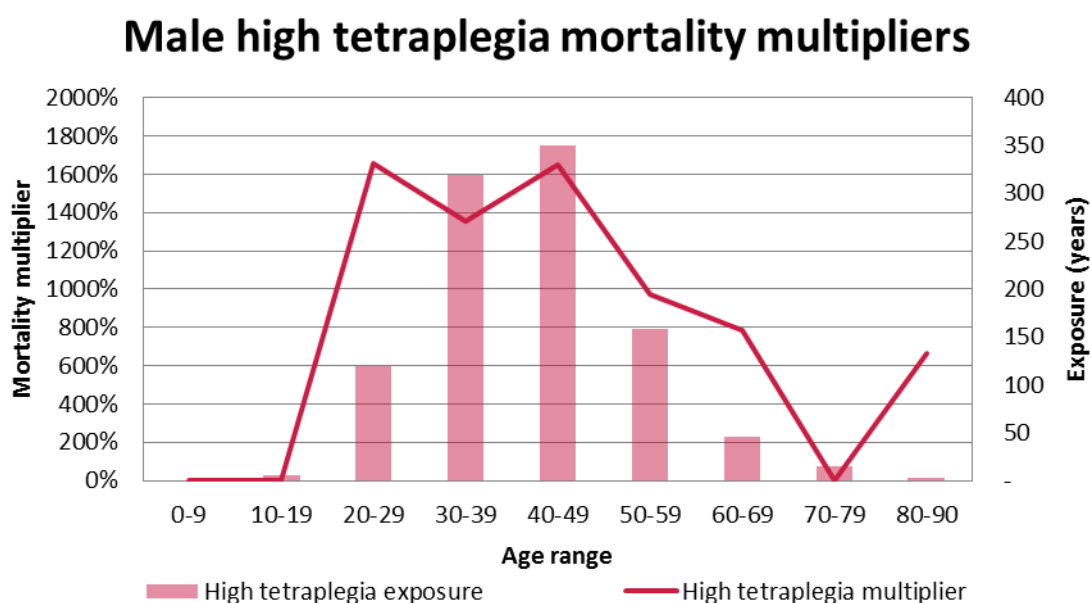### Multiplier adjustment

Figure 14.5: Male high tetraplegia mortality multipliers

14.6.3   The above graph plots the ratio of the actual observed mortality rate to the expected mortality rate (q_x) from the standard mortality tables to determine a multiplier adjustment for each 10 year age band. Whilst the exposure is low at the older ages, there is a clear downwards trend observed with age.

Additive adjustment

14.6.4 The next graph plots the difference between the actual observed mortality rate and the expected mortality rate (q_x) from the standard mortality tables to determine an additive adjustment for each 10 year age band. This implies a higher additive adjustment is required at older ages.

Figure 14.6: Male high tetraplegia additive adjustments

Comparison of adjustment methods

14.6.5 The following graph shows the standard mortality rate from the base table plotted in red. The actual mortality rate observed for each 10 year age band is shown in blue. The effect of applying a constant additive adjustment to standard rates of mortality at all ages is shown in purple, which can be seen to be shifted up from the red curve by a constant amount. The effect of applying a constant multiplier to standard rates of mortality at all ages is shown in green.
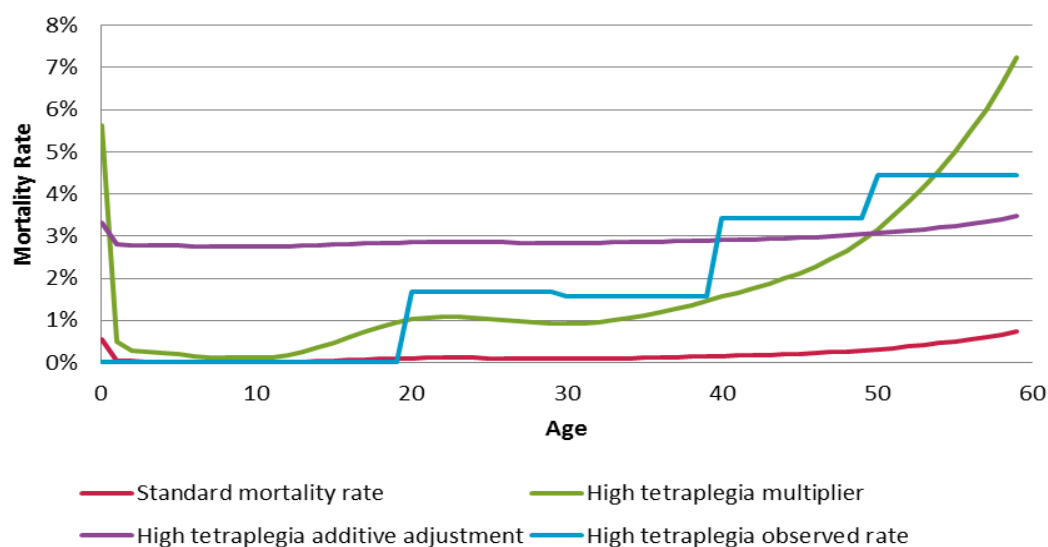
Figure 14.7: High tetraplegia injury mortality rate

14.6.6 The above graph shows a poor fit when using a constant additive adjustment (when the blue and purple lines are compared). The constant multiplier adjustment appears to be a better fit, although the fit appears less good at older ages. A multiplier adjustment which decreases with age, an additive adjustment that increases with age, or a combination of a multiplier adjustment and an additive adjustment may be a better fit. It is important to highlight again that there is insufficient data to conclude exactly what the shape or most appropriate level of adjustment should be, particularly as no account has been made for the impact of any other factors such as time since accident.

Type of impaired adjustment to apply: other injuries

14.6.7 The fit of both multiplicative and additive adjustments was also assessed for the other injury types. The results from the high tetraplegia example discussed above are not necessarily typical for all the injury types. High level summaries of the observed multipliers for each injury type are shown below. The full results are shown in Appendix B.

14.6.8 The graph below provides a comparison of the observed male multipliers for each type of spinal injury.
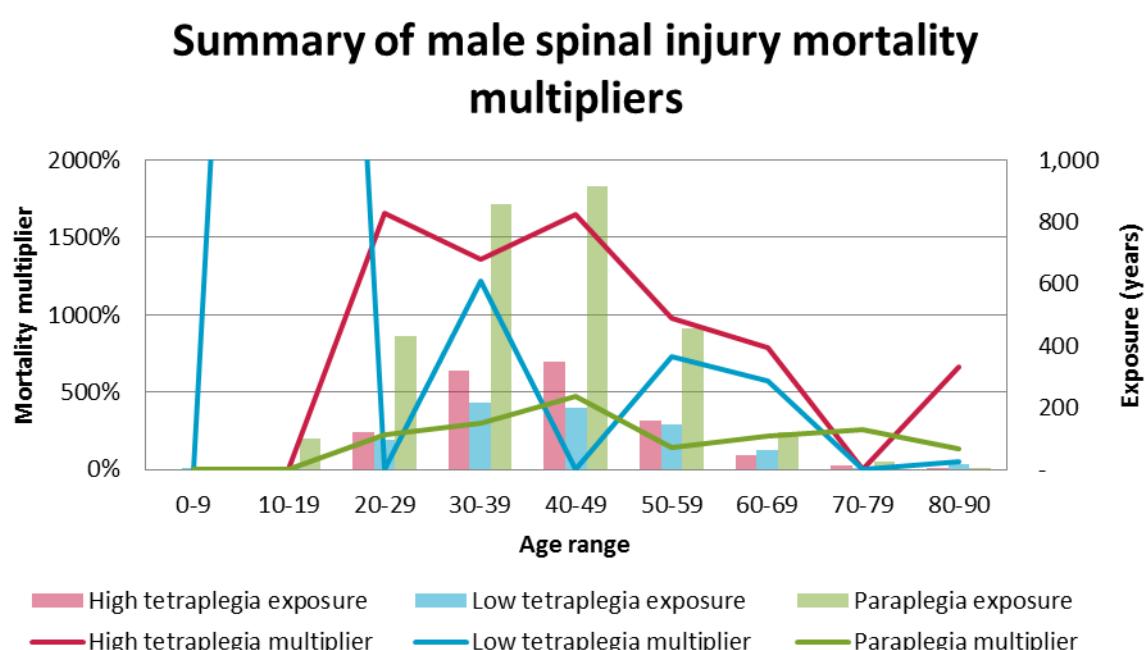
Figure 14.8: Summary of male spinal injury mortality multipliers

14.6.9 The results for each injury type are not conclusive in relation to whether there is a higher multiplier at younger ages. It may be the case that the effect is more pronounced for high tetraplegia owing to the severity of the injury being comparatively more important than the age of the claimant when compared to the less severe spinal injuries. However, the volume of data is more limited for high tetraplegia and low tetraplegia than for paraplegia, so care should be taken not to place undue reliance on the trend observed for high tetraplegia.

14.6.10 However this effect has also been observed in work carried out by Strauss, DeVivo and Shavelle (2000), investigating spinal injury mortality in the US. The following graph overlays the observed multipliers from the New Zealand data against the Strauss DeVivo and Shavelle findings from the US data. Whilst the New Zealand mortality multipliers are higher overall, the trends observed are similar.

Figure 14.9: Graph of the observed multipliers from the New Zealand data against the findings of Strauss from US data

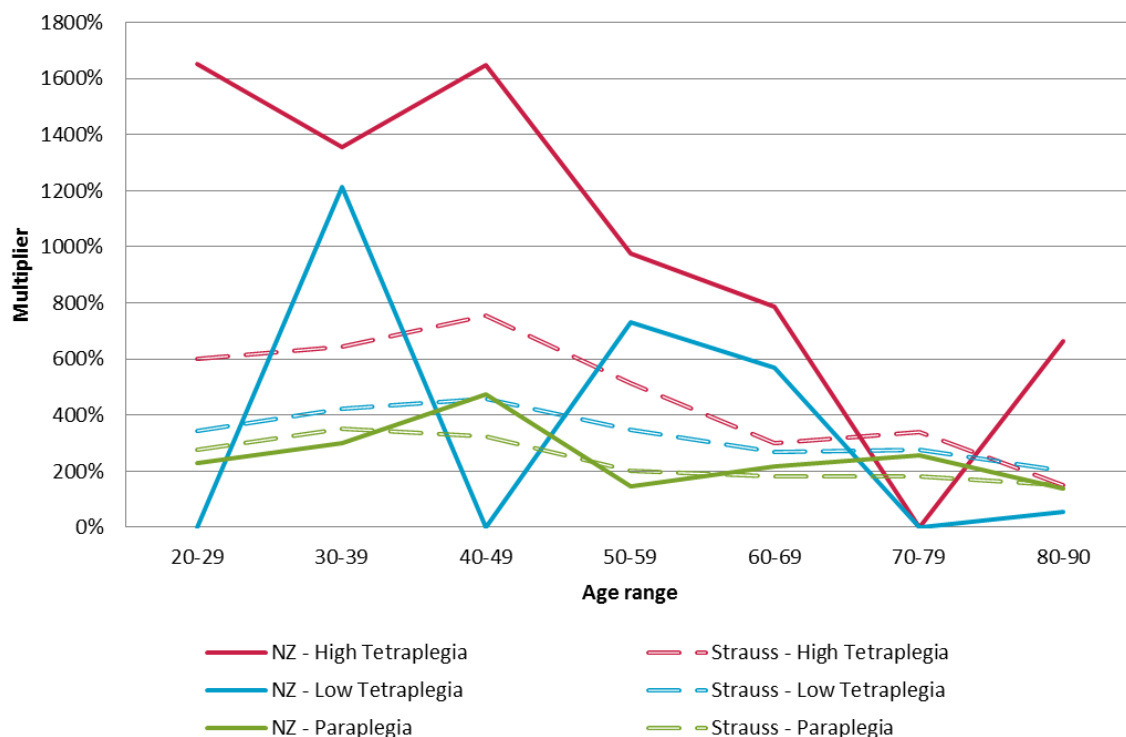14.6.11 The graph below provides a comparison of the observed male multipliers for each type of brain injury:
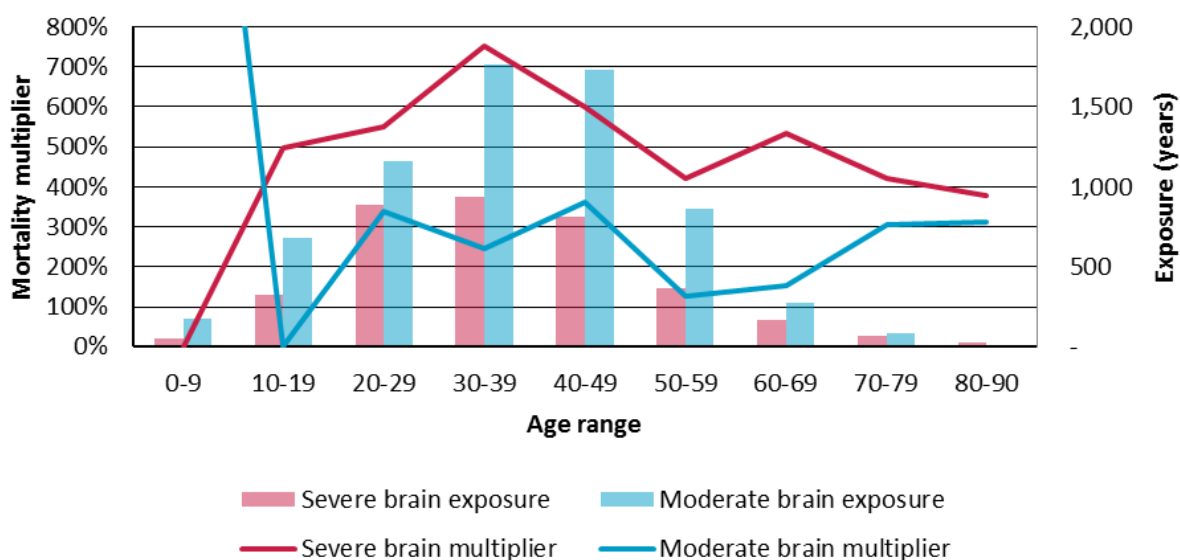

Figure 14.10: Summary of male brain injury mortality multipliers

14.6.12 In line with high tetraplegia, there is some evidence of a downward trend in observed multiplier for severe brain injury. However, this evidence is less conclusive, and really is most apparent at the older ages where the exposure is minimal. The accident hump will be impacting the multipliers observed in the age ranges 10 to 19 and 20 to 29, which may partly explain the lower multipliers observed at these age ranges compared to those observed in the age range 30 to 39. The multipliers for moderate brain injuries do not show a clear trend in multiplier by age.

14.6.13 The observed multipliers for each injury are shown in the table below:

Age	High Tetraplegia	Low Tetraplegia	Paraplegia	Severe Brain	Moderate Brain
0 – 9	N/A	0	0	0	20.8
10 – 19	0	110.5	0	5.0	0
20 – 29	16.5	0	2.3	5.5	3.4
30 – 39	13.6	12.2	3.0	7.5	2.5
40 – 49	16.5	0	4.7	6.0	3.6
50 – 59	9.8	7.3	1.5	4.2	1.3
60 – 69	7.9	5.7	2.2	5.3	1.5
70 – 79	0	0	2.6	4.2	3.1
80 – 90	6.6	0.6	1.4	3.8	3.1
Total (0 – 90)	10.0	3.4	2.6	5.0	2.4
Total Exposure (years)	1,000	750	2,900	3,650	6,750

Table 14.1: Observed multipliers by injury and age groups

14.6.14 The observed mortality multiplier for each injury type for some less granular age groupings is shown below:

Age	High Tetraplegia	Low Tetraplegia	Paraplegia	Severe Brain	Moderate Brain
0 – 19	0	101.4	0	4.6	2.5
20 – 39	14.3	8.7	2.8	6.6	2.8
40 – 59	13.1	4.5	3.0	5.1	2.4
60 – 90	4.3	1.8	2.1	4.4	2.3

Table 14.2: Observed multipliers by injury and less granular age groups

14.6.15 These age groupings illustrate that there is some evidence of higher multipliers at younger ages for all of the injury types except for paraplegia, focusing in particular on the age ranges 20-39 and 40-59, where there is a greater volume of data available.

14.6.16 The selected age groupings for the comparisons do affect the implied trend, owing to the limited data available and the sensitivity of the results to the occurrence or absence of individual deaths. Selection of different age groupings may not show a consistent trend for all injury types.

Impact of age on mortality adjustments

14.6.17 Across all injury types, the multiplicative adjustments generally provided a better fit to the mortality rates observed in the New Zealand data than the additive adjustments. However, there is an indication in some of the results of the investigation that a constant multiplier may not be an appropriate adjustment to allow for the additional mortality rates amongst PPO claimants, and that multipliers may be higher at younger ages for the most serious injuries. This finding is consistent with a previous study described in McMillan et al (2011) and findings by Strauss, DeVivo and Shavelle (2000) on US data which is discussed above. It is worth highlighting that this finding does not in any way indicate that younger individuals are somehow more vulnerable to death following serious injury. If that were the case, then the results would be expected to suggest that a higher additive adjustment would be required at younger ages compared to older ages, and this is not the case. In fact, the results suggest that a higher additive adjustment is required at older ages.

14.6.18 The broad conclusion that can be reached is that it may not be appropriate to use only a multiplicative adjustment or only an additive adjustment, but instead a combination of the two mortality adjustments may provide a better reflection of the impact of serious injury on mortality rates. Alternatively, a multiplicative adjustment that reduces with age may also be appropriate. As previously discussed, this can be justified in the context of a young, healthy individual being better able to survive serious injury, but that as the seriousness of the injury increases, the injury severity becomes more important in predicting the mortality rate compared to the age and pre-injury state of health of the affected individual. So amongst seriously injured individuals, the rate of mortality as a direct result of the serious injury does appear to increase with age, but not to the same extent that standard population mortality increases with age.

14.6.19 It is worth highlighting again that the investigation is based on only a small dataset and so the finding that higher multipliers may be appropriate at younger ages is not conclusive. However, it may be an area that merits further investigation, and is something an insurer should be aware of. This will be particularly important over time as the number of PPO claimants who have been on the insurer's book for a long period of time will increase, leading to an increase in the average age of claimants receiving PPO payments.

14.6.20 Fitting a combination of a multiplicative adjustment and an additive adjustment, or an adjustment that varies by age, to standard mortality rates would be even more difficult than adjusting mortality tables to allow only for a single adjustment. Whilst this may give a better representation of the impact of serious injury on mortality, an insurer should be aware that there is significant uncertainty over the appropriateness of any selected parameters.

14.6.21 There is also a danger of spurious accuracy when adjusting standard mortality rates to allow for severe bodily injury. The long term impact of a serious injury on an individual is very unpredictable and there is uncertainty over how the nature of the injury of an individual claimant compares to the injuries of individuals included in any mortality study. In addition, there is only a limited volume of data available with which to carry out studies of mortality rates amongst seriously injured individuals. The results of any such investigations should therefore be used with caution, as the observed impact on mortality rates will only be based on a very small sample group. Consideration should also be given to the impact of differences in medical care during the time period of any mortality study and over the lifetime of a PPO claimant.

14.6.22 Possibly the most important consideration for a non-life insurer, however, is the impact of having only a small number of PPO claimants in their book of business. Even if an insurer was to have sufficient data to come up with a reliable estimate of a PPO claimant's future life expectancy, the insurer is still exposed to significant uncertainty in actual experience owing to the low number of PPO claimants. If a claimant lives for much longer than expected, then a non-life insurer is much less likely than, for example, a pension scheme with a large number of members to have another corresponding claimant on their book who lives for much less than expected. Clearly this works both ways and the non-life insurer could have much better experience than expected. However, this additional volatility is

something a non-life insurer should be aware of, particularly when the payments due to a PPO claimant can be significant. It also emphasises the importance of obtaining regular updates on the medical condition of a PPO claimant where this is possible.

Further analysis

14.6.23 In addition to investigating the impact of age on mortality rates, a number of other comparisons were carried out, which are discussed briefly in the sections below.

Results – Comparison between brain and spinal injury

14.6.24 The following graph indicates that spinal injuries in general were observed to have a greater impact on mortality rates than brain injuries. The exposure in the lowest and highest age bands is very low, and this may be why the trend is not so apparent at these ages.
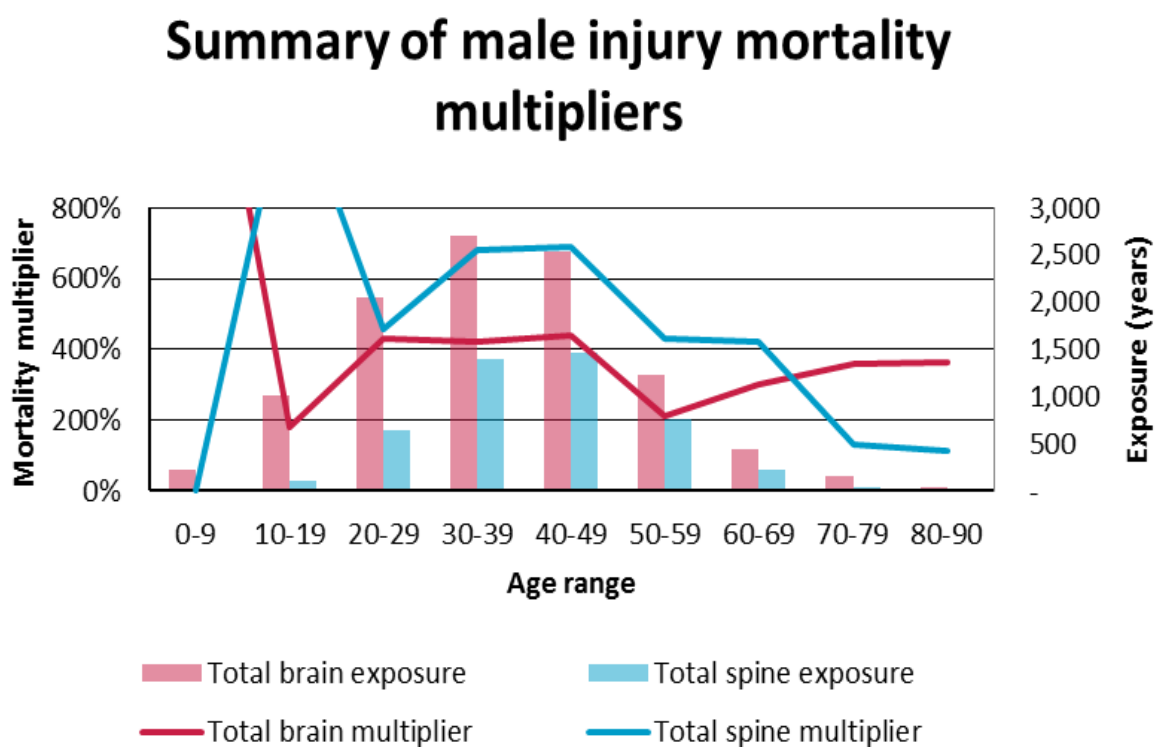
Figure 14.11: Summary of male injury mortality multipliers

Results - Severity of injury

Spinal

14.6.25 The following graph shows that, as expected, the observed mortality multipliers tend to be higher the more serious the spinal injury is.
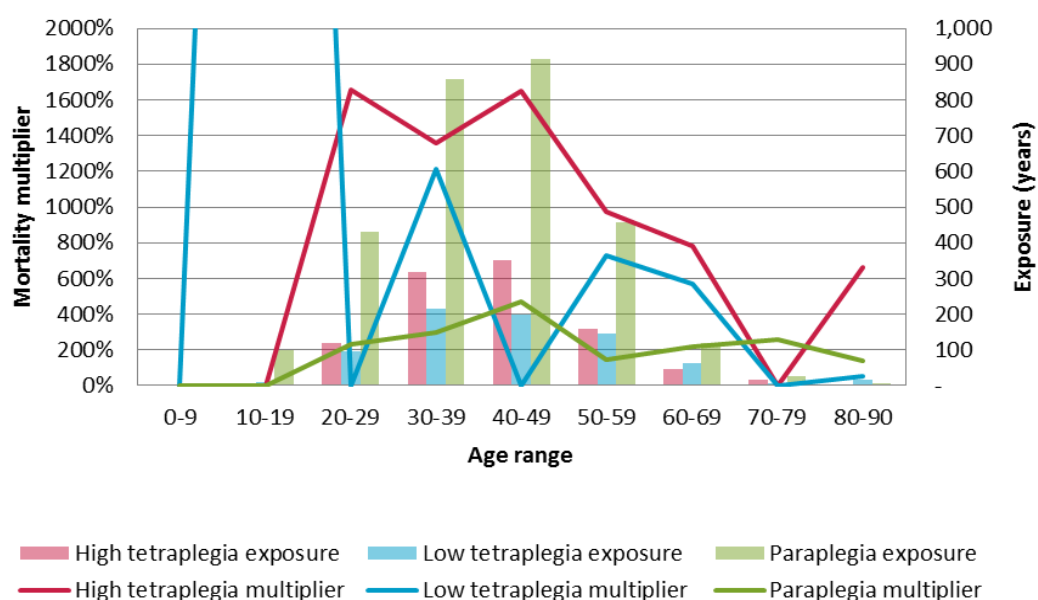
Figure 14.12: Graph of observed mortality multipliers for differing degrees of spinal injury

Brain

14.6.26 The following graph again shows the significance of the severity of the injury, with severe brain injury multipliers higher at all ages (with significant exposure) than for moderate brain injuries. The effect on the multiplier of the age of claimant is not as apparent for brain injury as was the case for the spinal data.
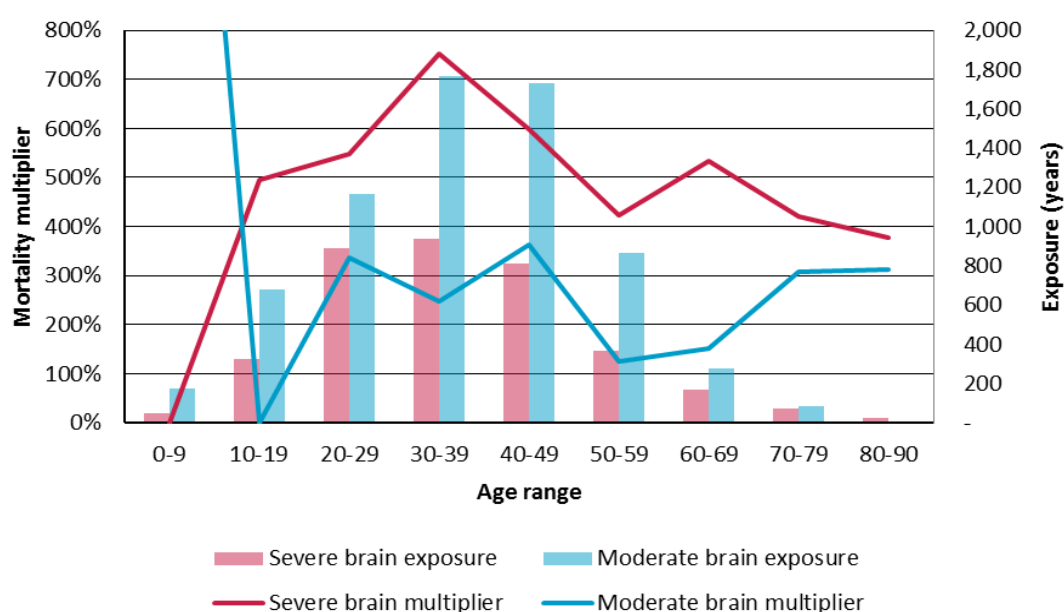
Figure 14.13: Graph of observed mortality multipliers for differing degrees of brain injury

Results – Comparison between males and females

14.6.27 Comparisons between the male and female observed multiplicative adjustments for both brain and spinal injuries are shown below.
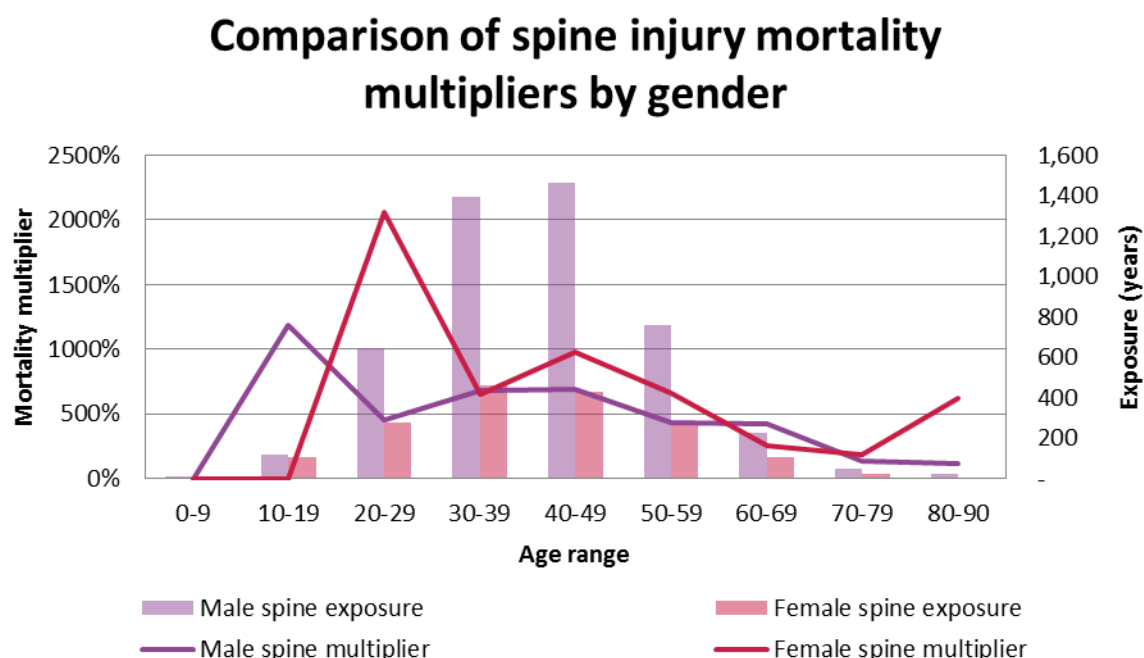
Figure 14.14: Comparison of spinal injury mortality multipliers by gender
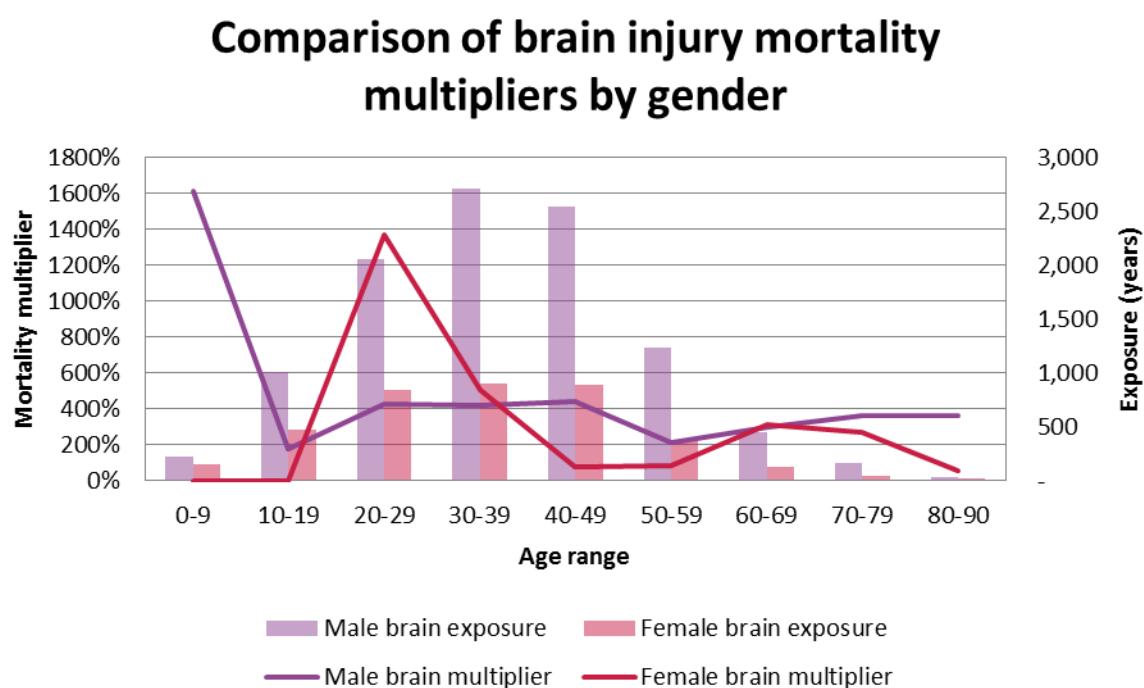
Figure 14.15: Comparison of brain injury mortality multipliers by gender

14.6.28 The observed multipliers are broadly similar for males and females for both brain and spinal injury, except for in the age group 20 to 29 where the observed female multipliers are higher. Part of the reason for this is that males experience a larger base mortality in this age range than females owing to the 'accident hump' (as discussed in Section 14.4). Hence the multiplier, which is calculated relative to base mortality, is observed to be lower for males than for females.

Results – Impact of employment status

14.6.29 A comparison between the observed multiplicative adjustments for based on employment status at time of accident for male brain and spinal injury claimants is shown below:
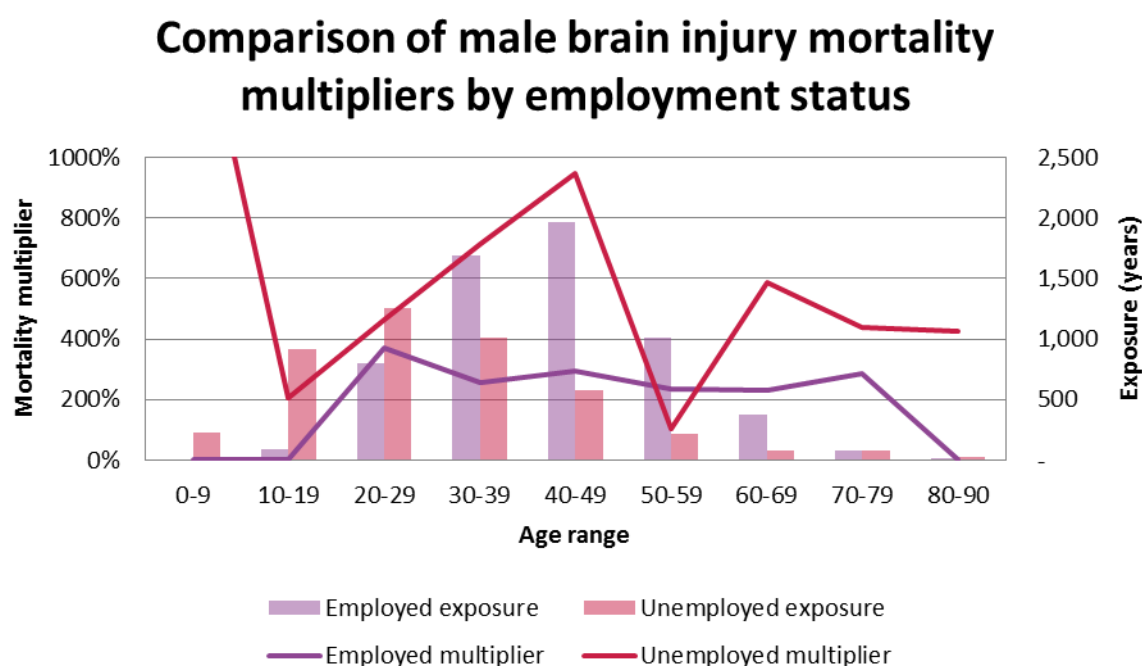
Figure 14.16: Comparison of male brain injury mortality multipliers by employment status

14.6.30 The brain injury data suggests higher multipliers may be appropriate for claimants who were unemployed at time of accident. The data for spine injuries shows less of a difference. Employment status is likely to have some correlation with socio-economic status, which would be expected to have some impact on the survival prospects of a seriously injured claimant.

Comparison of male spine injury mortality multipliers by employment status
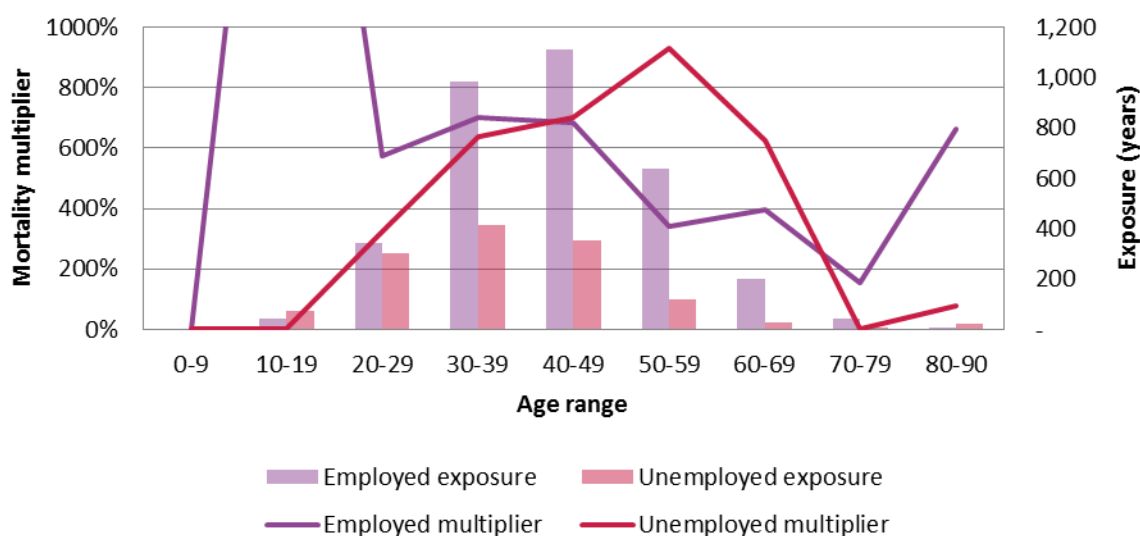
Figure 14.17: Comparison of male spine injury mortality multipliers by employment status

Results – Impact of time since injury

14.6.31 The volume of data available was too limited to assess mortality rate based on the number of years since accident. Instead, the data was split into two groups, with one group including all exposure during the first ten years since the date of accident and with the second group including all exposure ten or more years since the date of accident. The graph below shows a comparison of the multipliers for brain injury split by time since accident:

Comparison of male brain injury mortality multipliers by time since accident

Figure 14.18: Comparison of male brain injury mortality multipliers by time since accident

14.6.32 The multipliers are broadly similar for claimant exposure during the first ten years post-accident and claimant exposure more than ten years post-accident. The initial peak in mortality expected in the days and weeks following serious injury would not be expected to be present in the data, as those individuals who die very soon after injury would not ever enter the compensation scheme. The data does not provide any evidence of a trend for mortality rates to return towards standard rates over time. However, the data available is limited which constrains the reliance that can be placed on this finding. In addition, there is not much exposure at the older ages for claimants less than 10 years post-accident.

14.6.33 A useful extension to this analysis would be to assess the impact on mortality based on a number of different time periods since the accident to examine more fully whether there is any evidence of an impact of time since injury over. It would also be useful to compare the results of the full data set against only claimants with post 1999 accident dates as the exclusion of claimants who dies before 1999 from the analysis may distort these findings.

14.7   Comparison of UK and NZ results

Data

14.7.1   The following table provides a comparison of Road Traffic Accident (RTA) statistics between the UK and New Zealand:

	UK	NZ
Population (m)	63.7	4.4
Vehicles on road (m)	34.6	3.2
Annual deaths	1,754	284
Annual injuries	193,969	12,574
Deaths per 100,000 population	2.8	6.4
Injuries per 100,000 population	304.5	285.4
Deaths per 10,000 vehicles	0.5	0.9
Injuries per 10,000 vehicles	56.1	38.9

14.7.2   New Zealand can be seen to have 7% of the population of the UK, and 9% of the number of vehicles. The RTA mortality rate in New Zealand is much larger than in the UK – around 2.3 times higher, so whilst the population is just 7% that of the UK the proportion of RTA deaths is actually 16%. However, the RTA injury rate (measured as injuries per head of population) is slightly lower than that seen in the UK at around 0.9 times the level recorded in the UK, meaning that the number of RTA injuries incurred annually in New Zealand is just 6% of the number incurred annually in the UK.

14.7.3   Based on these figures, it could be expected that the number of RTA serious bodily injury claims under the ACC scheme would be around 15 times lower than that of the UK. However, when the number of Motor PPOs in the UK is compared against the number of New Zealand RTA bodily injuries under the ACC scheme in the graph below, it can be seen that the number of claims is fairly similar.
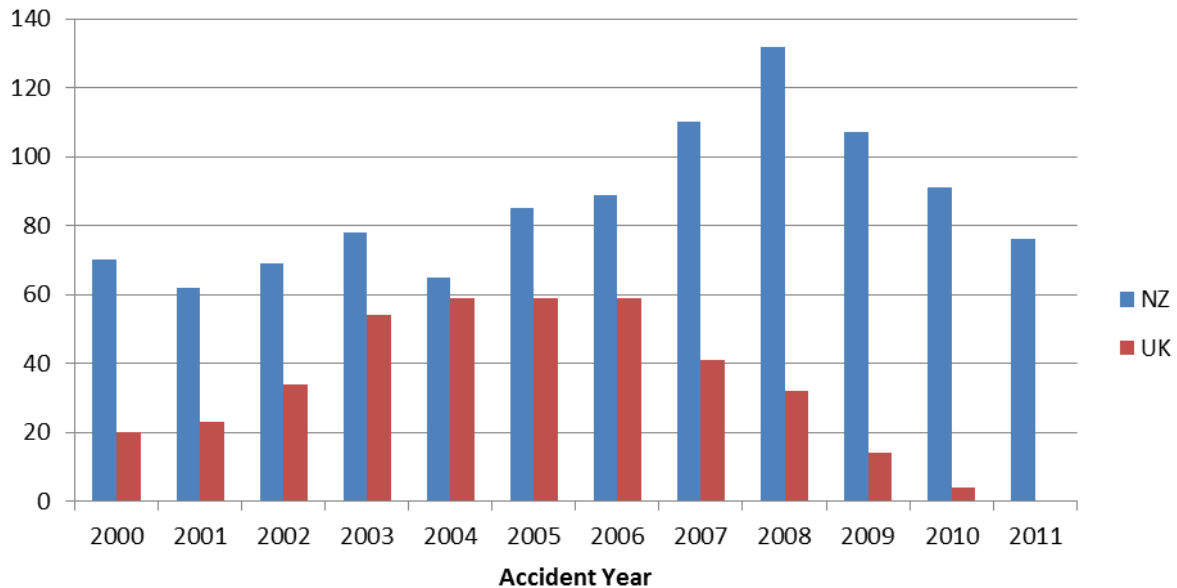
Figure 14.19: Number of claims split by accident year

14.7.4   There are two factors to take into account when looking at the above graph. Firstly, UK PPOs take on average six years to settle, whereas the New Zealand claims will settle and hence appear in the New Zealand scheme much earlier, although there will still be some delay which is characterised by the reducing number of claims by accident year from 2008 seen in the New Zealand data. Secondly, bodily injury claims only started being settled in the UK as PPOs in any number from 2008. As a result it is probably only reasonable to compare the UK and NZ numbers on the graph for the 2004 to 2006 years, and even then there may be a number of UK claims that occurred in that period that may still end up as PPOs.

14.7.5   There are a number of reasons why the UK PPO claim numbers would not be expected to be 15 times greater than the New Zealand claims. A significant factor is that only a third of bodily injury claims that are above £1 million settle as PPOs (and a much smaller proportion of claims under £1 million). In contrast, all bodily injury claims will fall under the New Zealand scheme, although as part of the New Zealand investigation only the most serious injuries were considered. In addition, the New Zealand scheme includes a wider net of claimants, for example at fault drivers.

14.7.6   Even allowing for these facts, the comparison of the number of claims in the New Zealand data to the number of claims in the UK data suggests that the number of New Zealand claims is higher than would be expected. This could suggest differences in injury severity between UK PPO claimants and New Zealand ACC claimants.

14.7.7   The definition of brain injury widened under the New Zealand scheme in 2007 which explains the upwards trend observed in the New Zealand data from 2006 onwards.

14.7.8   The UK figures shown above include MIB figures.

14.7.9   The above comparison suggests that the numbers of PPOs that can be collated in the UK over future decades is unlikely to be significantly greater than the New Zealand data available. Whilst it is certainly valuable to continue to gather information in the UK, as data volumes are limited it is also worthwhile considering other sources of data to analyse, such as the data available from the New Zealand compensation scheme. Lack of data availability is also another reason why insurers should record injury type comprehensively for all large injury claims, and not just those that settle as PPOs.

14.7.10 The proportion of brain and spinal injuries was observed to be remarkably similar for both sets of data:
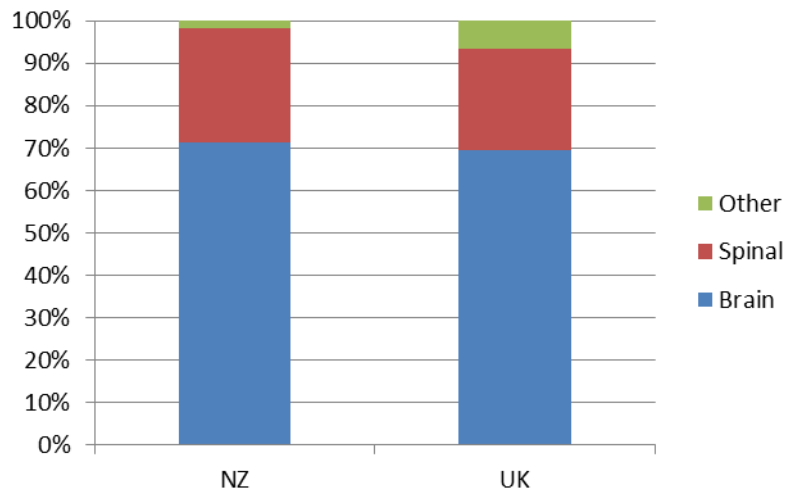
Figure 14.20: New Zealand and UK breakdown of injury type

14.7.11 The following graph shows the comparison between the base mortality rates for males in New Zealand and the UK. The accident hump can be seen to more significant in New Zealand than in the UK. This consistent with the differences in RTA death rates discussed earlier in this section, which were seen to be higher in New Zealand than in the UK.

Figure 14.21: Male standard mortality comparison

- New Zealand standard mortality curve based on population data for 2005 – 2007

- UK standard mortality curve based on Ogden 7 tables.

Results

14.7.12 As described fully in Section 9 even though there is currently very little data, the longevity apparent in the UK PPOs to date was analysed.

14.7.13 The following is a comparison of the amount of data available for the UK and New Zealand data and shows just how much less data is available in respect of the UK:

- UK: 835 person years (600 male, 235 female)

  – MIB data included to increase credibility

- NZ: 20,555 person years (15,042 male, 5,513 female)

- UK: 13 deaths (7 male, 6 female)

  NZ: 208 deaths (170 male, 38 female)

14.7.14 As described fully in Section 9, whilst analysis has been undertaken for the UK data, the data volume is very low and so the results have very little credibility. It is therefore not appropriate for reliance to be placed on these estimates and reference to other indicators and data sources should be made to support any assumptions made by (re)insurers to assess PPO claims. As discussed fully in the UK section of the Working Party paper, these results should be treated with caution owing, in particular, to:
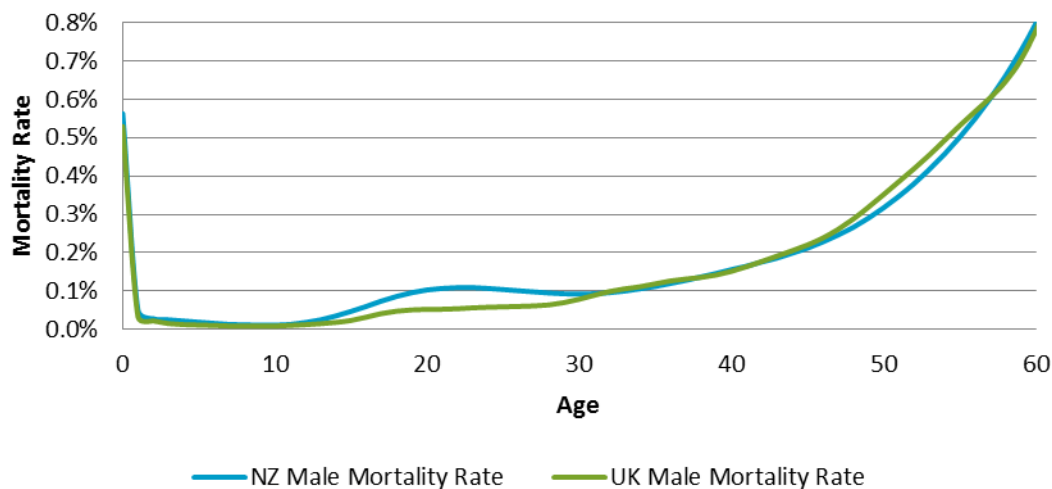
- The small sample size

- The simplifying assumptions which have been made in the model, such as homogeneity of underlying mortality in the cohort, the appropriateness of a single multiplier and the early stage of development of the data).

14.7.15 These points are explained in the longevity part of the UK section of the paper.

14.7.16 For both the UK and New Zealand data, analysis was carried out that involved calculating the adjustment to the standard unimpaired life mortality tables that would be required to produce the number of deaths observed over the period. The ratio of actual to expected deaths has been assumed to fit to a Poisson distribution, parameterised based on the actual exposed to risk and the mortality rates from the mortality tables, in order to estimate percentiles of multiplier adjustment. Using this method allowed confidence levels to be estimated around the median multiplier result.

14.7.17 The analysis to compare the UK and New Zealand mortality rates was carried out for the combined data brain and spinal injuries.

14.7.18 In comparing the UK and New Zealand results it can be seen that both suggest that the impaired mortality is around 3 to 4 times higher for those in the dataset than would be expected for those with unimpaired mortality in the general population.

14.7.19 The effect of the accident hump, which is more pronounced in New Zealand, would be to reduce the multipliers for young males relative to the multipliers in the UK analysis, as the base mortality is higher for New Zealand young males than for UK young males.

14.7.20 As described in detail in the longevity section of the UK part of the paper, despite estimating confidence intervals in the tables below, no reliance should be placed on them. The very small sample size and the simplifications used in the analysis are particularly important. It is also important to note that (re)insurers typically have only a small number of claimants on their book and, as such, the average claimant injury severity may differ from those of the UK and New Zealand investigations. The confidence intervals are intended only to highlight the uncertainty inherent in the multipliers that have been estimated from the available data.

New Zealand experience

Percentiles	Male	Female
5th	429%	515%
25th	398%	432%
50th	**378%**	**382%**
75th	359%	339%
90th	342%	303%
95th	333%	284%

Table 14.3: Confidence intervals for New Zealand mortality experience

UK experience

Percentiles	Male	Female
5th	550%	853%
25th	405%	574%
50th	**327%**	**436%**
75th	264%	331%
90th	218%	258%
95th	195%	223%

Table 14.4: Confidence intervals for UK mortality experience

14.8   Applications for reserving of PPO claims

14.8.1   Allowance for mortality rates amongst PPO claimants in the context of reserving varies fairly widely between UK insurers. At its most basic, an insurer may simply take the initial life expectancy provided by the medical expert, and deduct one year to obtain the future estimated life expectancy for each year of time since the PPO was settled. Whilst this approach may not cause too many problems over the first couple of years, if the insurer continues this approach, then this will cause significant problems with under-reserving as the time that a claimant survives increases. For a claimant who is given an initial life expectancy of 20 years, for example, in the event that he / she is still alive after 19 years (say), continuation of this approach would be equivalent to assuming that the claimant is definitely going to die over the next year. Unless the insurer has specific medical information to support this view, then this would be a very risky assumption to make.

14.8.2   An alternative and more appropriate method commonly used by insurers is to assume that the average life expectancy of a PPO claimant at the time of settlement is in line with the medical expert's opinion, but to make allowance for the possibility that the claimant lives for a shorter or longer time than expected. The insurer will usually adjust a standard mortality table using either a constant additive adjustment or a constant multiplicative adjustment, in order to obtain a life expectancy in line with the opinion of the medical expert. The liabilities in respect of the PPO claimant are then estimated as a probability-weighted average of all future possible cashflows, where the probability of payment at each age is equal to the

estimated probability that the PPO claimant survives to that age, based on the adjusted mortality table. An insurer may make allowance for any future inflationary increases to the regular PPO payments and may also discount each future payment to allow for returns earned on the investments backing the PPO liabilities.

14.8.3 The choice of whether to use an additive or multiplicative adjustment to mortality for PPOs does affect the liability estimate. If it is assumed that the real discount rate is 0%, then at the time of settlement there will be no difference in the estimated liabilities using either an additive or multiplicative adjustment. However, as time since settlement increases, a difference in the estimated liabilities will begin to emerge. As can be seen in the results of the New Zealand study, using a constant additive adjustment results in higher estimates of mortality at younger ages compared to using a constant multiplicative adjustment, and lower estimates of mortality at older ages. As time since injury increases, an additive adjustment will therefore predict lower average future mortality rates than a multiplicative adjustment. Estimated liabilities using an additive adjustment will therefore be greater than if a multiplicative adjustment is used.

14.8.4 Whilst the findings of the New Zealand study show only limited evidence of higher multipliers at younger ages, insurers using constant multiplicative adjustments to mortality (based on estimated life expectancy at time of settlement) should consider the potential impact there would be on reserving if it is actually the case that multipliers are higher at younger ages. In this case, calculation of a constant multiplier at the time of settlement of a PPO claim can then be thought of as taking an average of the higher multiplier at younger ages and the lower multiplier at older ages. If, after a number of years, the PPO claimant is still alive, then the average multiplier for the claimant's current age will no longer incorporate the multiplier appropriate for the first few years following the claim. In other words, the average multiplier appropriate to the claimant's age will now be lower. There is therefore a risk if a constant multiplier is used that, as time passes, future mortality rates for those claimants who survive are over-estimated, and therefore liabilities are under-estimated, although the extent to which this is the case may not be material. In a similar way, use of a constant additive adjustment could under-estimate mortality once claimants have survived for a few years, and hence over-estimate liabilities,

14.8.5 As previously discussed, possibly the most important consideration for a non-life insurer is the impact of having only a small number of PPO claimants in their book of business. Even if an insurer was to have sufficient data to come up with a reliable estimate of a PPO claimant's future life expectancy at each future age, the insurer is still exposed to significant uncertainty in actual experience owing to the low number of PPO claimants. If a claimant lives for much longer than expected, then a non-life insurer is much less likely than, for example, a pension scheme with a large number of members, to have another corresponding claimant on their book who lives for a much shorter time than expected. Clearly this works both ways and the non-life insurer could have much better experience than expected. However, this additional volatility is something a non-life insurer should be aware of, particularly when the payments due to a PPO claimant can be significant. This volatility in experience emphasises the importance of obtaining regular updates on the medical condition of each PPO claimant where this is possible.

14.8.6 A further consideration is the timescale over which any good and bad mortality experience emerges. If the long term mortality experience of a large pension scheme is broadly in line with expectations, then it would also be expected that the annual mortality experience might be fairly close to that expected. In the case of a group of PPO claimants, even if overall mortality experience is in line with expectations, there will be much more volatility in annual mortality experience as a result of the low number of claimants. As an example, suppose that an insurer has two similar PPO claimants in its book of business, with similar compensation payments and both with a life expectancy of 20 years. If one claimant lives for 10 years and the other for 30 years, then very approximately the experience could be considered to be in line with expectations. However, there is a large mismatch in the timing of the emergence of the good and bad experience, with the good experience emerging after 10 years but the bad experience emerging gradually over a 30 year period.

14.8.7 Insurers and reinsurers should consider carefully the extent that credit should be given for early good experience, either from a PPO claimant dying earlier than expected or from there being an absence of PPO claims in a particular reserving year or book of business. If an individual PPO claimant lives for longer than expected, then the eventual payments made to the claimant could be significantly more than the initial reserve attached to that PPO claim. Managing the release of reserves arising from good early PPO mortality experience is important to try to avoid the later emergence of poor mortality experience causing problems with under-reserving in the future.

14.9 References

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15. Appendix A – Members' Survey Questions

Q1: What area do you work in?

- Life
- Pensions
- General
- Investment
- Other

Q2: If General Insurance, do you work for a company writing UK motor and / or UK liability insurance?

- Yes: Insurance
- Yes: Reinsurance
- Yes: Both Insurance and Reinsurance
- No
- N/A

Q3: If General Insurance, what area do you principally work in?

- Pricing
- Reserving
- Capital Modelling
- Other Solvency II
- Risk
- Other
- Mixed
- General Management
- Other
- N/A

Q4: What kind of a company do you work in?

- Insurer
- Reinsurer
- Consultancy
- Other

Q5: Are you qualified?

- Yes
- No

Q6: How long have you been working in the actuarial profession?

- Less than 1 year
- 1 to 3 years

- 3 to 5 year
- 5 to 10 years
- 10 to 20 years
- 20 to 30 years
- More than 30 years

Q7: What best describes your position (rather than your profession)?

- New Graduate
- Assistant Analyst
- Analyst
- Trainee Actuary
- Actuary
- Manager
- Senior Manager
- Chief Actuary
- CRO
- Head of Product
- Head of Department
- Principal
- Partner
- Director
- Chief Executive
- Managing Director
- Not working

Q8: Have you heard of and are you aware of Periodical Payment Orders (PPOs)?

- Yes
- No -> **[If No, survey is finished]**

Q9: Do you generally think PPOs are good or bad thing for society?

- Good
- Bad
- Not sure

Q10: What do you think will be the impact of PPOs to your company in terms of viability, opportunity or profitability over the next 5 to 10 years?

- It will be a disaster
- It will have a significant negative impact
- It will have a minor negative impact
- It will be broadly neutral
- Not sure
- It will have a minor positive impact
- It will have a significant positive impact
- It's a fantastic opportunity for us

Q11: When do you first remember hearing about PPOs?

- 2011 - 2013
- 2008 - 2010
- Prior to 2008
- Absolutely no idea

Q12: How did you first hear about PPOs?

- Legislation changes
- Internally within your organisation
- Institute and Faculty of actuaries presentations / papers
- Other organisations presentations / papers
- Discussion with other actuary
- Newspaper / TV
- Other (please state)

Q13: Do you think PPOs will impact the price of your personal motor insurance?

- Yes a little: Why?
- Yes a lot: Why?
- No: Why?
- Not sure

Q14: Do you think PPOs should rank in the current top three concerns for the insurers writing UK motor and UK liability business?

- Yes
- No

Q15: Do you deal with PPOs in any way in your own role?

- Yes
- No

Q16: Do PPOs rank in your current top three concerns within your own role?

- Yes
- No

If Yes, why (please list as many reasons as you like)?

If No, what do you think are the three top concerns for UK motor and UK liability insurers?

If No, do you think they rank in the top 10 concerns?

- Yes
- No

Q17: Do you think PPOs will be a top 3 concern for insurers writing UK motor and UK liability business in the future (20 years' time)?

- Yes
- No

If Yes, why? (list as many reasons as you like)?

If no, do you think they will be a top 10 concern?

- Yes
- No

Q18: Given your knowledge of PPOs do you think they impact on any of the following areas (tick as many as you feel appropriate)

- Pricing
- Reserving
- Reinsurance
- Bad debt
- Asset management
- Solvency II
- Claims handling
- Systemic risk

Q19: If your day to day role involves PPOs, what do you think about the level of support and information provided to you in this area by the profession?

- I don't think there is any
- I don't think there is enough
- I don't really care either way
- It's about right
- It's pretty good
- There's too much information/discussion on this
- N/A

Q20: If your day to day role involves PPOs what resources would you like to see available to help you in your role?

Q21: What level of guidance do you think the GI Board should provide (please provide your view in each of the three main areas):

	Pricing	Reserving	Capital Modelling
Specific guidance in the form of a Practice Note	Y/N	Y/N	Y/N
Guidance only	Y/N	Y/N	Y/N
Training materials	Y/N	Y/N	Y/N
Nothing	Y/N	Y/N	Y/N
No view	Y/N	Y/N	Y/N

Q22: How aware is the senior management in your company of the impact of the Solvency II Long Term Guarantee Package? Rank from 1 to 5 with 1 being not at all aware and 5 being very aware.

1   2   3   4   5

Q23: How concerned is your company about the impact of the Solvency II Long Term Guarantee Package? Rank from 1 to 5 with 1 being not at all concerned and 5 being very concerned.

1   2   3   4   5

Q24: In relation to Solvency II, is your company intending to lobby for a relaxation of the rules on cashflow matching and/or ensuring that there are transitional measures applicable to general insurance companies?

Y/N

Q25: Do you think your company:

Prices for PPOs - conservatively/aggressively/sufficiently/does not consider PPOs/not sure/prefer not to answer?

Reserves for PPOs - conservatively/aggressively/sufficiently/does not consider PPOs/not sure/prefer not to answer?

Holds capital for PPOs - conservatively/aggressively/sufficiently/does not consider PPOs/not sure/prefer not to answer?

Q26: Do you think your company compared to the industry:

Prices for PPOs - more expensively/about the same/at a weaker level/not sure/prefer not to answer?

Reserves for PPOs - more strongly/about the same/more weakly/not sure/prefer not to answer?

Holds capital for PPOs- at higher levels/about the same/at a weaker levels/not sure/prefer not to answer?

Q27: What do you consider to be the level of management awareness of PPOs?:

very aware/ sufficiently aware/ slightly aware/ insufficiently aware/not sure

Q28: What is your name (Optional)?

Q29: Are you happy to be contacted by a member of the PPO Working Party to discuss your responses?

16. Appendix B – Detailed Results of Impaired Life Investigations

Results – Brain injury
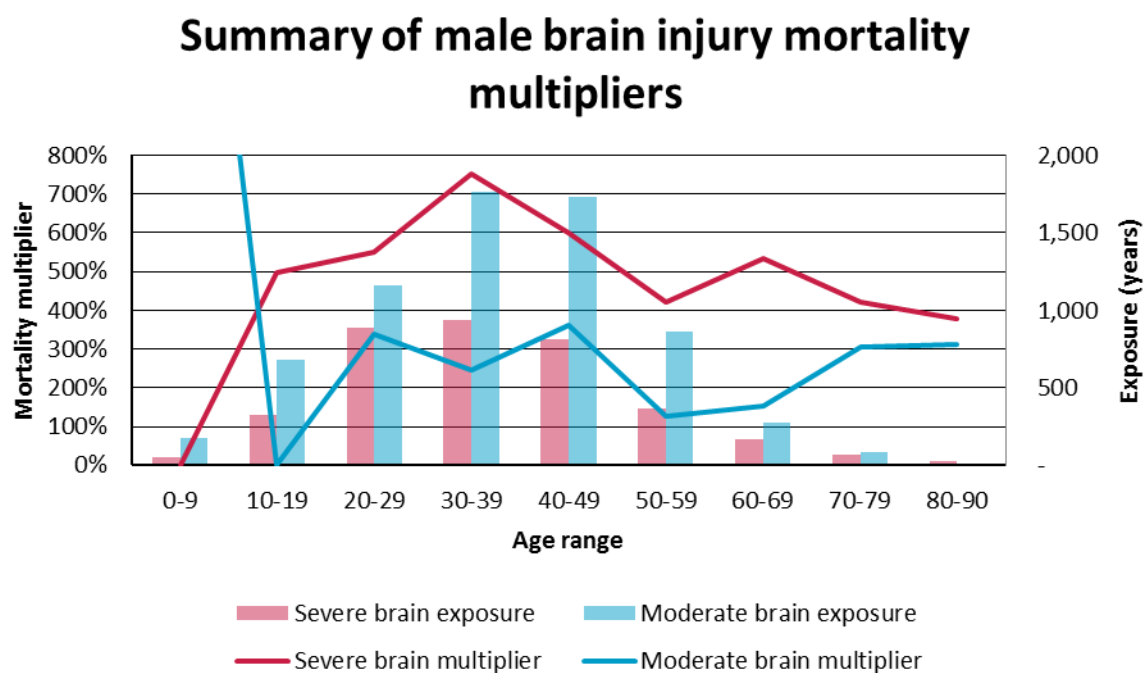
Summary of male brain injury mortality multipliers

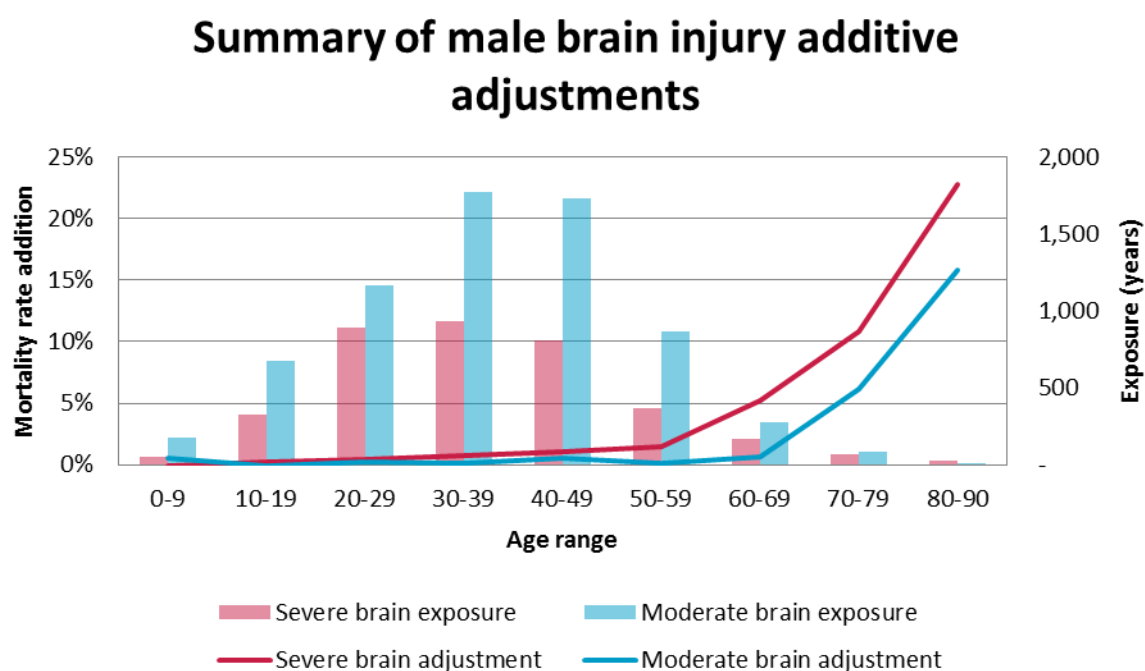*Figure 16.1: Summary of male brain injury mortality multipliers*

Summary of male brain injury additive adjustments

Figure 16.2: Summary of male brain injury additive adjustments
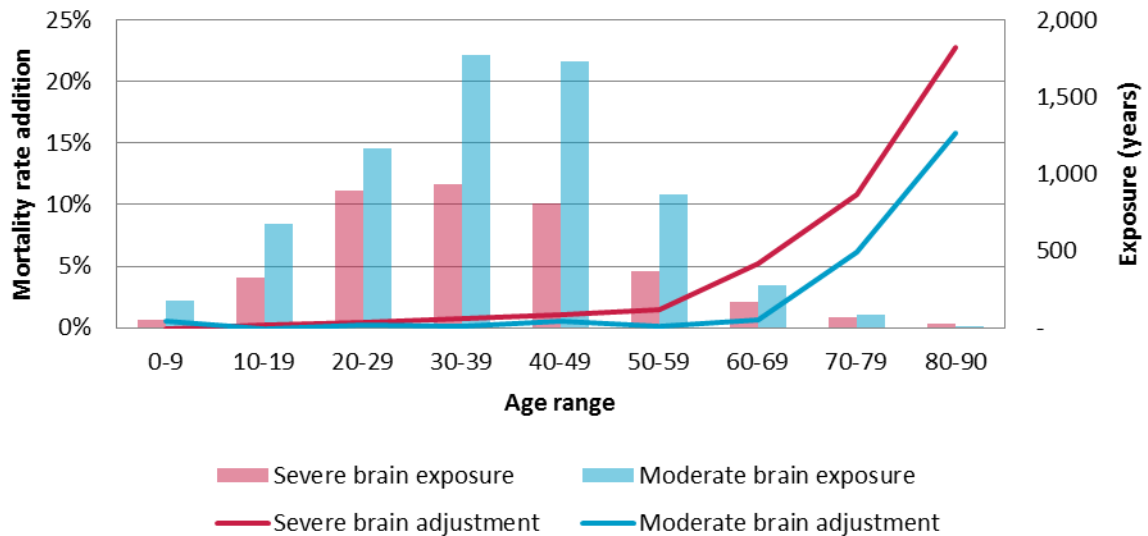
Figure 16.3: Severe brain injury mortality rate

Figure 16.4: Moderate brain injury mortality rate

Results – Spinal injury
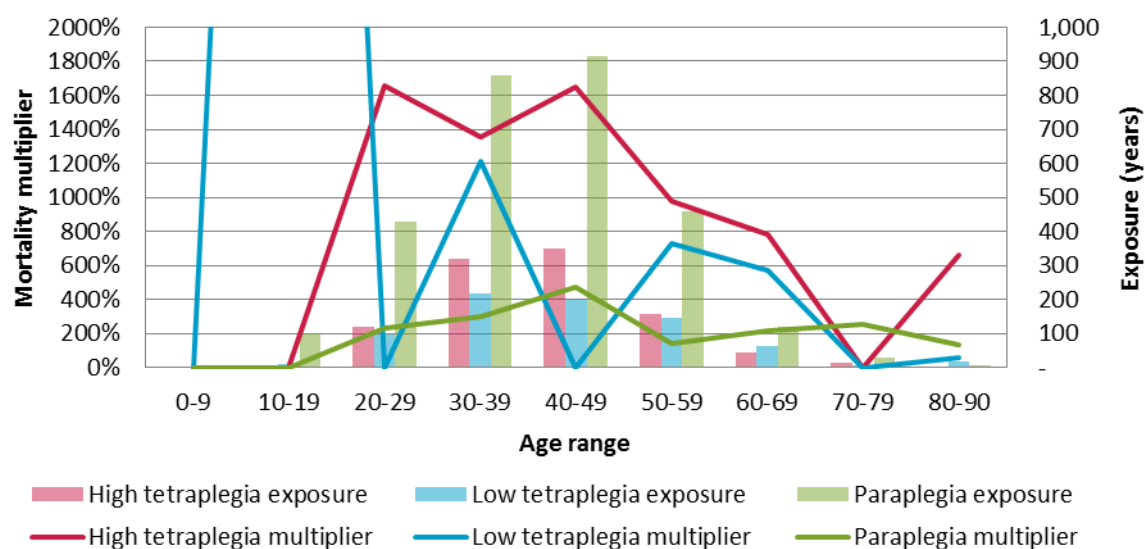
Figure 16.5: Summary of male spinal injury mortality multipliers

Figure 16.6: Summary of male spinal injury additive adjustments
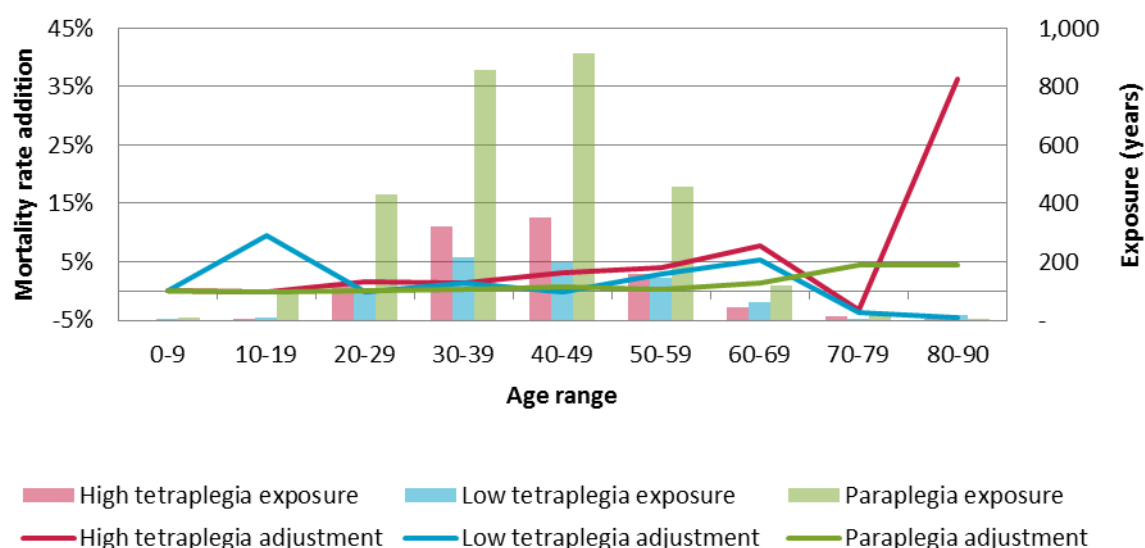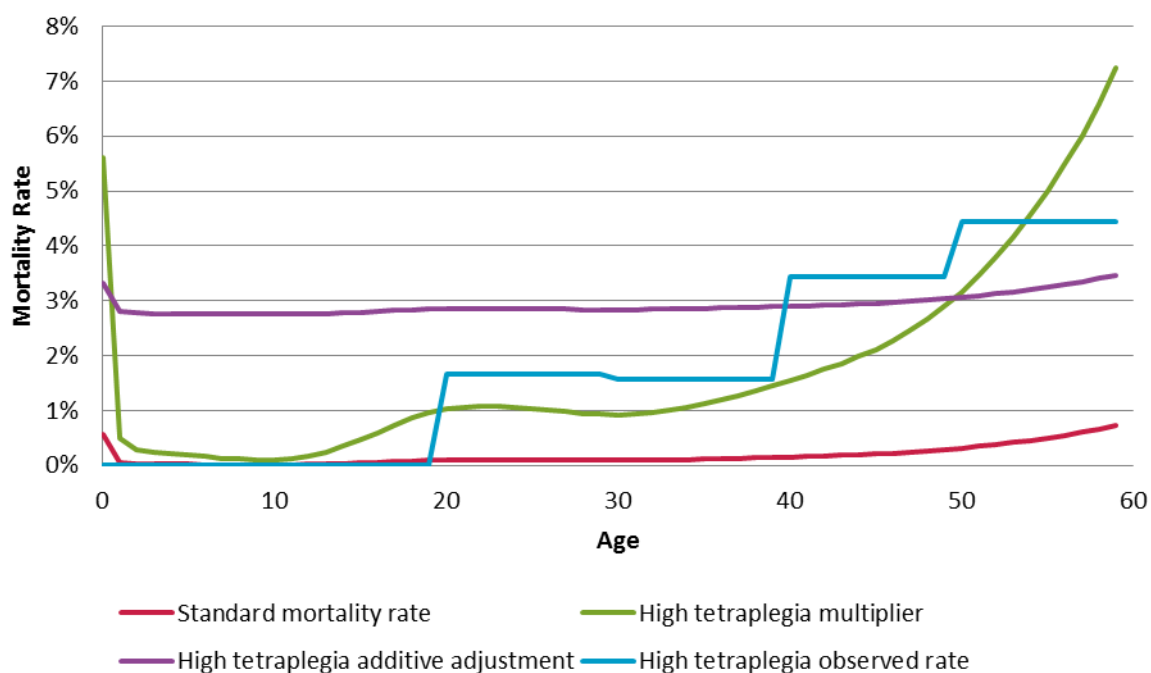
High tetraplegia injury mortality rate

Figure 16.7: High tetraplegia injury mortality rate

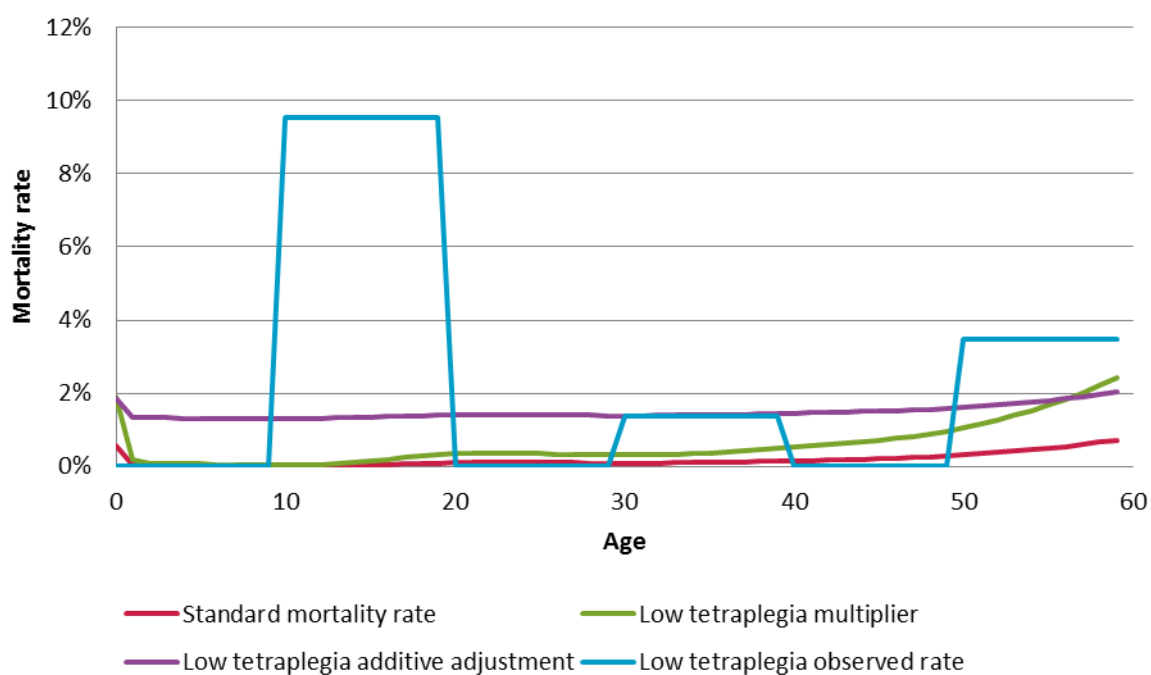# Low tetraplegia injury mortality rate

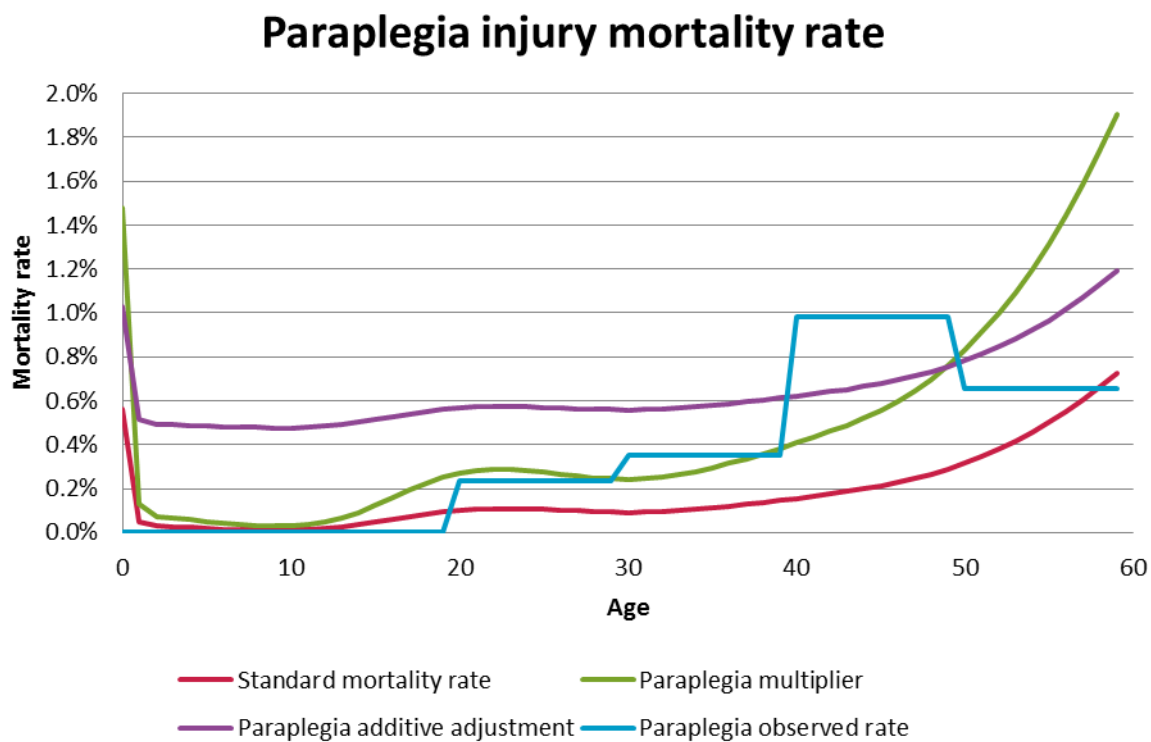*Figure 16.8: Low tetraplegia injury mortality rate*

Figure 16.9: Paraplegia injury mortality rate

17. Appendix C – Injury Definitions

The definition of an SI claim is currently:

Profile	Clinical Description
01 – High Level Tetraplegia	Lesion at C5 and above (includes injury at C5/6 level) and ASIA scale A, B or C
02 – Low Level Tetraplegia	Lesion at C6 to T1 and ASIA scale A, B or C
03 – Paraplegia	Lesion at T2 and below and ASIA scale A, B or C
05 – Severe Brain Injury	• Glasgow coma scale (GCS) 8 and under, assessed post resuscitation or on admission to an Accident and Emergency Department. and • A recorded Post-traumatic amnesia (PTA) of 8 days or more.
06 – Moderate Brain Injury	• GCS 8 and under, assessed post resuscitation or on admission to an Accident and Emergency Department, and • A recorded PTA up to and including 7 days. **OR** • GCS 9 and higher, assessed post resuscitation or on admission to an Accident and Emergency Department. and • A recorded PTA of 8 days or more. **Note:** Some flexibility is required when considering children, especially those aged three and younger. This is because it can be difficult to determine GCS and PTA accurately at these ages. Further consideration should be based on evidence for long term support needs, especially around attendant care.
08 – Comparable Diagnosis	Conditions with comparable severity to other profiles. Examples of injury types that could be considered are: • Multiple limb amputations. • Burns to at least 50% of the body (or less depending on the areas of the body affected). • Complete bi-lateral blindness. • Bi-lateral brachial plexus avulsion or rupture. • Neurotoxicity. • Non-traumatic brain injury (e.g. a result of oxygen deprivation). **Note:** Clients with cerebral palsy as a result of brain damage or anoxia at birth or in childhood are an exception, and should be profiled **[05] – Severe brain injury** or **[06] – Moderate brain injury** based on the comparative severity of the injury.
10 – Incomplete Spinal Cord Injury	Lesion at any level and ASIA D (including clinical syndromes e.g. cauda equina.)

Notes about serious injury profiles

Profile number	Selection guidelines
1 to 3, 10	The claimant with a diagnosis of back injury with no neurological damage to their spinal cord will **not** be admitted into the serious injury portfolio. Check that the damage is to the spinal cord itself and not to other structures of the spine and back eg, nerve roots, vertebrae, muscles, ligaments, discs.
5 and 6	Because of the unpredictable nature of recovery from brain injury, a claimant may fit the clinical description in one profile but fit the support description of another profile. In this case, the claimant will be allocated the profile that best describes their support needs. Claimants can be moved from one profile to another (usually 5 to 6) if support needs decrease over time. A claimant should be moved out of Profile 6 and out of SI when there are no assessed care needs or the needs will not last for the life of the claimant. Note: The claimant may have assessed needs for care or supervision but not have any care or supervision entitlements paid by ACC. This may be because the claimant's family chooses to not be paid for this work, or the claimant chooses to not have a carer at this time. If the claimant's family choose to not be paid for care provided, the case manager must ask the family to sign a family waiver form ACC077.
6	The claimant is likely to require lifelong access to support. They will be assessed as needing personal support or supervision, including (either singly or in combination): - Attendant Care - Supported employment (previously known as sheltered workshops) - Long term structured day programmes
8	Entry to profile 8 is based on support descriptions fitting the other SI profiles. Claimants with cerebral palsy as a result of brain damage or anoxia at birth, or in childhood, should be in profile 5 or 6.
13	Claimants who have a clinically severe or moderate traumatic brain injury, but for whom the long term care needs are not yet known, will be allocated to Profile 13 until they have recovered sufficiently to allow an assessment of their long term needs. Scheme Improvement Rehabilitation will monitor all claims in profile 13 on a monthly basis, and when long term needs are known, move the claim into either profile 5 or 6, or out of the serious injury.

Profiling claimants with more than one serious injury:

Where a claimant has two or more serious injuries, eg spinal injury and brain injury, the claimant's serious injury profile will be that of the injury that is the **main** driver of the clinical and support needs.

18. Appendix D – New Zealand Mortality Tables

Age	Male Mortality Rate	Female Mortality Rate
0	0.00563	0.00448
1	0.00050	0.00049
2	0.00028	0.00025
3	0.00025	0.00022
4	0.00022	0.00019
5	0.00019	0.00016
6	0.00016	0.00013
7	0.00013	0.00011
8	0.00012	0.00009
9	0.00011	0.00008
10	0.00011	0.00009
11	0.00013	0.00010
12	0.00018	0.00013
13	0.00025	0.00017
14	0.00035	0.00022
15	0.00047	0.00028
16	0.00060	0.00035
17	0.00074	0.00040
18	0.00086	0.00043
19	0.00096	0.00044
20	0.00103	0.00043
21	0.00107	0.00041
22	0.00109	0.00038
23	0.00109	0.00035
24	0.00107	0.00033
25	0.00104	0.00030
26	0.00101	0.00029
27	0.00098	0.00030
28	0.00095	0.00033
29	0.00093	0.00037
30	0.00092	0.00042
31	0.00093	0.00048
32	0.00096	0.00054
33	0.00100	0.00059
34	0.00106	0.00063
35	0.00112	0.00067
36	0.00120	0.00071
37	0.00128	0.00075
38	0.00137	0.00081
39	0.00146	0.00088
40	0.00156	0.00097
41	0.00165	0.00107
42	0.00176	0.00117
43	0.00186	0.00128
44	0.00199	0.00139
45	0.00212	0.00150
46	0.00228	0.00161
47	0.00246	0.00174
48	0.00266	0.00188
49	0.00290	0.00204
50	0.00317	0.00221
51	0.00347	0.00241
52	0.00380	0.00262
53	0.00417	0.00287

Age	Male Mortality Rate	Female Mortality Rate
54	0.00457	0.00313
55	0.00501	0.00342
56	0.00549	0.00375
57	0.00602	0.00410
58	0.00660	0.00449
59	0.00725	0.00492
60	0.00797	0.00539
61	0.00877	0.00590
62	0.00965	0.00647
63	0.01063	0.00708
64	0.01172	0.00776
65	0.01291	0.00851
66	0.01424	0.00935
67	0.01569	0.01031
68	0.01732	0.01138
69	0.01914	0.01260
70	0.02119	0.01396
71	0.02351	0.01547
72	0.02612	0.01713
73	0.02905	0.01895
74	0.03232	0.02094
75	0.03593	0.02317
76	0.03990	0.02571
77	0.04423	0.02865
78	0.04893	0.03206
79	0.05404	0.03602
80	0.05977	0.04062
81	0.06634	0.04594
82	0.07399	0.05208
83	0.08292	0.05911
84	0.09334	0.06712
85	0.10533	0.07625
86	0.11863	0.08663
87	0.13286	0.09839
88	0.14769	0.11163
89	0.16280	0.12642
90	0.17787	0.14260
91	0.19267	0.15999
92	0.20946	0.17841
93	0.22710	0.19767
94	0.24541	0.21762
95	0.26483	0.23866
96	0.28527	0.26074
97	0.30667	0.28376
98	0.32890	0.30762
99	0.35185	0.33220
100	0.37537	0.35735
101	0.41065	0.39130
102	0.44926	0.42847
103	0.49148	0.46918
104	0.53768	0.51376
105	0.58822	0.56256
106	0.64351	0.61600
107	1.00000	0.67452

Age	Male Mortality Rate	Female Mortality Rate
108	1.00000	0.73860

19.   Glossary

19.1   The table below provides definitions of terms used in this document. Please note that these are not necessarily universally held terms, but are just intended to relate to this specific document.

Term	Definition
Annual amount	The regular payment associated with the PPO as defined at time of settlement
ASHE	Annual Survey of Hours and Earnings
Large claim	£1 million in 2011 values, indexed at 7% per settlement year
Life expectancy	Future life expectancy at the time of settlement
Lump sum	Lump sum element of the PPO, over and above the regular PPO payment
MIB	Motor Insurers' Bureau
PPO	Periodical Payment Order
PPO amount	See definition of 'Annual amount' above
PPO reserve	The from-ground-up PPO cost minus the payments that have been paid to date.
Percentage reduction in life expectancy	Reduction in life expectancy as at the time of settlement as a proportion of unimpaired life expectancy as at the time of settlement
Unimpaired life expectancy	Life expectancy based on Ogden 7 tables

20. References

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