

**Report of the Working Party on  
Pensioner Mortality Experience under  
Self-Administered Pension Schemes**

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## 1. Introduction

This report sets out the results of an investigation commissioned by the Society of Actuaries in Ireland into the pensioner mortality experience of self administered pension schemes (SAPS) covering the period 2003 to 2006<sup>1</sup>.

The purpose of the review was to examine and update the pensioner mortality experience analysis of Irish self-administered schemes relative to tables based on standard UK tables. The primary aim was to provide a reference point for pension scheme actuaries in setting mortality assumptions and to examine the mortality experience relative to the previous investigation carried out in 2005.

The Continuous Mortality Investigation Bureau (CMI) have recently published a number of working papers analysing the experience of UK self administered pension schemes. The CMI Working Papers 31 & 32, published in January 2008, contain an analysis and proposed graduation of the CMI SAPS 2000-2006 mortality experience. A preliminary response to the draft graduations was published in March 2008 which highlighted a discrepancy in the proposed graduation.

It is recommended that further reviews of Irish SAPS experience be carried out every 3 years. It is important that scheme actuaries have results available to them based on Irish experience. With this in mind we would encourage scheme actuaries to assist in the preparation of these investigations through the collation and provision of data. The ongoing build up of data and results in this area will also assist in the formulation of views regarding mortality improvements in this sector. Over time it might also be possible to analyse mortality experience in greater detail using factors such as location and occupation.

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<sup>1</sup> Data relating to approximately 15% of lives ranged outside these years.

## 2. Data

The main pension consultancies and the Department of Finance were asked to contribute data to the investigation. The requirement was to provide data in respect of annuitants over a three year period; typically from the most recent inter-valuation period.

The criterion set out was for census data to be provided split by sex and type of pensioner. Information was requested in respect of both lives and amounts.

### Data provided

Data was provided by five pension consultancies and the Department of Finance. In total, data in respect of 49 schemes and approximately 93,000 lives were submitted.

98% of the data submitted covered the period 2002 to 2006 but there was also a small amount of experience from 2001 and 2007 included. There was no overlap of experience with the previous investigation. In approximately 90% of the submissions the data covered a three year period, i.e. between triennial valuations. Data for the remaining schemes were primarily split between four year and two year periods.

A significant amount of data was provided in respect of the public servants' pension schemes and the table below outlines the split of data between data provided by the pensions' consultancies and the public servants' schemes.

	<b>Number of Schemes</b>	<b>Number of lives at end of investigation</b>
Consultancies	45	55,400
Public Servants	4	38,000
<b>Total</b>	<b>49</b>	<b>93,400</b>

### Actual Exposures

The following table outlines the total exposures and actual deaths by amounts/lives and by sex:

	Male	Female	Total
<b>Lives Exposure</b>	160,723	91,355	252,078
<b>Number Deaths</b>	5,061	2,892	7,953
<b>Amounts Exposure €millions</b>	2,904	1,570	4,474
<b>Amount Deaths €millions</b>	80.5	38.6	119.1

Appendix A gives a breakdown of the exposures and deaths by age bands. There was limited data above age 90.

### Data constraints

The depth of analysis was constrained by the quality of data provided. For the majority of schemes the data was not subdivided by the type of pensioner. In particular, ill-health retirements were only identified for less than a quarter of the schemes submitted. Dependant's pensions were also not identified for the majority of schemes. Females represented 92% of dependants where dependant's pensions were identified.

The date of death was not recorded in most cases and in these instances death mid way through the inter-valuation period was assumed. Where date of entry was not recorded a similar assumption was made for consistency.

### 3. Methodology

#### Exposure and deaths

In calculating the exposed to risk, the census method was applied to the data using the calendar year rate interval.

#### Crude Mortality rates

A straightforward methodology was applied given the data issues. From the data analysed, initial exposed to risk figures were calculated for males and females. Crude mortality rates ( $q_x$ ) were then calculated at each age.

For ages below 60 the crude rates are very high relative to the table and quite volatile. This is due to a combination of ill-health early retirements before age 60 and a scarcity of data. Results at older ages are also quite volatile, largely due to the scarcity of data.

## 4. Analysis

The level of analysis was somewhat constrained given the limited nature of the data provided.

### Comparison with standard tables

The number of actual deaths in each analysis was compared against the expected deaths from the population based on a number of standard tables. Comparisons were made with:

1. The relevant '92' series tables projected to 2001 for both lives and amounts, in order to allow comparison with the previous investigation.
2. The base 2000 series Normal Retirement tables with no improvements.

The following table outlines the results by sex and age-band as a percentage of PMF92C2001. It is notable that experience in the later age bands lags behind that in the earlier bands.<sup>2</sup>

Age Band	Male Amounts PMA92C2001	Female Amounts PFA92C2001	Male Lives PML92C2001	Female Lives PFL92C2001
<b>60-69</b>	103%	96%	89%	106%
<b>70-79</b>	87%	76%	87%	88%
<b>80-89</b>	97%	105%	103%	101%
<b>90+</b>	113%	121%	117%	106%
<b>Age 60+</b>	<b>96%</b>	<b>98%</b>	<b>95%</b>	<b>99%</b>

<sup>2</sup> These figures are slightly different to those presented in December 2007 due to the clean up of some data issues

The following table outlines the results by sex and age-band as a percentage of the PMF2000 tables. Actual experience for Irish pension schemes over the later period 2003 to 2006 appears to be relatively close to this table on average.

Age Band	Male Amounts PNMA00	Female Amounts PNFA00	Male Lives PNML00	Female Lives PNFL00
<b>60-69</b>	98%	106%	101%	121%
<b>70-79</b>	98%	83%	99%	97%
<b>80-89</b>	102%	102%	110%	102%
<b>90+</b>	113%	100%	121%	96%
<b>Age 60+</b>	<b>101%</b>	<b>97%</b>	<b>105%</b>	<b>101%</b>

One significant feature of the investigation was the difference in experience between the public servants' data and the scheme data provided by the pension consultancies. The following table outlines the results of the investigation excluding any public servants' experience.

Age Band	Male Amounts PNMA00	Female Amounts PNFA00	Male Lives PNML00	Female Lives PNFL00
<b>Age 60+</b>	<b>105%</b>	<b>118%</b>	<b>108%</b>	<b>115%</b>

There is a particularly significant impact upon the female experience. It appears that this is a result of the fact that the female experience in the public servants schemes contains a much greater proportion of primary lives compared to the other pension schemes where the majority of female experience relates to dependents.



## Comparison with UK study

The CMI have published the results of a similar study into SAPS experience in the UK in Working Paper 31, which was published in January 2008. This Working Paper analyses the results of an investigation over the period 2000 to 2006. However, the data mostly relates to the period between 2001 and 2004. This is an important difference from our investigation which contains more recent data and is centred on 2005.

A comparison of the results of the two investigations is contained in the following table with the results expressed as a percentage of the 2000 series tables:

	<b>Male Amounts</b>	<b>Female Amounts</b>	<b>Male Lives</b>	<b>Female Lives</b>
<b>Irish investigation including public servants</b>	101%	97%	105%	101%
<b>Irish investigation excluding public servants</b>	105%	118%	108%	115%
<b>Working Paper 31</b>	110%	109%	113%	110%

There are a number of differences between the two investigations which prevent us from reading too much into relatively small differences in experience.

Firstly, the investigations cover different time periods with the Irish investigation centred on 2005 whereas the UK experience is centred on 2002/2003. The public servants mortality experience has a significant impact upon the Irish results, whereas this is not a feature of the UK experience. Finally, the UK figures quoted are aggregate figures combining normal health, ill health and dependent data. Our data did not allow us to separately identify experience by type of pensioner and therefore there could also be differences in the relative proportions of the various categories.

### Comparison with previous Irish investigation

The following table outlines the results of the previous Irish investigation which was carried out in 2005 using data from 1998 to 2003. The results are expressed as a percentage of PMA92C2001.

Age Band	Previous investigation	Current investigation
<b>60-69</b>	121%	103%
<b>70-79</b>	111%	87%
<b>80-89</b>	127%	97%
<b>90+</b>	120%	113%
<b>Overall</b>	<b>120%</b>	<b>96%</b>

Looking at these results it is apparent that experience has improved in every age band but perhaps slightly less in the oldest band. These results suggest improvements of close to 5% per annum although it is difficult to be exact given the wide spread of years covered in both investigations.

There has also been a significant change in the mix of the schemes covered by the two investigations with public servants' experience much more heavily represented in this investigation. In the previous investigation they represented less than 20% of the data, whereas they represent over 40% of the current investigation. This has also contributed to the improvement in experience since the previous investigation. If this effect were controlled for, then the improvements would represent approximately 4% per annum.

This level of improvement is consistent with the level of improvements experienced in the general population. The demographic sub-committee of the Society of Actuaries in Ireland presented a paper in June 2007 examining general population mortality and this paper highlighted the following rates of improvement:

<b>Period</b>	<b>Females</b>	<b>Males</b>
<b>1982/84 – 1985/87</b>	0.9%	0.2%
<b>1985/87 – 1988/90</b>	1.9%	2.5%
<b>1988-90 – 1991/93</b>	1.7%	1.5%
<b>1991/93 – 1994/96</b>	1.0%	1.1%
<b>1994-96 – 1997/99</b>	1.2%	1.6%
<b>1997-99 – 2000/02</b>	3.0%	3.6%
<b>2000/02 – 2003/05</b>	3.4%	4.4%

The increase in improvements over the last decade is noticeable and it appears that similar improvements have also been experienced in the SAPS experience. These levels of improvements have significant implications for actuaries when projecting mortality improvements.

## Results by pension band

The CMI's Working Paper 31 breaks out the results of their investigation into a number of pension bands and shows a clear pattern of mortality reducing with pension amount. WP31 breaks these results down by age and shows that the effect is more pronounced at younger ages and diminishes significantly at older ages.

We did not have sufficient data to analyse the results to the same level of detail but we did split the overall results into a number of bands in order to investigate if the same effect was observed in our data.

The following table shows the results of our investigation broken down by pension band and expressed as a percentage of the 2000 series:

<b>Pension Band</b>	<b>Males Actual / Expected PNMA00</b>	<b>Females Actual / Expected PNFA00</b>	<b>Proportion of lives</b>
<b>€5,000 or less</b>	143%	146%	27%
<b>€5,000 to €10,000</b>	135%	103%	15%
<b>€10,000 to €30,000</b>	126%	117%	34%
<b>€30,000 or above</b>	91%	83%	24%
<b>Overall</b>	<b>104%</b>	<b>101%</b>	

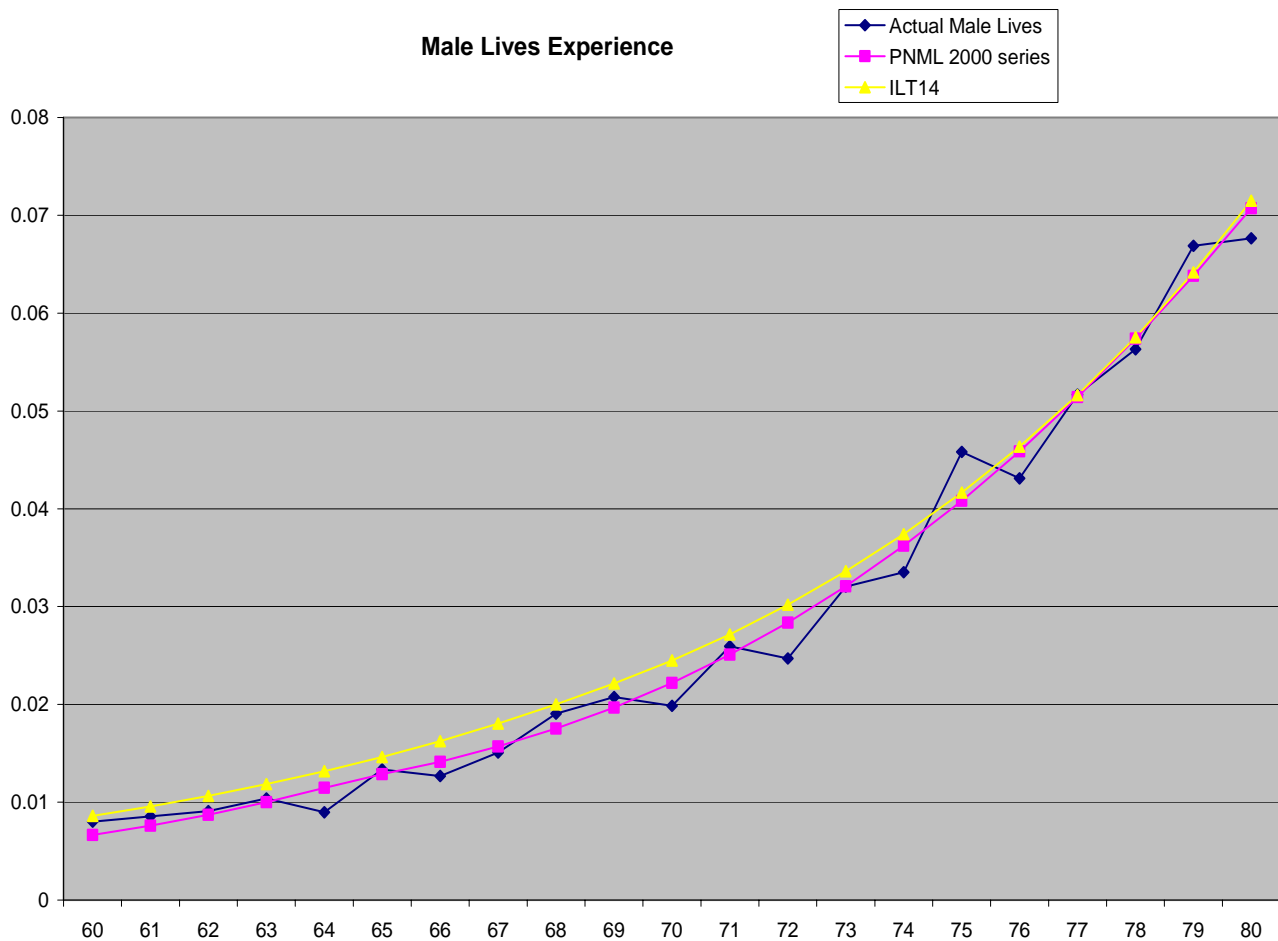
It can be seen that the final band has a very significant impact upon the experience of the investigation and there is considerable exposure in this band. The public servants included in this study are not integrated with the state pension, whereas most of the individual pension schemes are integrated. This leads to a significant difference in average pension between the two groups. Similar mortality patterns were observed in the data when we excluded the public servants.

The amounts exposures are given in the next table (figures in €millions):

<b>Pension Band</b>	<b>Male Exposure</b>	<b>Female Exposure</b>	<b>Total</b>
<b>€5,000 or less</b>	110	44	154
<b>€5,000 to €10,000</b>	144	116	260
<b>€10,000 to €30,000</b>	858	630	1,488
<b>€30,000 or above</b>	1,793	780	2,573
<b>Total</b>	<b>2,904</b>	<b>1,570</b>	<b>4,474</b>

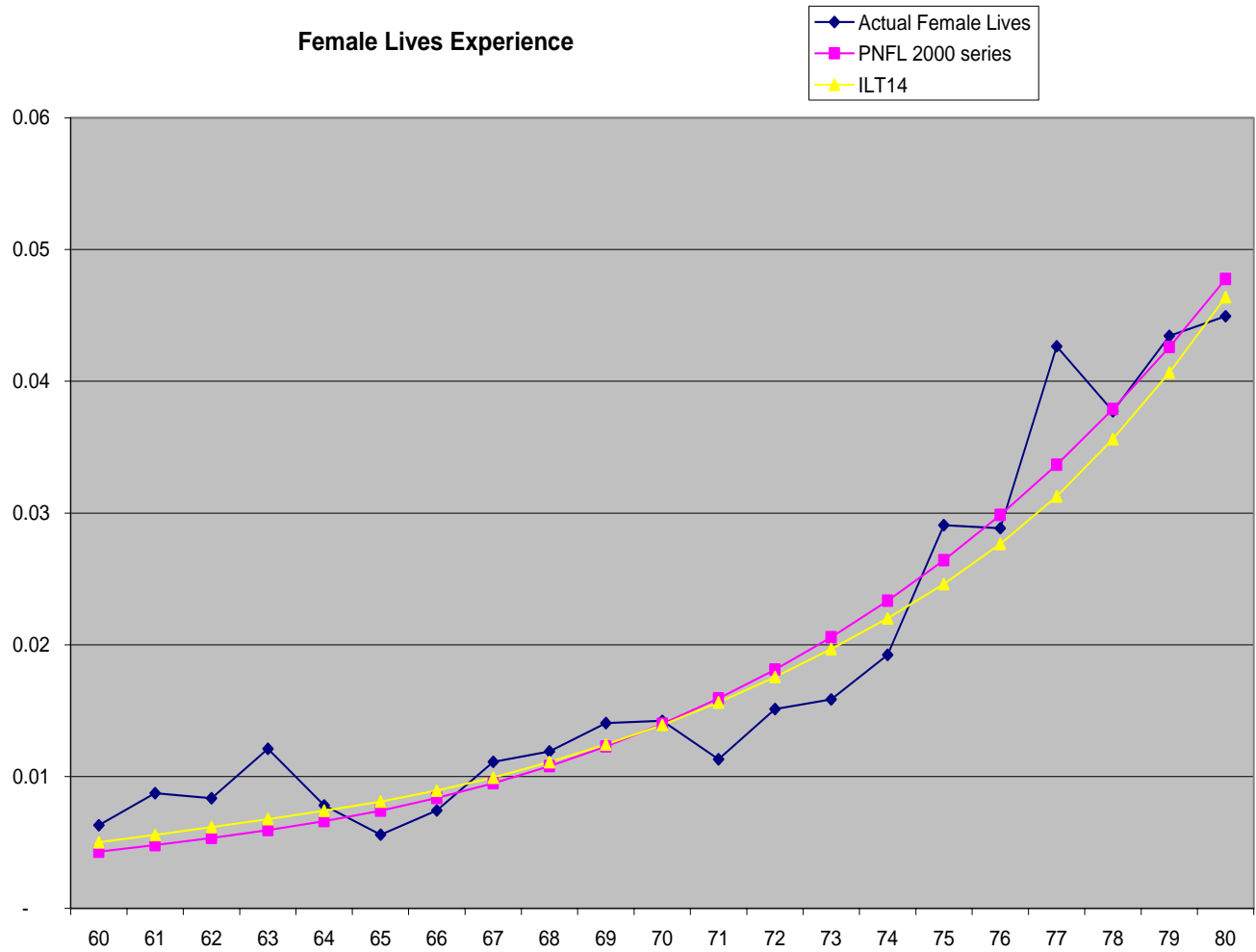
## 5. Mortality Shape

We wanted to examine the shape of the mortality emerging from the investigation and compare it to both the UK 2000 series tables and to Irish population mortality tables to examine which would represent a more appropriate base table. The following graphs display the crude mortality rates between ages 60 and 80 for males and females. We compare these rates to the PNL00 tables, which are based upon the experience of normal retirement UK life office pensioners between 1999 and 2002 and also to 80% of the ILT14 tables, which are based upon Irish general population mortality between 2001 and 2003. The following is the graph of the male comparison:



We can see that the PNML 2000 series looks like a reasonable fit, while the ILT tables are a good fit at the older ages but less so at younger ages.

The following is the graph of the female comparison:



The actual experience is much more volatile on the female lives.

A similar analysis based on ages 60 to 90 is contained in Appendix B. It appears that a percentage of the Irish population tables produces a better fit at the older ages but our data is relatively sparse after age 80.

## 6. Conclusions

This report updates the investigation into the experience of self administered pension schemes in Ireland. The results show significant improvements in mortality from the previous investigation but a change in the mix of schemes included has also influenced the results. The mortality experienced over the period of investigation is relatively close to the UK 2000 pensioner normal retirement tables and these tables are a reasonable fit to the data.

We know that population mortality is improving at 3 to 5% per annum and it would appear that pensioner mortality experience is improving at a broadly similar level. The Society will need to consider the results of this investigation when reviewing actuarial guidance relating to mortality improvements.

The results of our analysis also show that persons with higher pensions tend to experience significantly lighter mortality than others. The Working Papers published by the CMI over the last year also provide significant evidence of this relationship, which may be caused by lifestyle factors made affordable by higher incomes (e.g. more spending on health and nutrition) and by lower prevalence of smoking among higher-income groups.

We recommend that the Society carry out a similar study in 2010 based on data from 2007 to 2009 in order to allow further investigation of actual mortality improvements. It will be necessary to begin planning for the study and agreeing the collection of data well in advance of this date.

## Appendix A

The following tables outline the actual exposure and actual deaths by age-band and sex and by lives and amounts. The small amount of exposure after age 90 can be seen from the lives exposure.

### Actual Lives Exposure by age-band

<b>Age-band</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
59 and under	28,699	16,606	45,305
60 to 69	65,277	28,833	94,110
70 to 79	48,583	27,645	76,228
80 to 89	16,546	14,905	31,451
90 and over	1,618	3,366	4,984
<b>Total</b>	<b>160,723</b>	<b>91,355</b>	<b>252,078</b>

### Actual Amounts Exposure by age-band €million

<b>Age-band</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
59 and under	420	279	699
60 to 69	1,242	570	1,812
70 to 79	875	455	1,330
80 to 89	328	217	545
90 and over	39	49	88
<b>Total</b>	<b>2,904</b>	<b>1,570</b>	<b>4,474</b>



**Actual Number of Deaths by age-band**

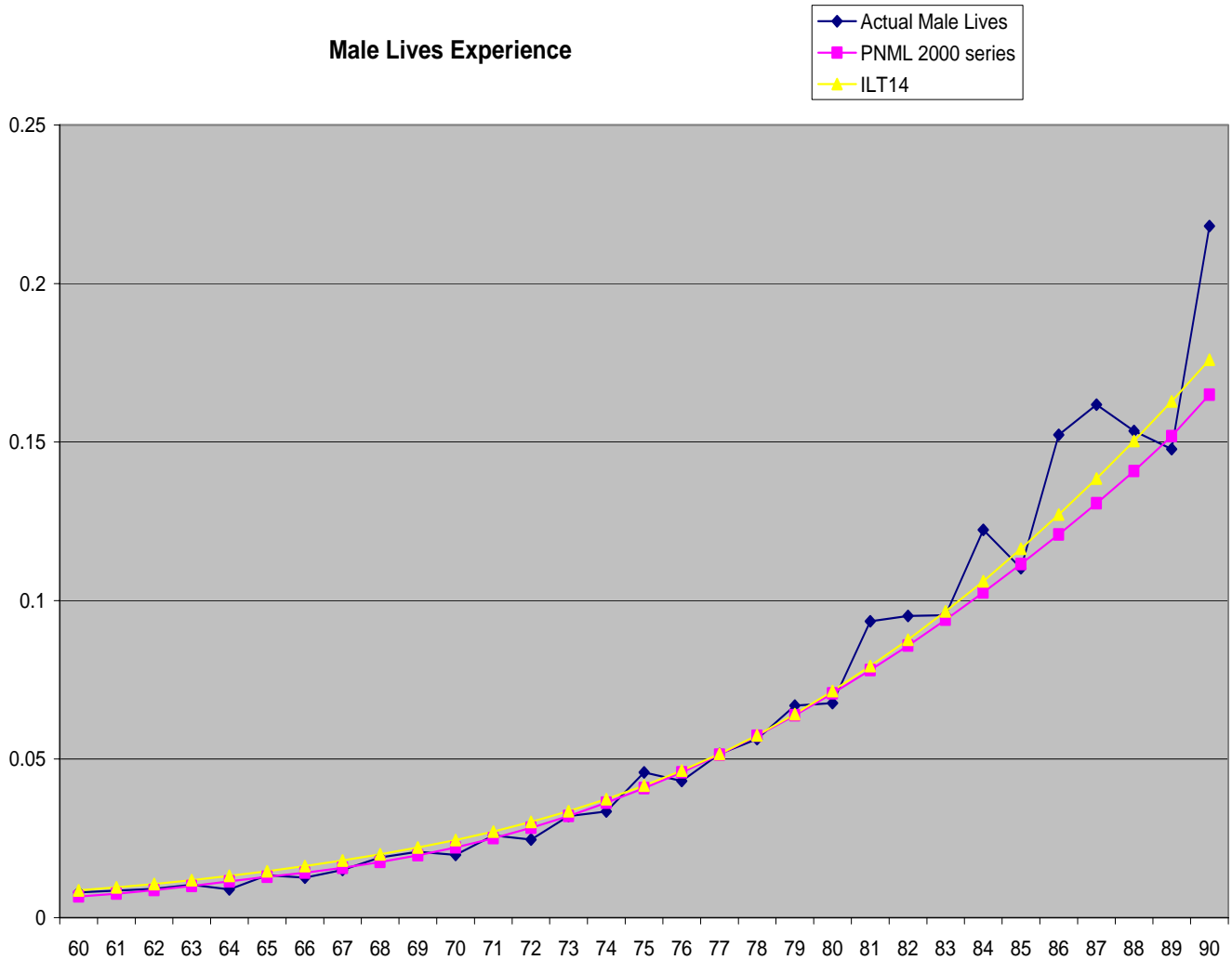
<b>Age-band</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
59 and under	285	208	493
60 to 69	838	273	1,111
70 to 79	1,795	682	2,477
80 to 89	1,748	1,131	2,879
90 and over	395	598	993
<b>Total</b>	<b>5,061</b>	<b>2,892</b>	<b>7,953</b>

**Actual Death Amounts by age-band €million**

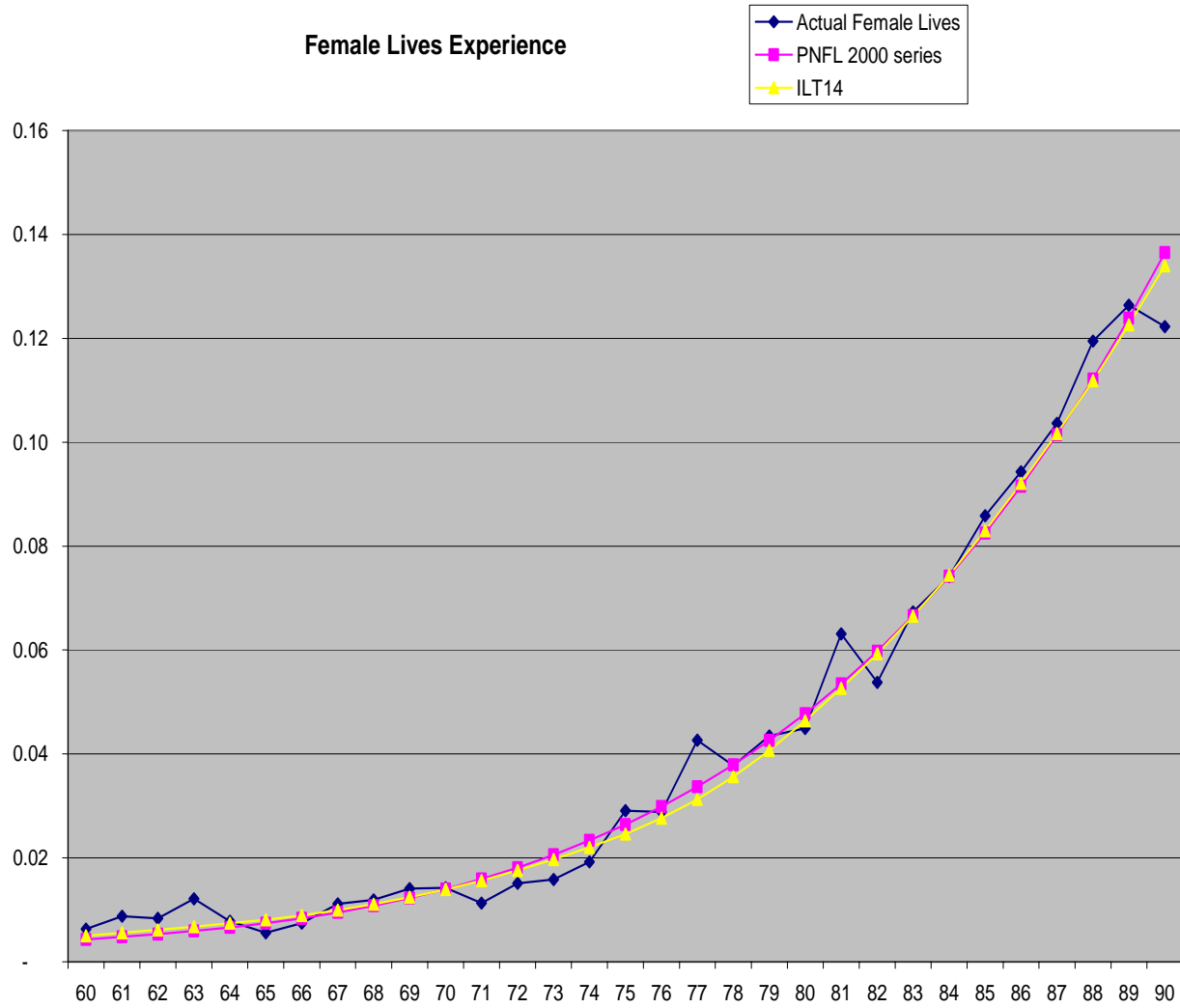
<b>Age-band</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
59 and under	2.8	2.5	5.3
60 to 69	12.4	4.2	16.6
70 to 79	26.1	8.3	34.4
80 to 89	30.5	15.2	45.7
90 and over	8.7	8.4	17.1
<b>Total</b>	<b>80.5</b>	<b>38.6</b>	<b>119.1</b>

## Appendix B

The following graphs display the crude mortality rates between ages 60 and 90 for males and females. We compare these rates to the PNL00 tables, which are based upon the experience of normal retirement UK life office pensioners between 1999 and 2002. We also compare the crude rates to 80% of the ILT14 tables, which are based upon Irish general population mortality between 2001 and 2003.



It is interesting to note that the ILT tables appear to be a better fit at ages in excess of age 80. However, our data is relatively sparse at these ages and graphing the higher mortality rates at the older ages results in a scale which hides differences at younger ages.



The rates are very volatile for the female lives given the relative lack of data. Both tables would seem like a reasonable fit to the data with the PNFL having slightly heavier experience in the 70s age band.