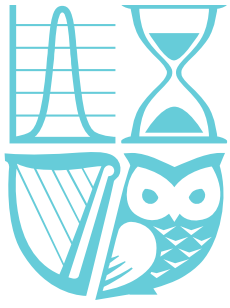

Society of Actuaries in Ireland

Report on the 2013 pensioner mortality study of Irish self-administered pension schemes

November 2013

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Contents

1. Introduction

This report sets out the results of a study commissioned by the Society of Actuaries in Ireland in 2012 into the pensioner mortality experience of Irish self-administered pension schemes (SAPS); the last such study was commissioned in 2007[1].

The study working party members and other contributors were Ciaran McGrath, Maura Carter, Shane Prendergast, John Pender, Sarah Fee, Aidan Kennedy, Brian Fitzgerald, Mary Hall, Martin Whelan, Mark Jordan, Des Cryan, Tracy Gilbert, and Emily O'Gara.

The objectives of the study were to (i) carry out research that would assist pension scheme actuaries when setting mortality assumptions generally (ii) provide a basis for updating mortality assumptions in relevant Actuarial Standards of Practice (iii) quantify changes in Irish SAPS pensioner mortality experience since the last study.

It is recommended that future studies are carried out every three years, with the next study being commissioned in 2015, so that Irish SAPS pensioner mortality assumptions can continue to reflect emerging experience.

[1] Report of the Mortality Working Party - May 2008 https://web.actuaries.ie/press/demography-studies

2. Data

The main pension consultancies and the Department of Finance (for pension schemes managed within the public service) were asked to contribute data to the study based on the following specifications:

- Include all Irish occupational pension schemes with at least 300 pensioners (under which pensions are paid directly from scheme resources, for funded schemes).
- Provide data for the beginning and end of the most recent intervaluation period (and the two intermediate scheme anniversaries, if available).
- Data should include date of birth, sex, and annual pension amount.
- Dates should also be provided (as far as possible) for entrants and exits over the period (with any transfers-out or buy-outs highlighted).
- Pensioners should be distinguished by type if possible: normal retirement, ill-health retirement or dependant.
- Industry sector and exposure period should be stated.

Data provided

Data was provided by 5 pension consultancies and the Department of Finance. In total, data in respect of 52 schemes and approximately 105,900 lives on average (over the exposure period) was submitted; amounts-based data was not available for approximately 20,700 of the total 105,900 lives (see Section 7 for further information).

The exposure mid-point was March 2010, with a spread of data by calendar year as follows:

Exposure year	% of total lives exposure
2006	2%
2007	2%
2008	17%
2009	23%
2010	26%
2011	21%
2012	9%

There was no overlap of experience with the previous study.

In approximately 60% of the submissions the data covered a 3 year period, i.e. between triennial valuations. 30% of submissions were for periods longer than 3 years (average 4.5 years) and 10% of submissions were for periods shorter than 3 years (average 2.1 years).

A significant amount of data was provided by the Department of Finance in respect of pension

schemes for public servants and the table below sets out the relevant split:

Data source	Number of Schemes	Average number of lives
Consultancies	45	63,100
Department of Finance	7	42,800
Total	52	105,900

The next table below shows the distribution of schemes by membership numbers.

Number of pensioners	Number of Schemes
200 to 300	2
300 to 400	7
400 to 500	12
500 to 1000	10
1000 to 2000	6
2000 to 5000	9
5000 +	6
Total	**52**

A rough split of schemes by industry type was as follows:

Industry type	Number of Schemes
Food and drinks	9
Communications	3
Construction / manufacturing	10
Financial services	10
Energy / natural resources	5
Public sector	7
Transport / travel	6
Professional bodies	2
Total	**52**

Actual Exposures and deaths

Actual exposures and deaths by amounts / lives and by gender were:

	Male	Female	Total
Lives Exposure	234,741	152,356	387,097
Lives Deaths	7,536	4,598	12,134
Amounts Exposure €m	3,386	1,150	4,536
Amount Deaths €m	90	38	128

Appendix A gives a breakdown of the exposures and deaths by age bands.

The corresponding statistics from the 2007 study were:

	Male	Female	Total
Lives Exposure	160,723	91,355	252,078
Lives Deaths	5,061	2,892	7,953
Amounts Exposure €m	2,904	1,570	4,474
Amount Deaths €m	81	39	119

Excluding Department of Finance data, the statistics for the latest study were:

	Male	Female	Total
Lives Exposure	161,044	52,965	214,009
Lives Deaths	5,426	1,830	7,256
Amounts Exposure €m	2,335	643	2,978
Amount Deaths €m	57	19	76

Data constraints

The analysis was constrained by the quality of data provided. In particular:

- For the majority of schemes, data was not subdivided by type of pensioner (e.g. ill-health, dependant).

- 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.

Although the associated impact cannot be quantified, the same constraints applied to the previous study.

3. Methodology

The methodology adopted was as follows:

- The census method was used, based on a life year rate interval.
- Crude mortality rates were derived by age and gender.
- Ill-health and dependant lives were included but not analysed separately due to insufficient data.
- A number of mortality tables were considered when determining the most appropriate basis for expressing the study results.

In addition, for consistency with the mortality basis in ASP PEN-2 Retirement Benefit Schemes Transfer Values version 5.6 (Appendix C):

- The impact of data provided by the Department of Finance was assessed
- Crude rates were also calculated excluding ages below 60.

The tables considered are described below:

Mortality tables	Central exposure year	Type of lives
S1PL	2003	UK SAPS pensioners (excluding dependants)
S2PL [2]	2007	UK SAPS pensioners (excluding dependants)
ILT 15[3]	2006	Irish population
PN00 [4]	2000 approx.	UK Life office pensioners (normal retirements only)

[2] The S2 tables were proposed in CMI Working Paper 66 (published on 23 April 2013) and they are still in draft form. Final tables are expected to be issued by November 2013.

[3] ILT 16 due to be published in Q1 2014.

[4] The PN00 tables were used to express the results of the 2008 study.

4. Graphical analysis

Appendix B contains graphs which compare the crude rates derived from the study against the mortality tables identified in Section 3. In order to better illustrate the differentials, graphs are included for the following age ranges separately:

- 50 to 100
- 50 to 70
- 70 to 90
- 90 to 100

We have made the following observations:

- Between ages 50 to 70, the crude rates are above the highest comparator rates (S1PL) at younger ages, falling below the lowest comparator rates (S2PL) at older ages; we believe this is attributable to the impact of Ill-health retirements at younger ages (with perhaps ill-health retirees having a greater impact on the crude rates than the S1PL and S2PL rates), diminishing as age rises.
- Between ages 70 to 90, the crude rates continue below the lowest comparator rates (S2PL) initially, eventually rising towards the highest comparator rates (ILT 15) by age 90; we believe this is attributable to the increasing impact of dependant lives at older ages (S1 and S2 table exclude dependants and therefore do not exhibit the same pattern) but also the fact that the crude rates are based on a more recent exposure period and rates of mortality improvement have been lower at older ages.
- From 90 to 100, the crude rates rise above the highest comparator rates (ILT 15 and S1PL) although the volume of study data at these ages is obviously low.

The remainder of this report focuses on the study results expressed in terms of:

- the PN00 tables, for the purposes of comparison with the 2008 study results
- the S2 tables, as they have the most recent central exposure year of all the tables considered, and are also based on the experience of SAPS pensioners (albeit in the UK)

5. Numerical analysis

The tables in this section set out the Actual / Expected (A/E) mortality rate statistics by age-band and gender, using the PNL00 and S2PL tables; the impact of the Department of Finance data is also quantified.

We would comment as follows:

- It can be seen from the lives based tables, Tables 5.1 and 5.3, that overall mortality experience is slightly higher for males when Department of Finance data is excluded; the mortality experience for females is however significantly higher – we believe this is because a high percentage (approximately 65%) of female lives exposure arises from Department of Finance data for groups with lighter mortality experience.
- Comparing Tables 5.1 and 5.2, A/E for females (all ages and 60+) is significantly higher on the amounts basis as the amounts weighted average age is higher than the lives weighted average age for females but not males (the study results indicate that A/E is U-shaped with a low-point between ages 70 and 80; as average age is above 80, higher average age produces a higher average A/E; see also Section 7 regarding lower volume of amounts-based data).
- Tables 5.1 and 5.3 show that A/E statistics are higher using the S2 tables compared to the PNL00 tables. Therefore, the fact that the S2 tables are based on much more recent exposure outweighs the selection effect of purchasing an annuity.

Table 5.1: Actual/Expected on a Lives Basis using PN00 Mortality Tables

	Including Department of Finance data		Excluding Department of Finance data	
Age Band	**Male Lives PNML00**	**Female Lives PNFL00**	**Male Lives PNML00**	**Female Lives PNFL00**
Under 60	193%	249%	183%	218%
60-69	90%	99%	93%	130%
70-79	81%	77%	86%	93%
80-89	104%	94%	105%	99%
90+	124%	111%	127%	110%
All ages	96%	96%	99%	103%
60-80	84%	82%	88%	101%
60+	95%	94%	98%	102%

Table 5.2: Actual /Expected on an Amounts Basis using PN00 Mortality Tables

	Including Department of Finance data		Excluding Department of Finance data	
Age Band	**Male Amounts PNMA00**	**Female Amounts PNFA00**	**Male Amounts PNMA00**	**Female Amounts PNFA00**
Under 60	178%	311%	115%	253%
60-69	89%	129%	86%	124%
70-79	82%	88%	84%	91%
80-89	101%	97%	105%	100%
90+	121%	122%	132%	120%
All ages	96%	107%	96%	107%
60+	95%	104%	96%	104%

Table 5.3: Actual/Expected on a Lives Basis using S2PL Mortality Tables

	Including Department of Finance data		Excluding Department of Finance data	
Age Band	**Male Lives S2PML**	**Female Lives S2PFL**	**Male Lives S2PML**	**Female Lives S2PFL**
Under 60	145%	184%	138%	160%
60-69	92%	99%	96%	130%
70-79	92%	88%	98%	107%
80-89	111%	102%	113%	107%
90+	117%	111%	119%	109%
All ages	102%	102%	105%	110%
60+	101%	101%	105%	109%

As outlined in Appendix C, the mortality basis in ASP PEN-2 Retirement Benefit Schemes Transfer Values version 5.6 was set using the results of the 2008 study[5]. More specifically, it was based on the result for males aged 60 and over, excluding Department of Finance data which was 108% PNML00 as at 2005, the mid-year of the study exposure. As can be seen from Table 5.1, the corresponding result from this study is 98% PNML00 as at 2010 (the exposure mid-year).

It should be noted that the S2 tables we have used are provisional (contained in Working Paper

[5] Report of the Mortality Working Party - May 2008 https://web.actuaries.ie/press/papers

66, which the Continuous Mortality Investigation (CMI) issued on 23 April 2013 for comment). Final S2 tables are expected to be published around November time.

Some of the statistics set out above are slightly different to those presented to the Society on 29 May 2013; this is due to the subsequent inclusion of additional data.

6. Mortality improvement rates

The following table shows Actual / Expected experience measured against the PNL00 tables arising from both the current and previous studies, for all schemes (including Department of Finance data):

	2013 study		2008 study	
Age Band	**Male Lives PNML00**	**Female Lives PNFL00**	**Male Lives PNML00**	**Female Lives PNFL00**
Under 60	193%	249%	260%	524%
60-69	90%	99%	101%	121%
70-79	81%	77%	99%	97%
80-89	104%	94%	110%	102%
90+	124%	111%	121%	96%
All ages	96%	96%	108%	107%
60+	95%	94%	105%	101%

Based on the time interval of 5.33 years between exposure mid-points for both studies (November 2004 to March 2010), the implied improvement rates are:

Age Band	**Male Lives PNML00**	**Female Lives PNFL00**
All ages	2.2% p.a.	2.0% p.a.

If schemes that were only included for either the current or previous studies are excluded (leaving 79,600 lives on average), the implied improvement rates are:

Age Band	**Male Lives PNML00**	**Female Lives PNFL00**
All ages	2.1% p.a.	1.8% p.a.

For comparison purposes, the CSO has identified the following population mortality improvement rates over recent years[6]:

[6] Population and Labour Force Projections 2016-2046 ,http://www.cso.ie/en/releasesandpublications/population/

Period	Males p.a.	Females p.a.
2002 to 2005	5.0%	3.5%
2006 to 2010	3.0%	2.5%

It would appear from this study, and population mortality experience, that mortality improvement rates between 2005 and 2010 have been lower than anticipated by the 2008 CSO population projections.

Historical improvement rates presented to the Statistical and Social Inquiry Society of Ireland are shown in the following table[7]:

Table 1: Annualised Percentage Rate of Decline in Mortality, Years Ending 2002, Various Ages, Each Sex

	10 Years		*20 Years*		*50 Years*		*76 Years*	
Age	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
50	1.9	2.0	2.7	2.2	1.7	2.0	1.4	2.0
60	3.4	2.8	2.9	2.8	1.3	1.9	1.1	1.8
70	3.4	3.0	2.4	2.4	1.0	1.7	0.6	1.3
80	1.9	1.7	1.6	1.9	0.8	1.4	0.3	0.7
90	1.1	1.5	0.8	1.1	0.5	0.7	0.0	0.2
100	0.7	1.5	0.1	0.7	0.2	0.3	-0.1	0.0

[7] Projecting Population Mortality for Ireland, S. Whelan, 24 January 2008

7. Results by pension amount

The 2008 study and previous work by the CMI identified an inverse relationship between pension amount and mortality experience; this link becomes weaker at older ages.

The following table shows the results of our study broken down by pension band and expressed as a percentage of the S2 tables:

Pension Band	Males Actual / Expected S2PML	Females Actual / Expected S2PFL	Proportion of lives
€2,500 or below	117%	131%	23%
€2,500 to €5,000	117%	125%	13%
€5,000 to €10,000	117%	114%	14%
€10,000 to €20,000	106%	107%	19%
€20,000 to €30,000	93%	97%	15%
€30,000 or above	76%	89%	16%
Overall	105%	112%	100%

It is important to note that amounts-based data was not available for approximately 20,700 of the total 105,900 lives on average, so these lives were not included in the amounts-based analysis; a large percentage of this missing data was for female primary lives which is perhaps why the results for females in the above table are high - greater proportion of dependants (with higher mortality rates).

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

Pension Band	Male Exposure	Female Exposure	Total
€2,500 or less	71	21	92
€2,500 to €5,000	101	40	141
€5,000 to €10,000	173	129	303
€10,000 to €20,000	471	332	804
€20,000 to €30,000	723	344	1,067
€30,000 or above	1,847	283	2,130
Overall	3,386	1,150	4,536

8. Conclusions

It is clear that mortality rates for Irish SAPS pensioners continue to improve, although at rates that are lower than previously expected.

The Working Party will refer the results of this study to the Demography and Pensions Committees so that the mortality bases set out in ASP PEN-2, ASP PEN-12, ASP LA-8 and ASP PRSA-2 can be updated.

Consideration should also be given to average pension amount when setting a mortality basis for a particular group of pensioners.

We recommend that work on the next Irish SAPS pensioner mortality study should commence in 2015.

Appendix A – Data by age bands

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

Age-Band	Male	Female	Total
Under 60	27,937	23,879	51,816
60 to 70	96,564	50,760	147,323
70 to 80	77,300	43,720	121,021
80 to 90	29,713	28,064	57,778
Over 90	3,227	5,932	9,159
Total	234,741	152,356	387,097

Actual Amounts (€m) Exposure by age-band

Age-Band	Male	Female	Total
Under 60	406	222	628
60 to 70	1,515	342	1,856
70 to 80	1,019	290	1,309
80 to 90	400	244	644
Over 90	46	52	98
Total	3,386	1,150	4,536

Actual Number of Deaths by age-band

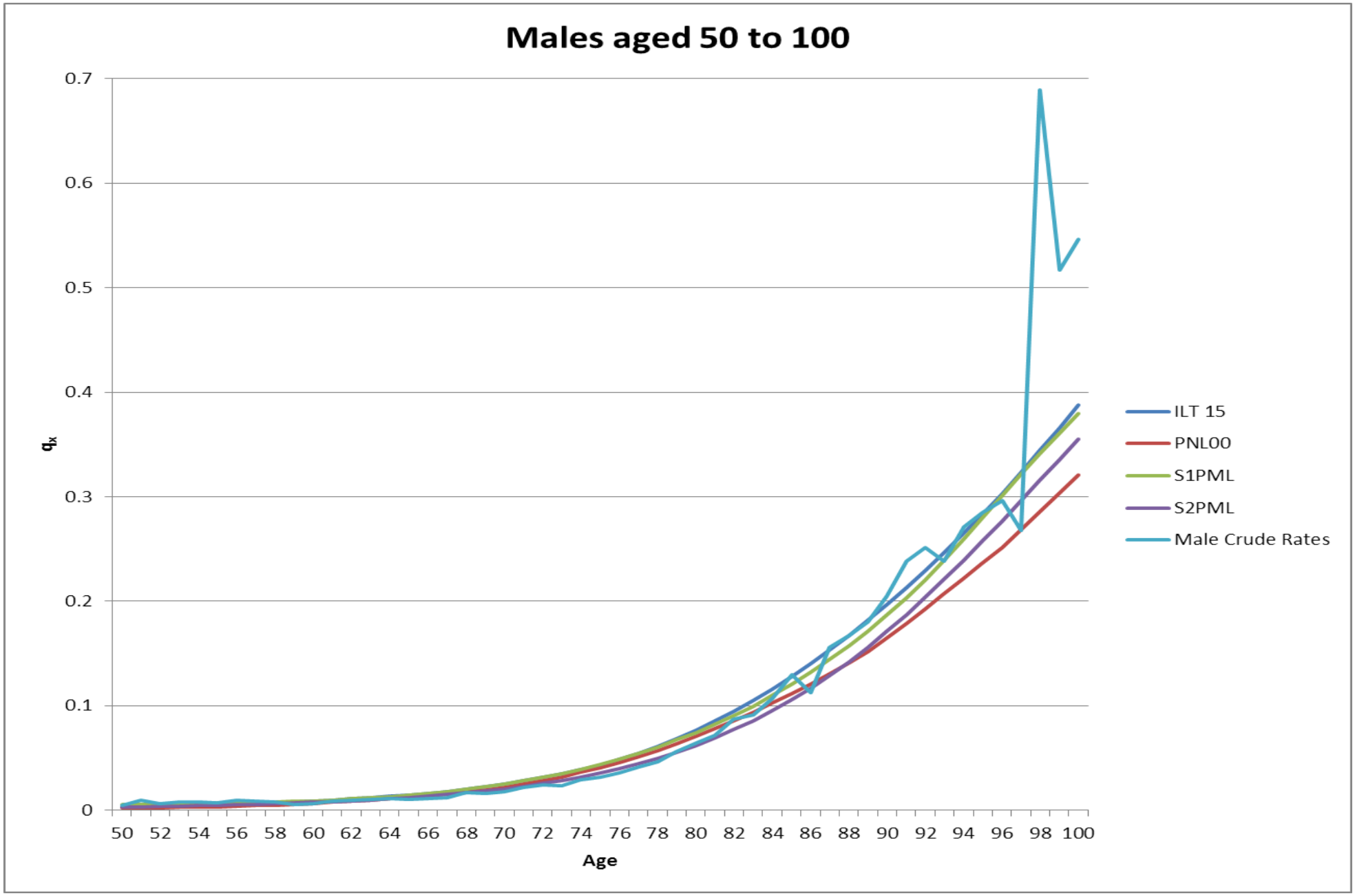
Age-Band	Male	Female	Total
Under 60	213	162	375
60 to 70	1,120	380	1,500
70 to 80	2,391	856	3,247
80 to 90	3,024	1,994	5,018
Over 90	788	1,206	1,994
Total	7,536	4,598	12,134

Appendix A – Data by age bands

Actual Death Amounts (€m) by age-band

Age-Band	Male	Female	Total
Under 60	3	2	4
60 to 70	14	3	17
70 to 80	26	6	32
80 to 90	37	16	53
Over 90	11	11	22
Total	90	38	128

Appendix B – Mortality rate graphs



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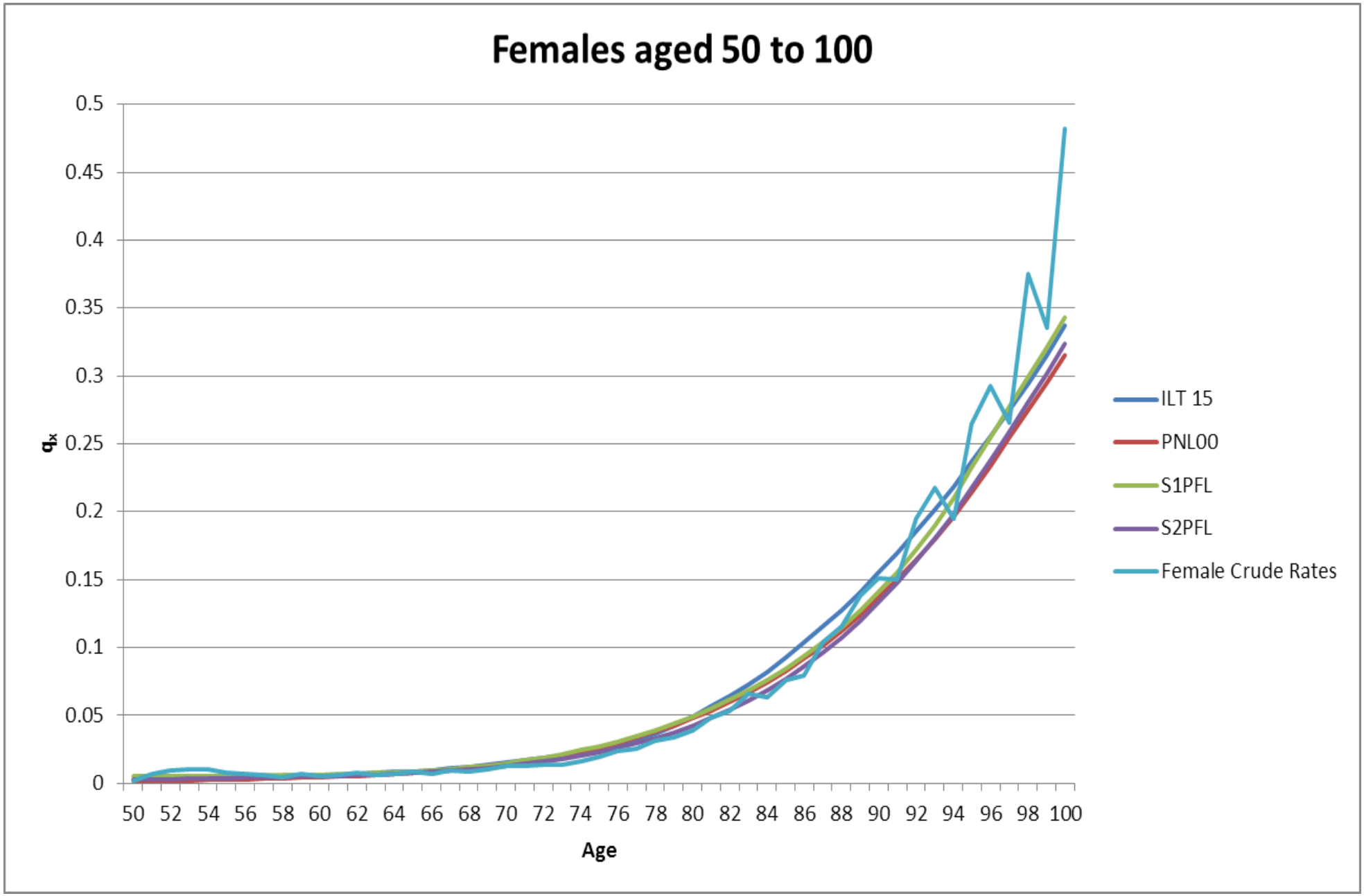

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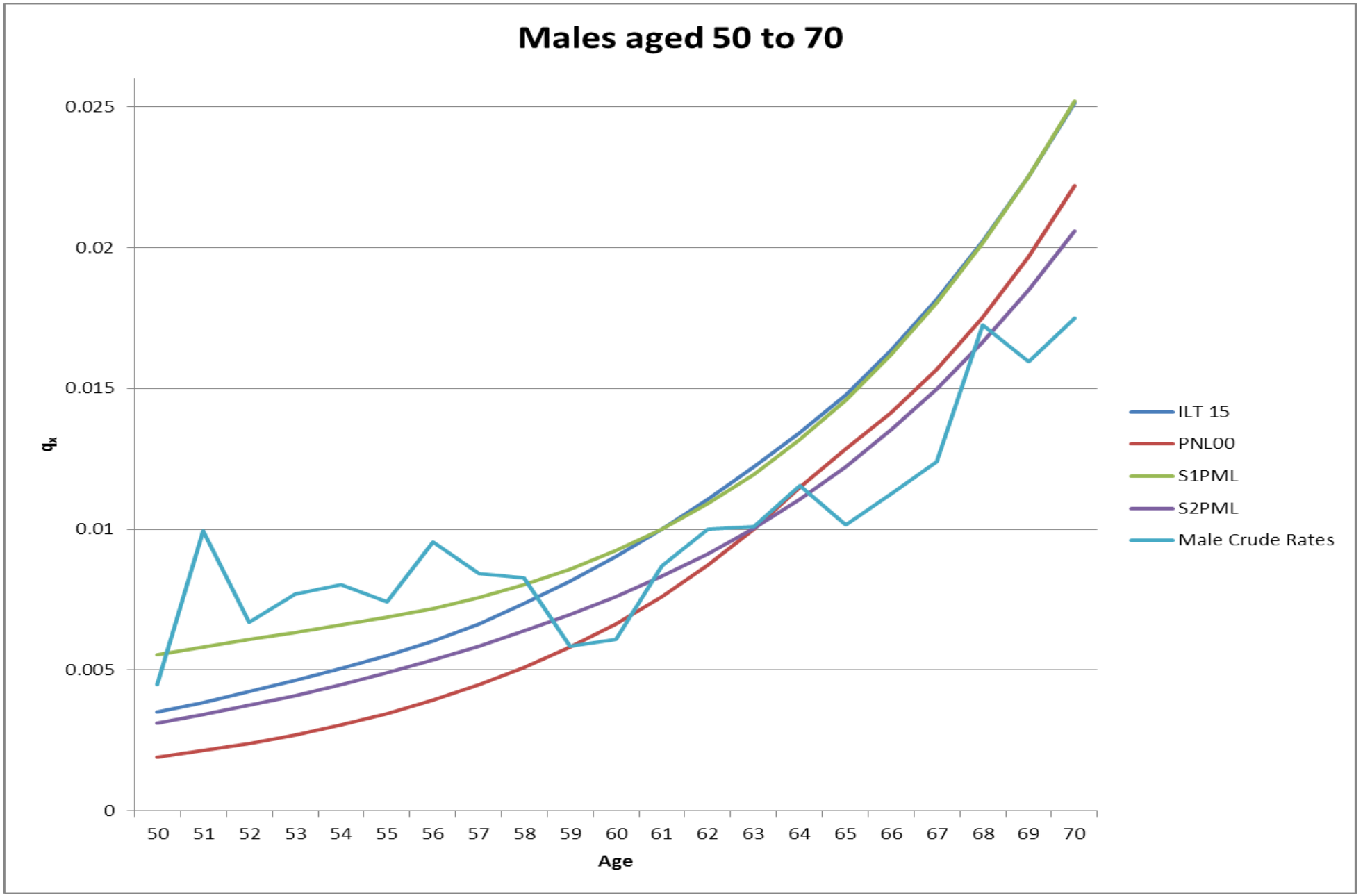

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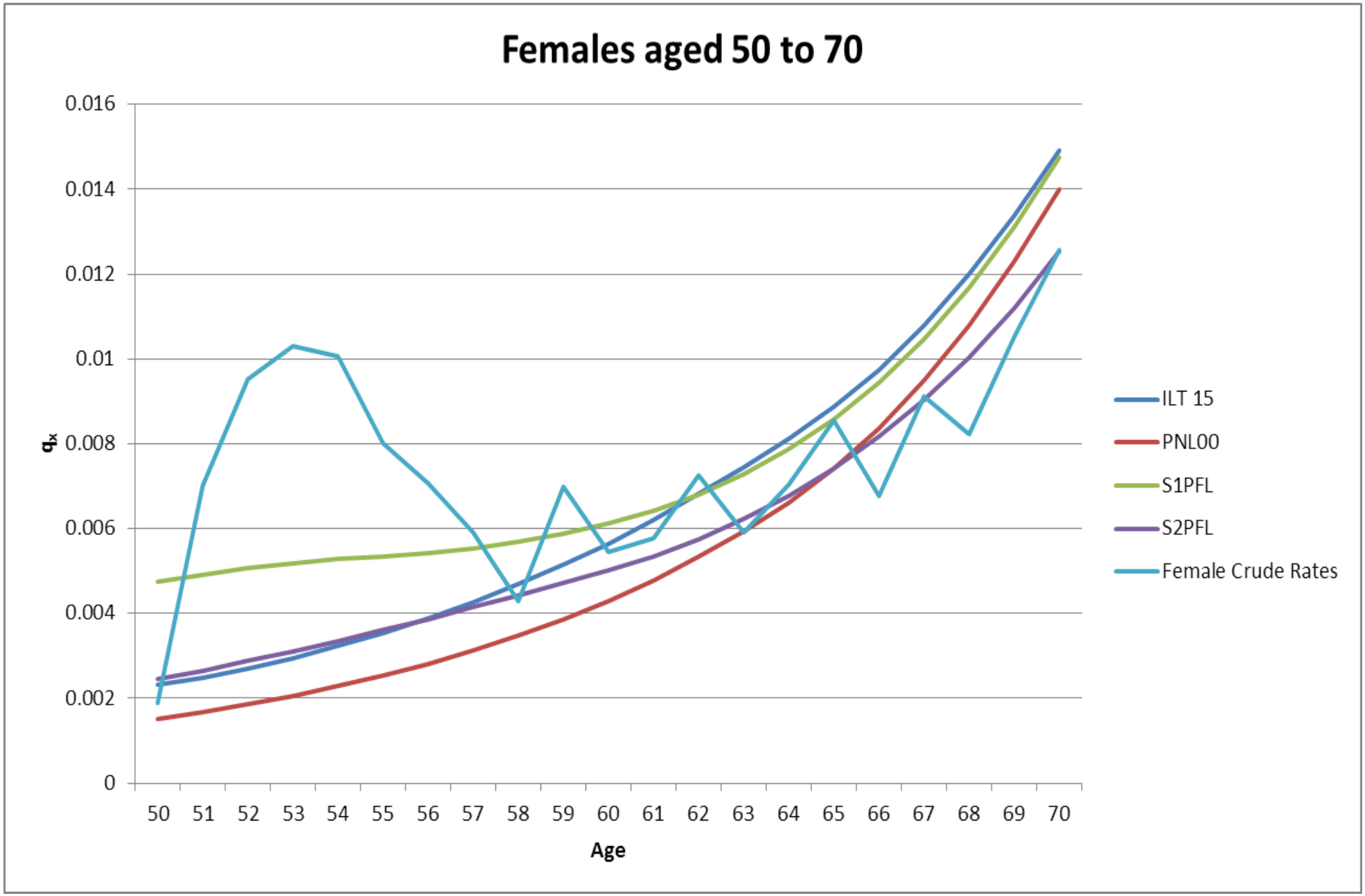

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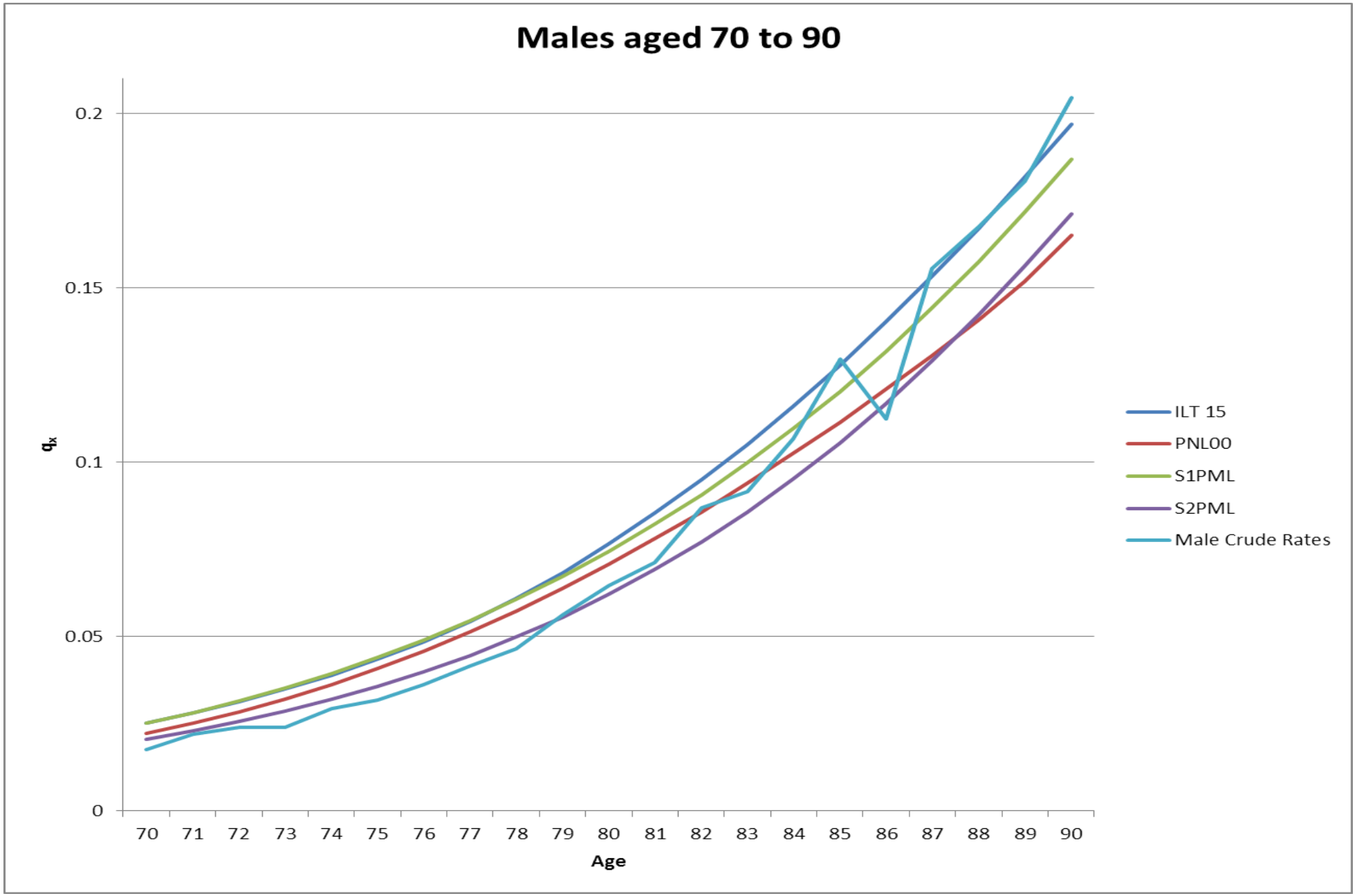

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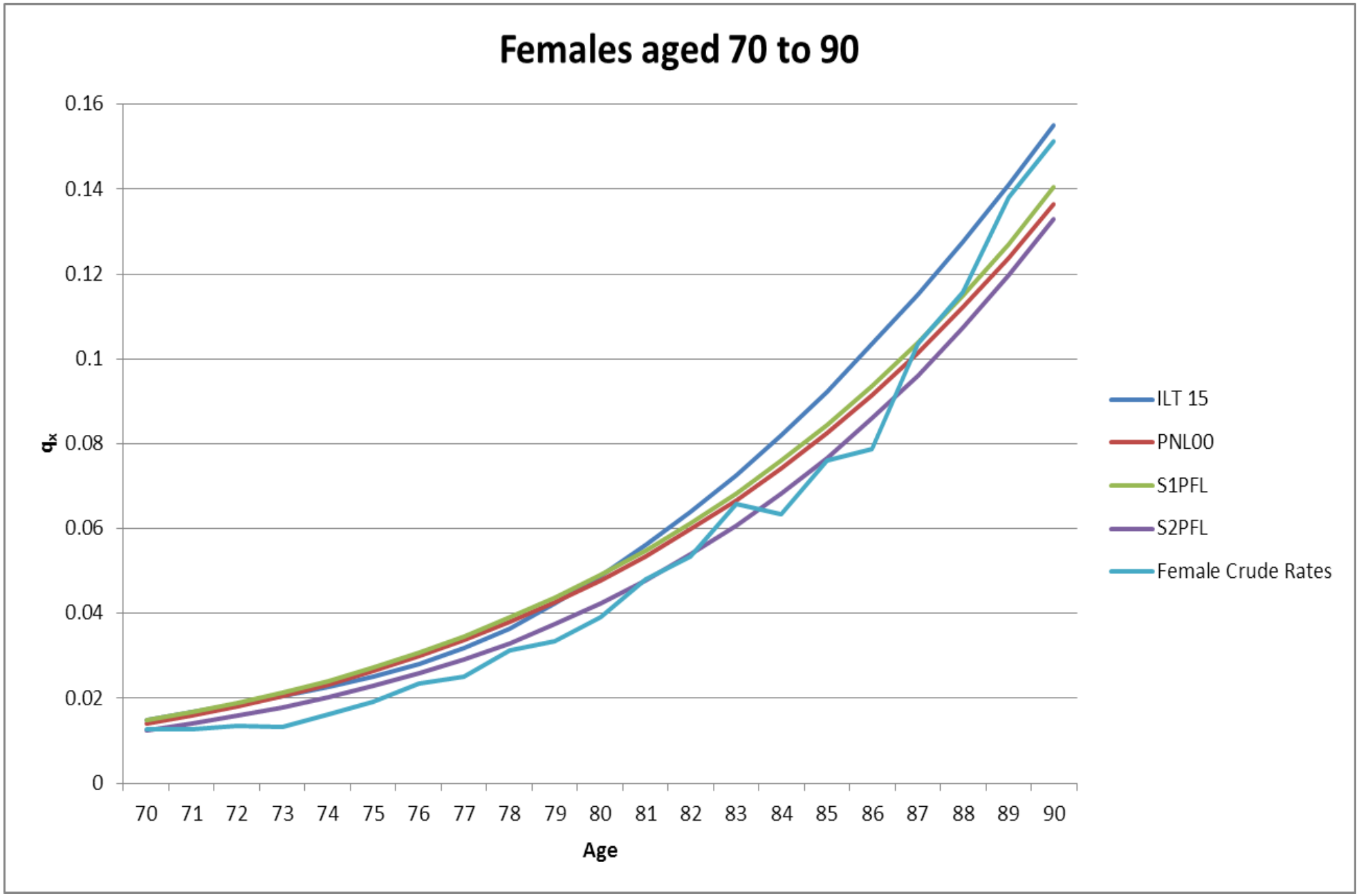

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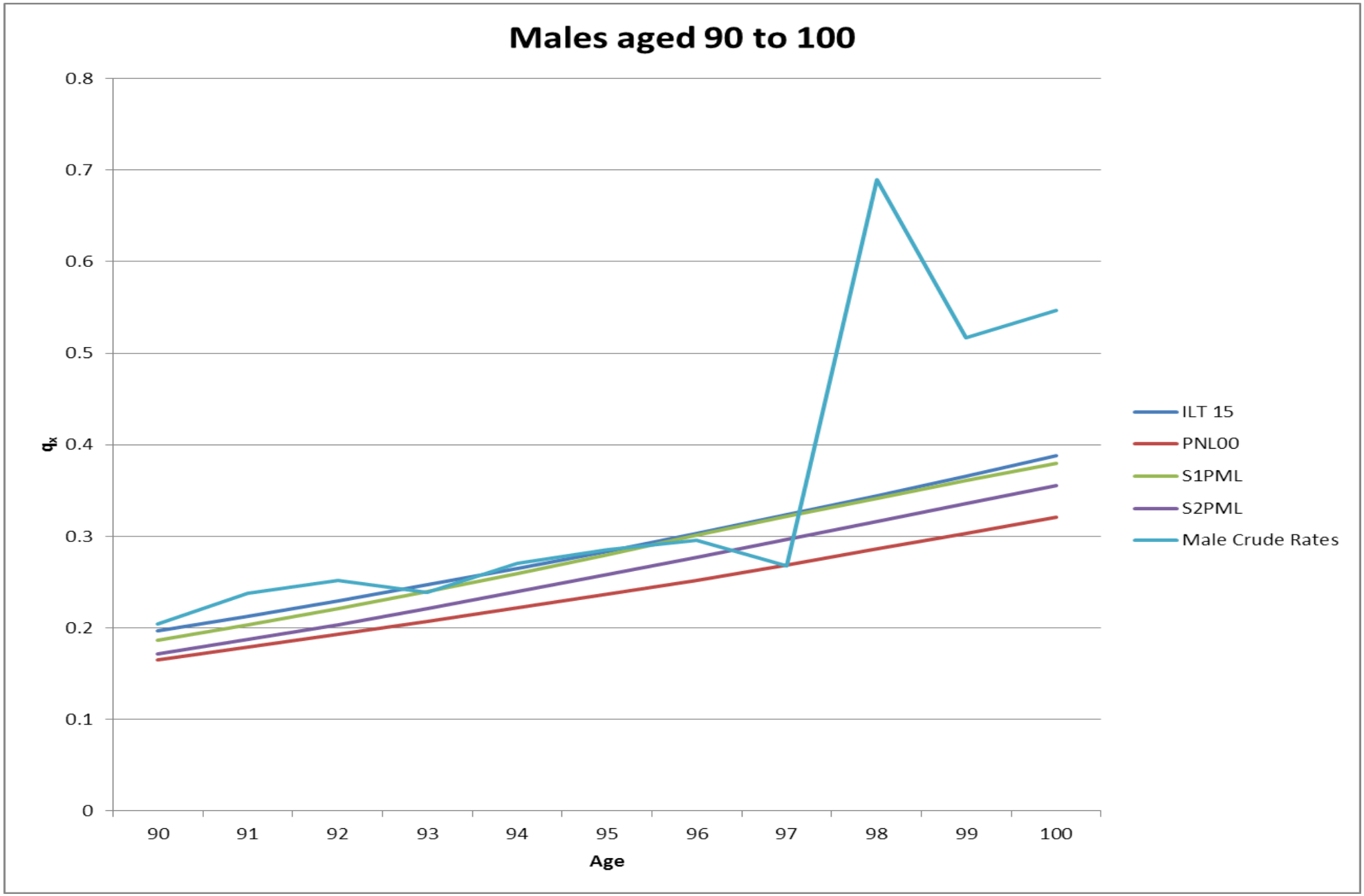

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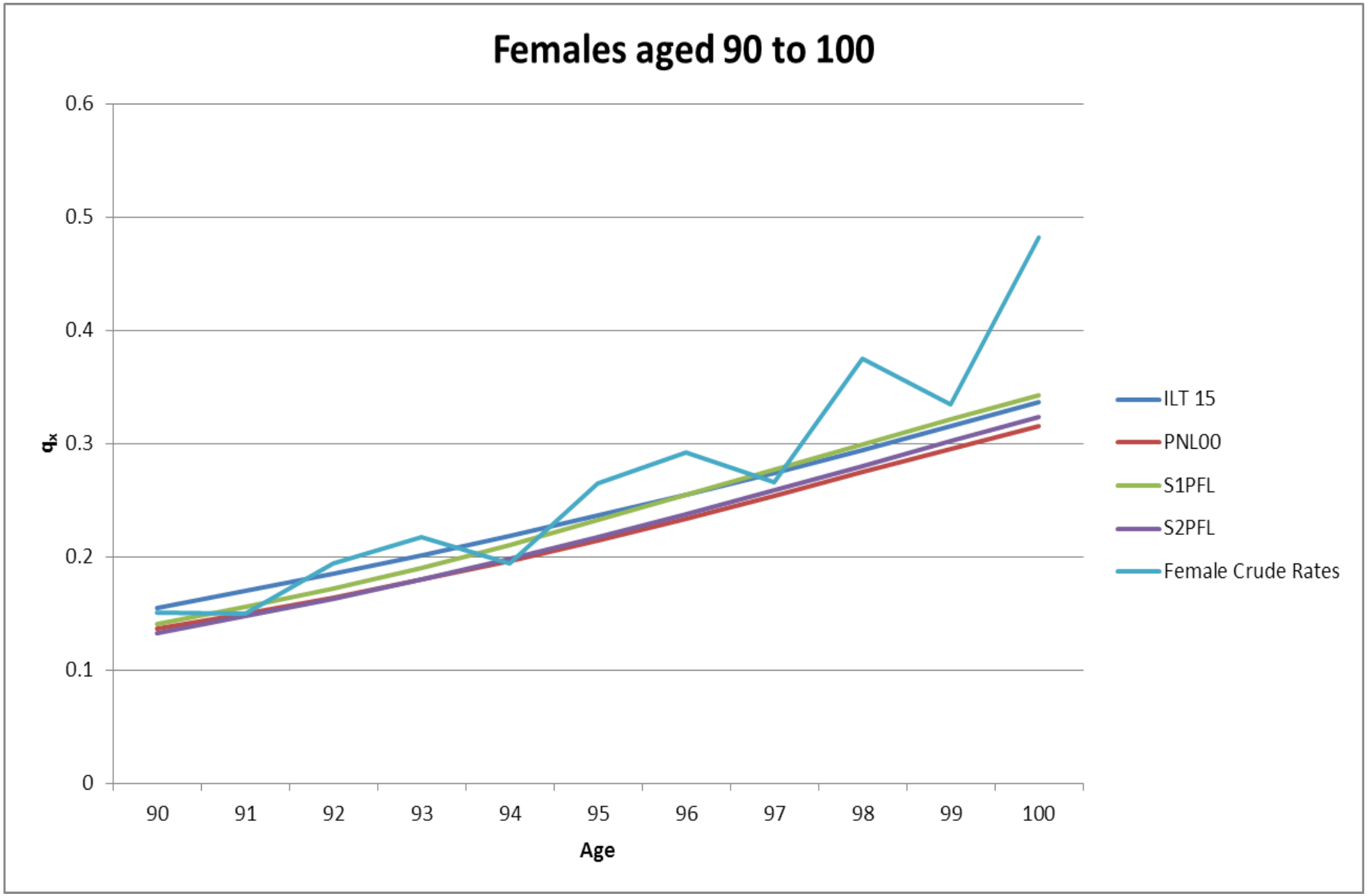

Appendix C – ASP PEN-2 Mortality Basis

Recommended Mortality Basis

The mortality basis in ASP PEN-2 Retirement Benefit Schemes Transfer Values version 5.6 was derived using the results of the last study by the Society of Actuaries in Ireland into the mortality experience of Irish self-administered pension schemes detailed in the Report of the Mortality Working Party, May 2008[8]. Based on the results of this study, the Demography Committee recommended[9] that the most appropriate mortality basis to be used for the purpose of transfer value calculations was:

- 108% of the '00 series, lives' table for both men and women with CSO mortality improvements applied in respect of 2006 onwards.

More specifically, it was based on the result for males aged 60 and over, excluding Department of Finance data, which was 108% PNML00 as at 2005, the middle year of the study exposure.

Proxy for Recommended Basis

As for the previous recommended basis for ASP PEN-2, it was again considered that direct application of the proposed basis was likely to cause considerable practical difficulties for actuaries working in both the life and pension sectors. For the purposes of ASP PEN-2, the Committee derived a proxy method that gave results which were close to the recommended basis:

- Men: 62% of PNML00
- Women: 70% of PNFL00

with an increase to the annuity value of:

- 0.50% (men with no spouse's pension)
- 0.38% (women with no spouse's pension)
- 0.39% (men or women with spouse's pension)

per annum compound for each year between 2008 and the year in which normal pension date falls.

[8] Report of the Mortality Working Party - May 2008 https://web.actuaries.ie/press/demography-studies

[9] Review of Rates of Mortality Improvement - Demography Committee, 14th October 2008 https://web.actuaries.ie/press/demography-studies

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