Continuous Mortality Investigation

Mortality Committee

Working Paper 16

The Graduation of the CMI 1999-2002 Mortality Experience: Proposed Annuitant and Pensioner Graduations

September 2005

CMI Mortality Graduation Working Party
Working Paper 16
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Proposed Annuitant and Pensioner Graduations

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The Graduation of the CMI 1999-2002 Mortality Experience:
Proposed Annuitant and Pensioner Graduations

Introduction

In 2003 the Mortality Committee set up a Working Party to carry out the graduation of a new set of standard mortality tables, to be based on the 1999-2002 experience. The members of the Mortality Graduation Working Party ("MGWP") are Angus Macdonald (Chairman), John Ellam, Adrian Gallop, Simon Spencer, Joanne Wells, David Wilkie and Richard Willets.

Working Paper 8, first published in draft form in May 2004 with the final version made available in August 2004, contained initial findings of the Working Party and proposals on which tables to graduate.

Working Paper 12, published in April 2005, contained proposed graduations for the assured lives tables. Comments on this Working Paper and Working Paper 12 will be considered together to arrive at base tables on which the CMI will seek approval from FIMC for adoption by the profession. Further consultation will only take place if feedback results in significant revisions to the tables.

This Working Paper is expected to complete the proposal stage by setting out the Working Party's proposed graduations for the annuitant and pensioner tables. It should be borne in mind that these are the base mortality tables and do not contain any projections of future mortality, which are the subject of a separate strand of work being carried out by the Mortality Projections Working Party ("MPWP"). The MPWP has published a number of Working Papers, the most recent being Working Paper 15 in July 2005.

Any feedback on this Working Paper is very welcome and should be addressed by 31 October 2005 to:

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Labels for tables

The previous two sets of standard tables were denoted the "92" Series (based on the 1991-1994 experience) and the "80" Series (based on the 1979-1982 experience). In keeping with this convention, we expect that the new tables, being based on the 1999-2002 experience, will be denoted the "00" Series. This is not set in stone, however, and may yet change. For the purposes of this Working Paper, though, we will assume that this will be the case, and that the naming convention of individual tables remains unchanged – thus, for example, the equivalent of PMA80 and PMA92 would be called PMA00. We have provisionally labelled new tables in a way that follows the previous naming convention, although again these may be subject to change when the final tables are published.

Summary of proposed annuitant and pensioner tables

Following comments received on Working Paper 8 and a subsequent seminar held at Staple Inn on 4 June 2004, and after further detailed consideration of the 1999-2002 data, the MGWP is proposing graduations for the following tables:

Immediate Annuitants

Table	Investigation	Sex	Lives / Amounts	Select Period	Age range	"92" Series Equivalent
IML00	Immediate Annuitants	Male	Lives	0	60-120	IML92
IFL00	Immediate Annuitants	Female	Lives	1	60-120	IFL92

Life Office Pensioners

Table	Investigation	Sex	Lives / Amounts	Select Period	Age range	"92" Series Equivalent
PML00	Pensioners, Normal	Male	Lives	0	50-120	PML92
PMA00	Pensioners, Normal	Male	Amounts	0	50-120	PMA92
PFL00	Pensioners, Normal	Female	Lives	0	50-120	PFL92
PFA00	Pensioners, Normal	Female	Amounts	0	50-120	PFA92
PEML00	Pensioners, Early	Male	Lives	0	50-120	New
PEMA00	Pensioners, Early	Male	Amounts	0	50-120	New
PEFL00	Pensioners, Early	Female	Lives	0	50-120	New
PEFA00	Pensioners, Early	Female	Amounts	0	50-120	New
PCML00	Pensioners, Combined	Male	Lives	0	50-120	New
PCMA00	Pensioners, Combined	Male	Amounts	0	50-120	New
PCFL00	Pensioners, Combined	Female	Lives	0	50-120	New
PCFA00	Pensioners, Combined	Female	Amounts	0	50-120	New
WL00	Widows	Female	Lives	0	17-120	WL92
WA00	Widows	Female	Amounts	0	17-120	WA92

Personal Pensioners / Retirement Annuitants

Table	Investigation	Sex	Lives / Amounts	Select Period	Age range	"92" Series Equivalent
RMD00	Retirement Annuitants, Deferred	Male	Lives	0	17-75	New
RMV00	Retirement Annuitants, Vested	Male	Lives	0	50-120	RMV92
RMC00	Retirement Annuitants, Combined	Male	Lives	0	17-120	New
RFD00	Retirement Annuitants, Deferred	Female	Lives	0	17-75	New
RFV00	Retirement Annuitants, Vested	Female	Lives	0	50-120	RFV92
RFC00	Retirement Annuitants, Combined	Female	Lives	0	17-120	New
PPMD00	Personal Pensioners, Deferred	Male	Lives	0	17-75	New
PPMV00	Personal Pensioners, Vested	Male	Lives	0	50-120	New
PPMC00	Personal Pensioners, Combined	Male	Lives	0	17-120	New
PPFD00	Personal Pensioners, Deferred	Female	Lives	0	17-75	New
PPFV00	Personal Pensioners, Vested	Female	Lives	0	50-120	New
PPFC00	Personal Pensioners, Combined	Female	Lives	0	17-120	New

Note: in the above tables, "New" denotes an experience that was not part of the "92" Series standard tables. Some of these tables were actually graduated, but were not designated as standard.

Overview of graduation methodology

The Working Party has used the same methodology as was the case with the assured lives graduations, described in Working Paper 12, namely the methodology developed by Forfar, McCutcheon and Wilkie (1988). This involves fitting a formula of the μ_x = GM(r,s) class, making subsequent adjustments as necessary, and then calculating values of q_x as

$$q_x = 1 - e^{-\int_0^1 \mu_{x+t}\,dt}$$

The integral has been estimated using a Simpson's rule approximation. However, the Working Party recognises that more accurate evaluation methods are available and will consider these for production of the final tables; the effect on the final tabulated values of q_x is likely to be trivial, however they would be theoretically more accurate.

Immediate Annuitants

This investigation (CMI investigation 12) covers (non-pension) purchased life annuities, and is among the longer-running of the CMI mortality investigations. However, there is very little new business currently being submitted to the CMI, and so the experience is effectively closed and ageing. If current trends continue, data volumes are likely to reduce over time and it is possible that this will be the last time that tables on this experience will be produced.

For the "92" Series, four separate tables were produced for males and females, lives and amounts. Each of these tables had a one-year select period, and covered the age range 17-120.

The 1999-2002 data for this investigation has reduced in size from the 1991-1994 experience used to produce the "92" Series tables. Furthermore, there is very little data below age 60. There were six male deaths and around 5% of the total male exposure below age 60. For females, the equivalent figures are three deaths and around 3½% of the female exposure. We therefore recommend that graduations are carried out using the data in the age range 60-100, and that tables are not published below age 60 since the results would not be supported by the data.

Trial ultimate graduations were carried out using various GM formulae, initially assuming a one-year select period (i.e. durations 1 and over were considered), as was the case with the "92" Series graduations.

Amounts mortality is often heavier than lives mortality for both sexes. This would appear to contradict past experience and our intuitive expectations, but an examination of average amounts of claims and in force shows that, for females, the average amount of claim is greater than the average in force at all durations. This is also true for males at early durations. As a result we propose only to produce lives tables for the immediate annuitants.

For males, the GM(1,3) graduation provided the best fit. There were only 49 deaths at duration 0, with one of them below age 60. No attempt was made to graduate this experience; instead the values of q_x generated from the ultimate graduation were applied to the duration 0 experience with a resulting 100A/E of 98. We therefore recommend that there is no select period for males, and that the graduation be based on all durations.

For females, the GM(1,3) graduation again provided the best fit. At duration 0 there were 78 deaths, and again no attempt was made to graduate this experience. Instead, the approach described above for males was used, with a resulting 100A/E of 84. This is sufficiently different from 1 to recommend adopting a select period of one year, with the graduated values of $\mu_{[x]}$ being defined as $\mu_{[x]} = 0.84 \times \mu_x$. As with the "92" Series tables, we are recommending that select rates cease at age 100.

A summary of the fitted parameters and a graphical presentation are given in Table 1 and Figures 1 and 2 below.

Table 1. Unadjusted graduations for the 1999-2002 immediate annuitant ultimate experience

Sex	Male	Female
Lives / Amounts	Lives	Lives
Durations in ultimate	0+	1+
GM formula	GM(1,3)	GM(1,3)
Age range fitted	60-100	60-100
Optimised parameters		
$100\times a_1$	0.494978	0.275363
b_1	–6.069074	–8.233861
b_2	8.266671	10.673350
b_3	–1.514280	–2.908070
Selected μ_x		
μ_{60}	0.006733	0.003210
μ_{80}	0.053624	0.035343
μ_{100}	0.509003	0.364942
μ_{119}	1.897480	0.639280

Figure 1. Crude Mu, gates and graduated Mu for Males, Immediate Annuitants, Lives, Dur 0+: GM(1,3) ML

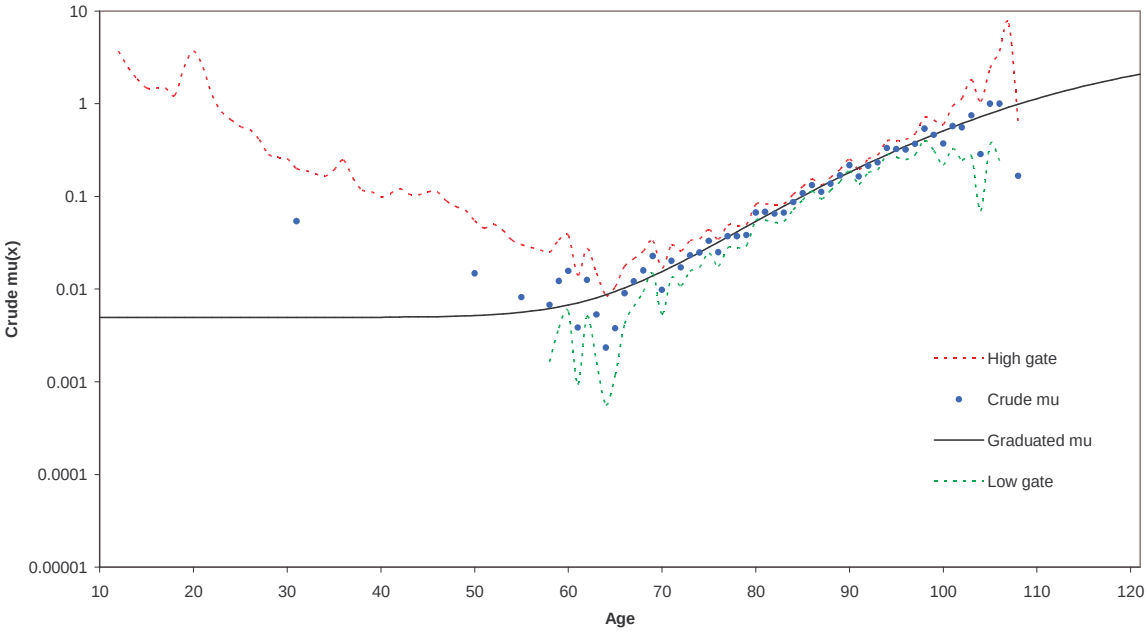
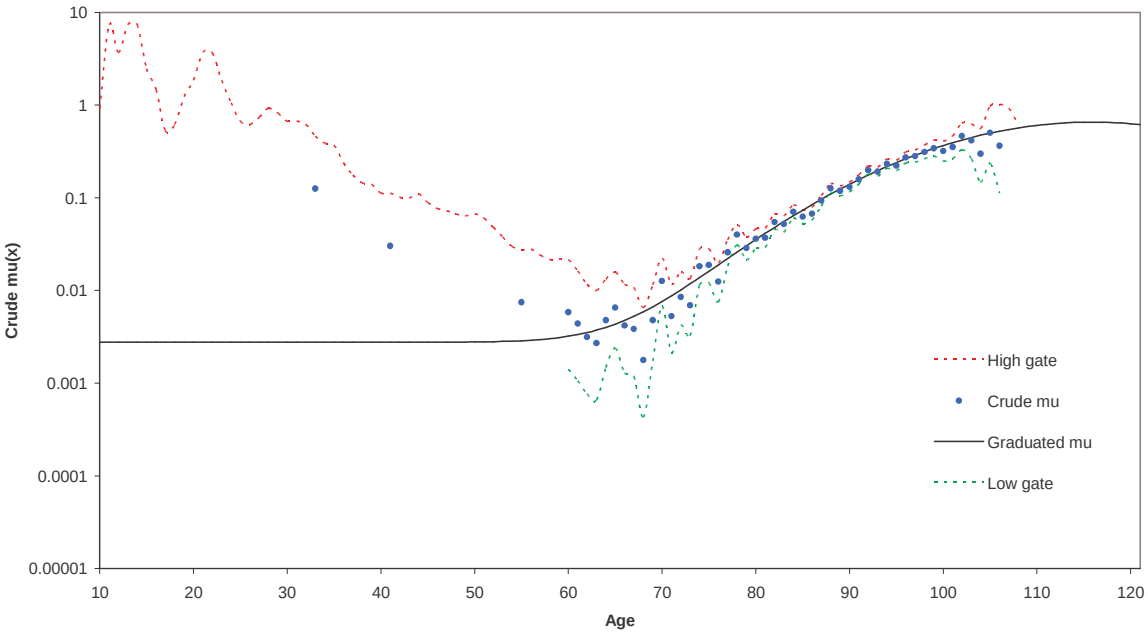


Figure 2. Crude Mu, gates and graduated Mu for Females, Immediate Annuitants, Lives, Dur 1+: GM(1,3) ML



Old age mortality rates

The Working Party has no credible data at the oldest ages, and so whatever mortality rates are published will necessarily be subjective. One option might be to stop the mortality tables at an age supported by the data (say 90). This, however, would not be particularly helpful to practitioners. We have therefore decided to "blend" the graduated formulae into an arbitrary upper limit, which we believe will provide a sensible and consistent end to the tables. The process we have used is summarised below.

Action	Assumption
1. Choose an age, ω, at which, arbitrarily, $q_{\omega-1} = 1$	$\omega = 121$, i.e. $q_{120} = 1$
2. Fix a value of $\mu_{\omega-1}$	$\mu_{120} = 1.0$
3. Choose a lower age, y, from which the blending will begin	$y = 100$

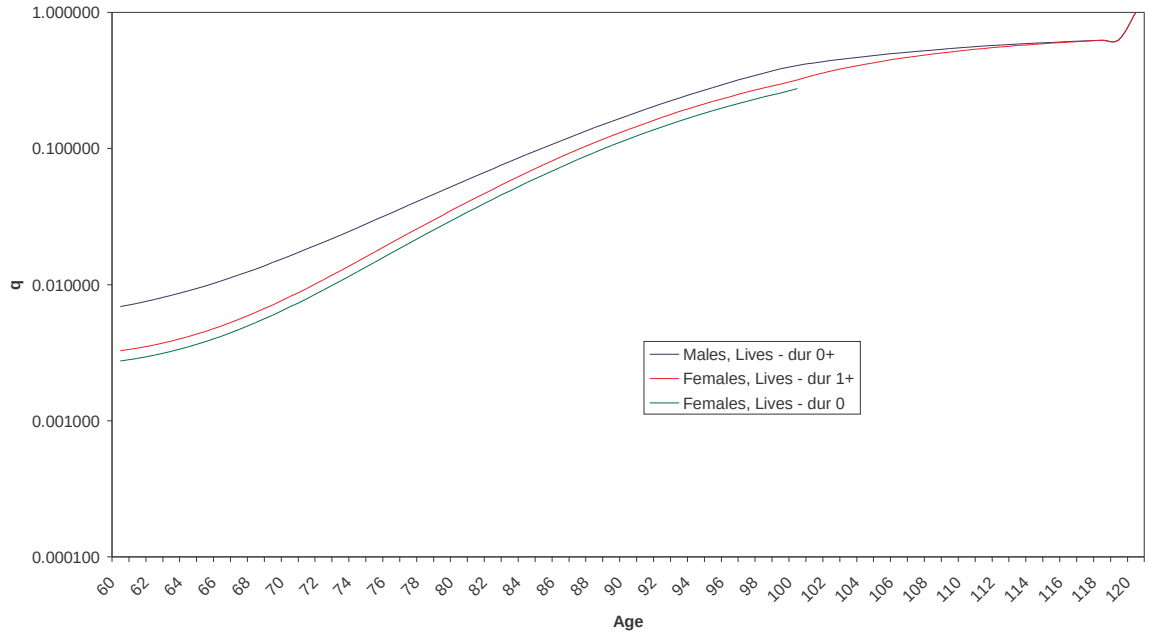
Values of μ are calculated according to the GM graduation formulae up to μ_{100}. μ_{120} is set to equal 1. Values of μ between 100 and 120 are then derived by interpolation between the two, using the formula:

$$\mu_x = \frac{(120-x)^{1.25}}{(120-100)^{1.25}} \times \mu_{100} + \left(1 - \frac{(120-x)^{1.25}}{(120-100)^{1.25}}\right) \times \mu_{120}$$

The power factor in the weights affects the speed (or "curvature") at which the rates blend into the target value. A value of 1 would simply be linear interpolation, i.e. a straight line. The value of 1.25 chosen leads to a slowing of the rate of increase of mortality rates by age. This feature would accord with views expressed at the Society of Actuaries International Symposium: Living to 100 and Beyond held in January 2005 (see for example *Ending the Mortality Table* by E C Hustead).

The final graduated rates are listed in the Appendix and are illustrated graphically below.

Figure 3. Immediate Annuitants, Lives - select and ultimate q



Comparison with 1999-2002 experience

Table 2 below shows how the graduated tables compare with the 1999-2002 experience.

Table 2. Immediate Annuitants, Lives, Males and Females, comparison basis IML00 ult and IFL00 sel

	Males, IML00 ult		Females, IFL00 sel			
Age	Duration 0+		Duration 0		Duration 1+	
Group	Deaths	100A/E	Deaths	100A/E	Deaths	100A/E
61-65	10	63	1	238	8	115
66-70	59	109	1	142	17	95
71-75	132	106	5	182	53	98
76-80	271	97	11	110	213	108
81-85	498	99	22	101	529	98
86-90	804	104	27	109	1,203	97
91-95	587	97	7	50	1,461	103
96-100	195	100	3	99	665	100
61-100	2,556	100	77	100	4,149	100

Extension of tables to younger ages

The proposed tables do not include rates below age 60. The Working Party would be interested to know whether users, in practice, would need younger ages for these tables. The CMI data does not inform as to what such rates should be, and so a possibility might be to blend into the assured lives rates.

Life Office Pensioners

This experience covers pensioners insured under life office pension schemes. Data is collected separately for those retiring at or after normal retirement age and those retiring early (i.e. before the normal retirement age). The latter category would include, but is not restricted to, ill-health retirements. In addition, data is collected for the experience of spouses granted pensions on the death of life office pension scheme members either in service or after retirement.

For ease of notation, we will refer to these three categories as "Normals", "Earlies" and "Widows" respectively.

For the "92" Series graduations, standard tables were produced for Normals and Widows only. Separate tables were produced for lives and amounts and, for Normals, for males and females. For Widows, only female tables were produced.

The Working Party is proposing, for the "00" Series graduations, to extend the pensioner 'family' of tables to include Earlies and "Combined" (comprising Normals and Earlies together). Combined "92" Series pensioner tables were graduated, but were not designated as standard. Again, there is insufficient data to justify a graduation of widower mortality.

Data are available by duration up to 10 years and over (5 and over for Widows). There is some evidence of select effects at shorter durations; however the consultation process did not suggest to us that there was a desire for pensioner select rates to be graduated and so this has not been done.

Graduations were carried out by fitting GM formulae over the age range 45-97 (55-98 for Widows). The curves with the best fit over the main range of data were chosen, recognising that these could lead to clearly unsuitable shapes at the extremes of age and that subsequent adjustments will need to be made at these younger and older ages for the final tables. For the amounts experiences, exposures and deaths were divided by a 'scaling factor' based on the average pension size for the relevant experience before the graduations were carried out; this does not affect the crude (or graduated) mortality rates, but does allow meaningful confidence intervals to be calculated.

Details of the initial graduations and their graphical presentations are given in the following tables and figures.

Table 3. Unadjusted graduations for the 1999-2002 life office pensioner experiences: Normals

Sex	Male	Male	Female	Female
Category	Normal	Normal	Normal	Normal
Lives / Amounts	Lives	Amounts	Lives	Amounts
Durations in ultimate	0+	0+	0+	0+
GM formula	GM(1,4)	GM(1,3)	GM(2,2)	GM(2,2)
Age range fitted	45-97	45-97	45-97	45-97
Amounts scaling factor		2,373.06		1,269.45
Optimised parameters				
$100\times a_1$	0.802951	0.592331	–1.407288	–0.873144
$100\times a_2$			–3.778481	–2.532105
b_1	–10.196636	–7.397703	–3.602183	–3.894701
b_2	15.407579	9.134072	4.552974	4.973934
b_3	–5.859048	–2.868544		
b_4	1.872415			
Selected μ_x				
μ_{60}	0.009117	0.007304	0.004452	0.003858
μ_{80}	0.069554	0.059223	0.046143	0.041232
μ_{100}	0.353055	0.334145	0.382041	0.378463
μ_{119}	2.871654	0.342925	2.311424	2.630256

Table 4. Unadjusted graduations for the 1999-2002 life office pensioner experiences: Earlies

Sex	Male	Male	Female	Female
Category	Early	Early	Early	Early
Lives / Amounts	Lives	Amounts	Lives	Amounts
Durations in ultimate	0+	0+	0+	0+
GM formula	GM(1,4)	GM(1,4)	GM(2,2)	GM(0,5)
Age range fitted	45-97	45-97	45-97	45-97
Amounts scaling factor		2,557.63		1,076.12
Optimised parameters				
$100\times a_1$	0.673320	–0.136071	–3.047197	
$100\times a_2$			–6.446960	
b_1	–8.903854	–2.410636	–3.065582	7.065115
b_2	13.353462	0.481060	3.595655	–5.594119
b_3	–4.913046	1.470896		15.031700
b_4	1.645541	–1.565250		–3.988009
b_5				3.700078
Selected μ_x				
μ_{60}	0.008932	0.007298	0.005137	0.004762
μ_{80}	0.077538	0.060766	0.052342	0.047157
μ_{100}	0.354456	0.342068	0.334100	1.119227
μ_{119}	2.768293	0.151877	1.487510	2,444,124

Table 5. Unadjusted graduations for the 1999-2002 life office pensioner experiences: Combined

Sex	Male	Male	Female	Female
Category	Combined	Combined	Combined	Combined
Lives / Amounts	Lives	Amounts	Lives	Amounts
Durations in ultimate	0+	0+	0+	0+
GM formula	GM(1,4)	GM(1,3)	GM(2,2)	GM(2,2)
Age range fitted	45-97	45-97	45-97	45-97
Amounts scaling factor		2,436.03		1,211.67
Optimised parameters				
$100\times a_1$	0.735863	0.536403	–1.594305	–1.286105
$100\times a_2$			–4.144155	–3.607197
b_1	–9.258547	–6.688640	–3.511518	–3.693170
b_2	13.714773	8.359170	4.377971	4.602553
b_3	–5.064792	–2.286393		
b_4	1.565239			
Selected μ_x				
μ_{60}	0.008935	0.007281	0.004782	0.004269
μ_{80}	0.071604	0.059659	0.047421	0.042420
μ_{100}	0.348109	0.361320	0.372015	0.359404
μ_{119}	2.253534	0.553099	2.122504	2.216239

Table 6. Unadjusted graduations for the 1999-2002 life office pensioner experiences: Widows

Sex	Female	Female
Category	Widows	Widows
Lives / Amounts	Lives	Amounts
Durations in ultimate	0+	0+
GM formula	GM(1,2)	GM(1,2)
Age range fitted	55-98	55-98
Amounts scaling factor		1,796.46
Optimised parameters		
$100\times a_1$	0.307161	0.269451
b_1	–4.235211	–4.468221
b_2	5.258961	5.839618
Selected μ_x		
μ_{60}	0.008129	0.006261
μ_{80}	0.044515	0.039567
μ_{100}	0.342723	0.383887
μ_{119}	2.508778	3.509146

Figure 4. Crude Mu, gates and graduated Mu for Males, Normals, Lives: GM(1,4) ML

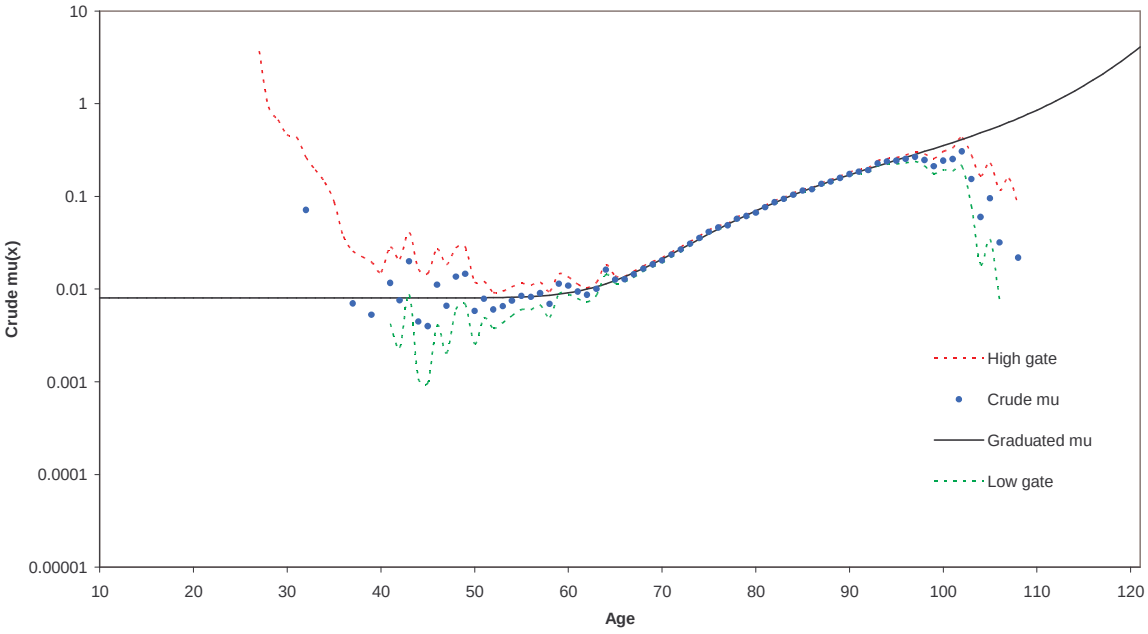


Figure 5. Crude Mu, gates and graduated Mu for Males, Normals, Amounts: GM(1,3) ML

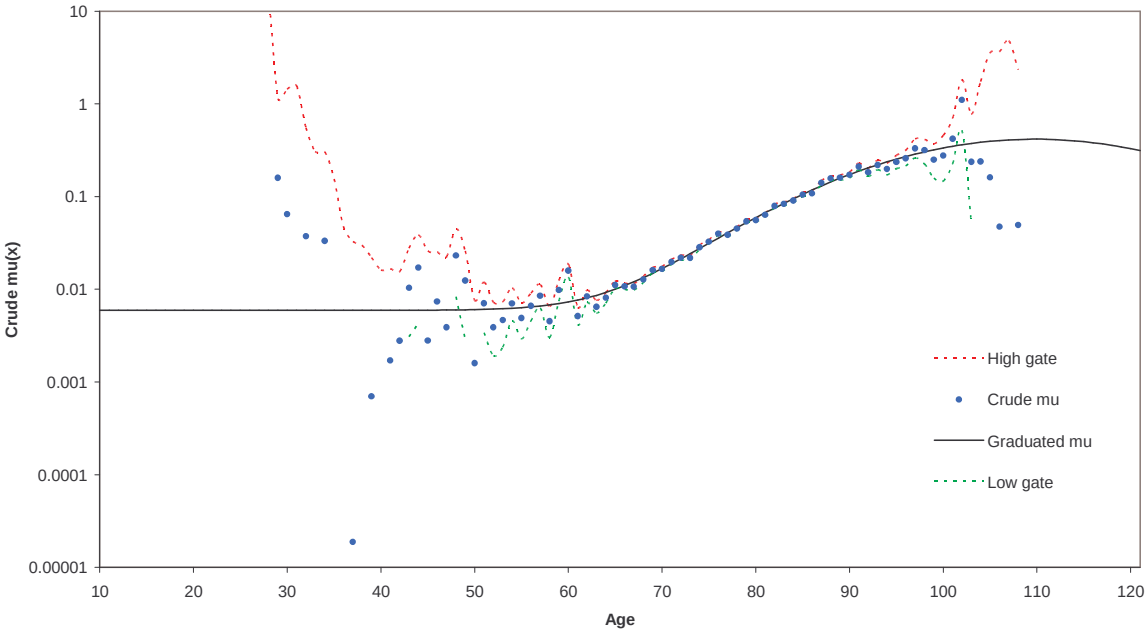


Figure 6. Crude Mu, gates and graduated Mu for Females, Normals, Lives: GM(2,2) ML

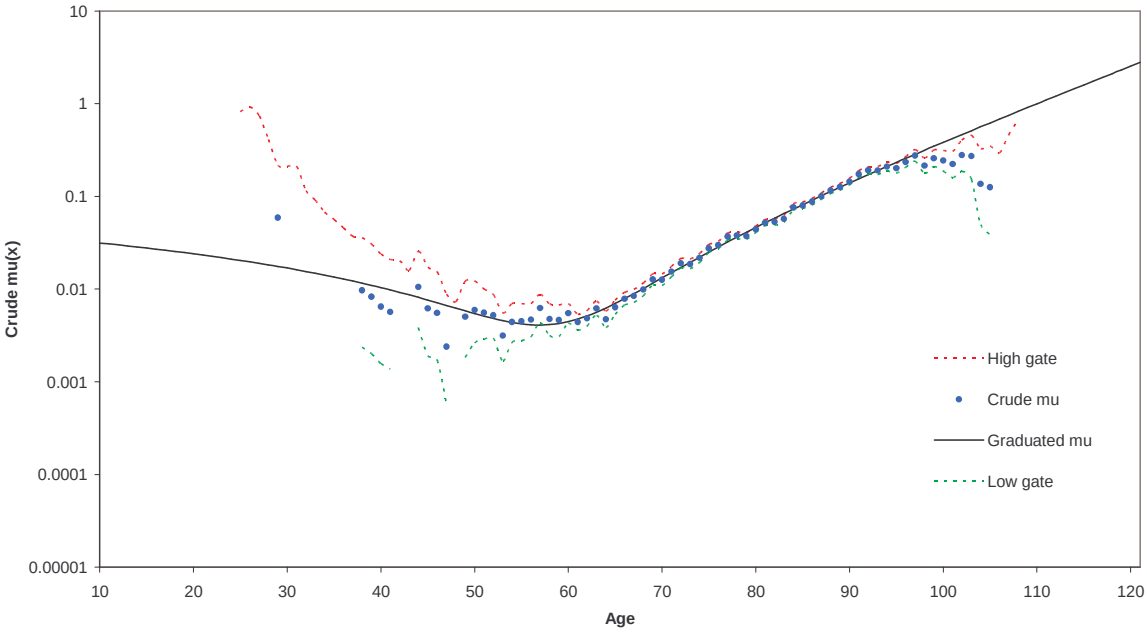


Figure 7. Crude Mu, gates and graduated Mu for Females, Normals, Amounts: GM(2,2) ML

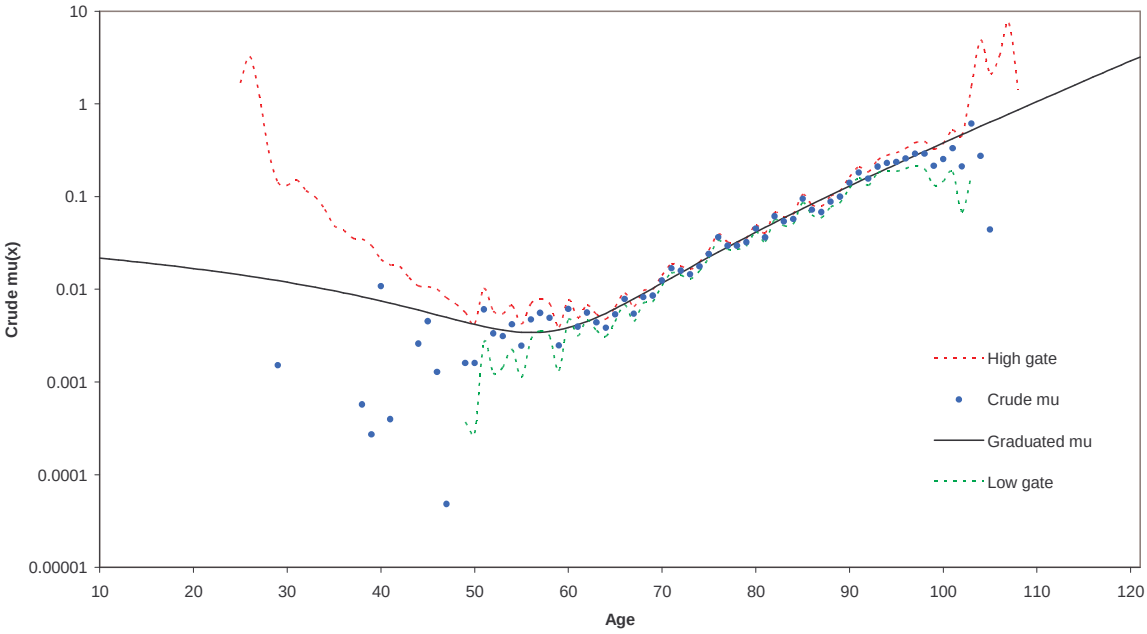


Figure 8. Crude Mu, gates and graduated Mu for Males, Earlies, Lives: GM(1,4) ML

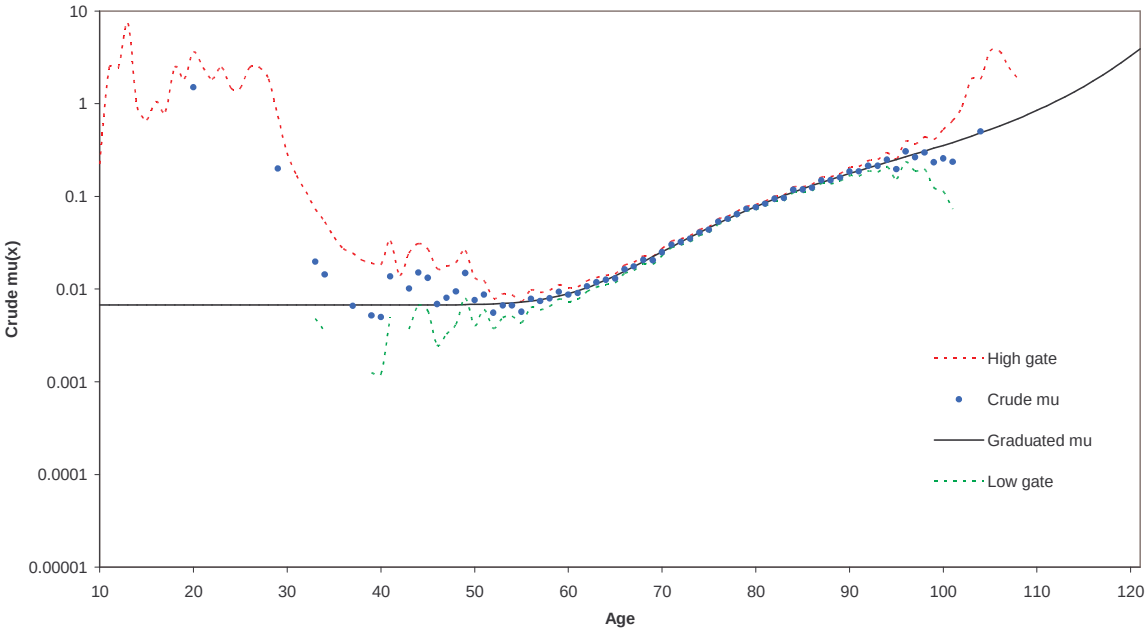


Figure 9. Crude Mu, gates and graduated Mu for Males, Earlies, Amounts: GM(1,4) ML

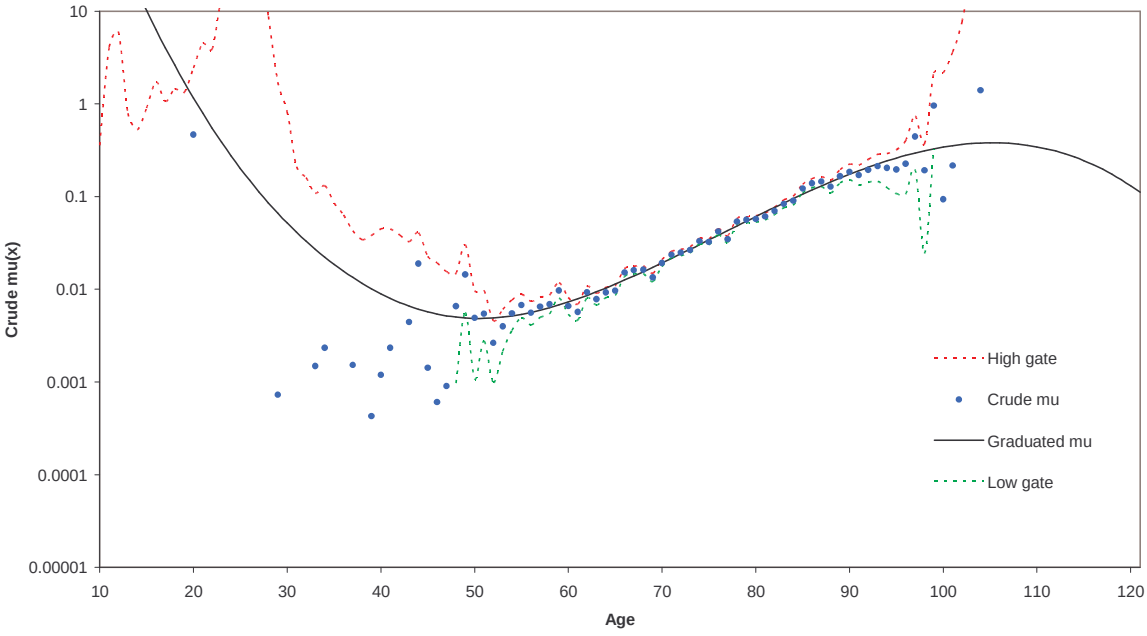


Figure 10. Crude Mu, gates and graduated Mu for Females, Earlies, Lives: GM(2,2) ML

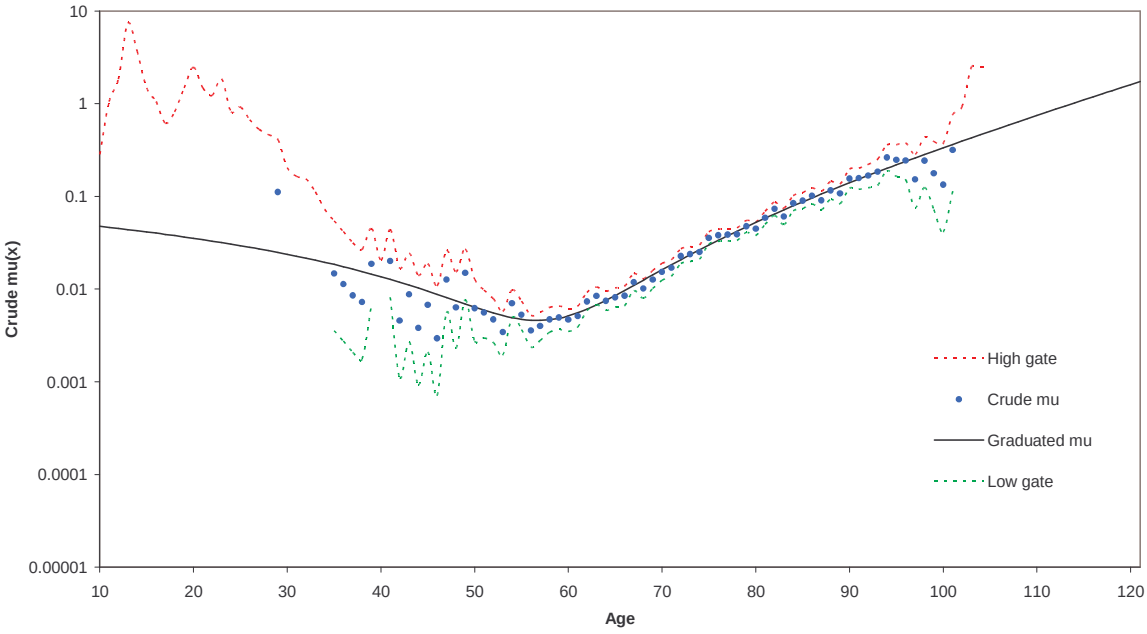


Figure 11. Crude Mu, gates and graduated Mu for Females, Earlies, Amounts: GM(0,5) ML

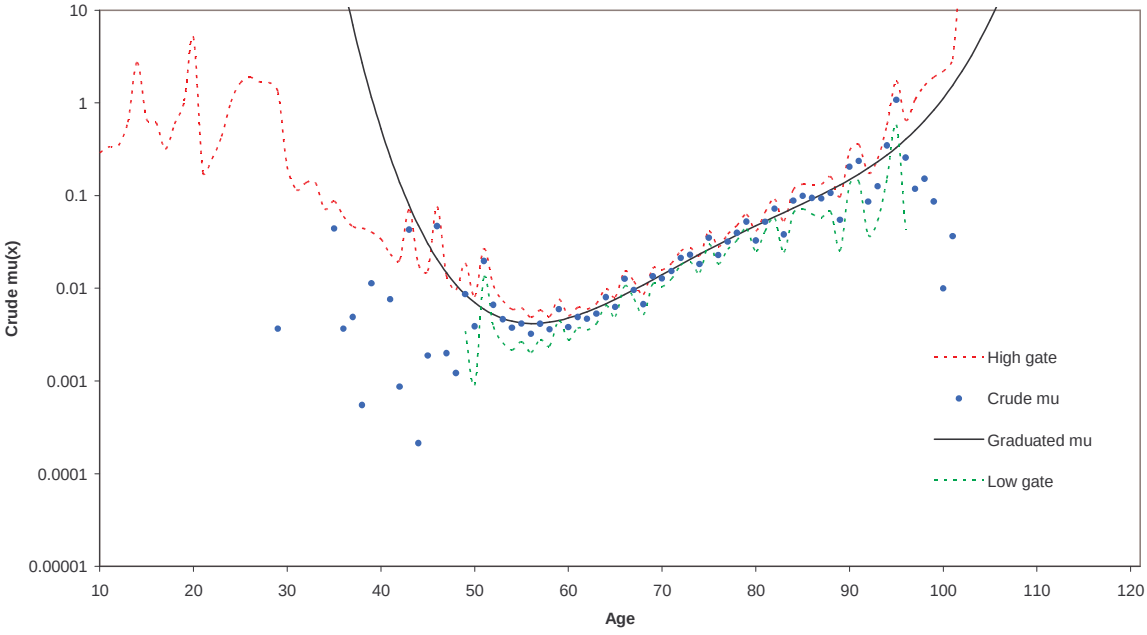


Figure 12. Crude Mu, gates and graduated Mu for Males, Combined, Lives: GM(1,4) ML

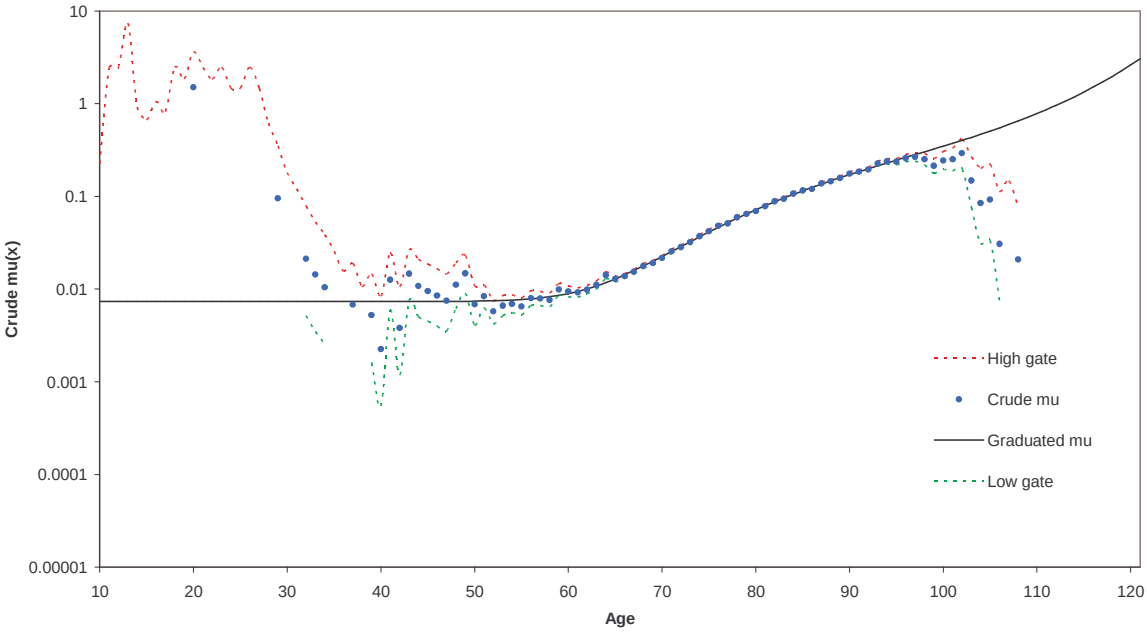


Figure 13. Crude Mu, gates and graduated Mu for Males, Combined, Amounts: GM(1,3) ML

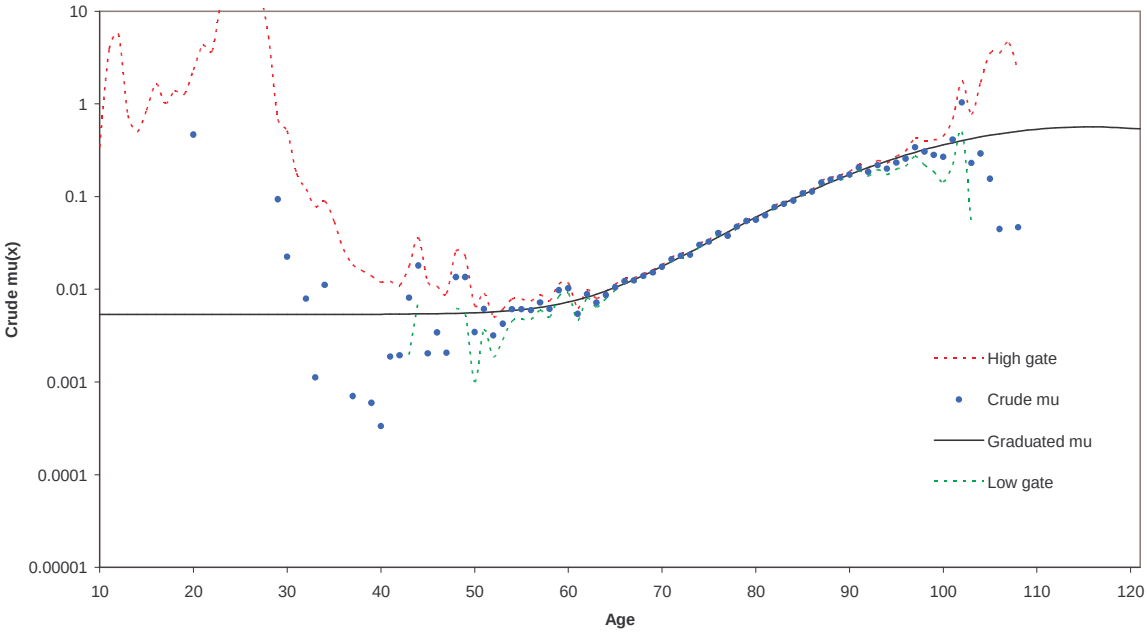


Figure 14. Crude Mu, gates and graduated Mu for Females, Combined, Lives: GM(2,2) ML

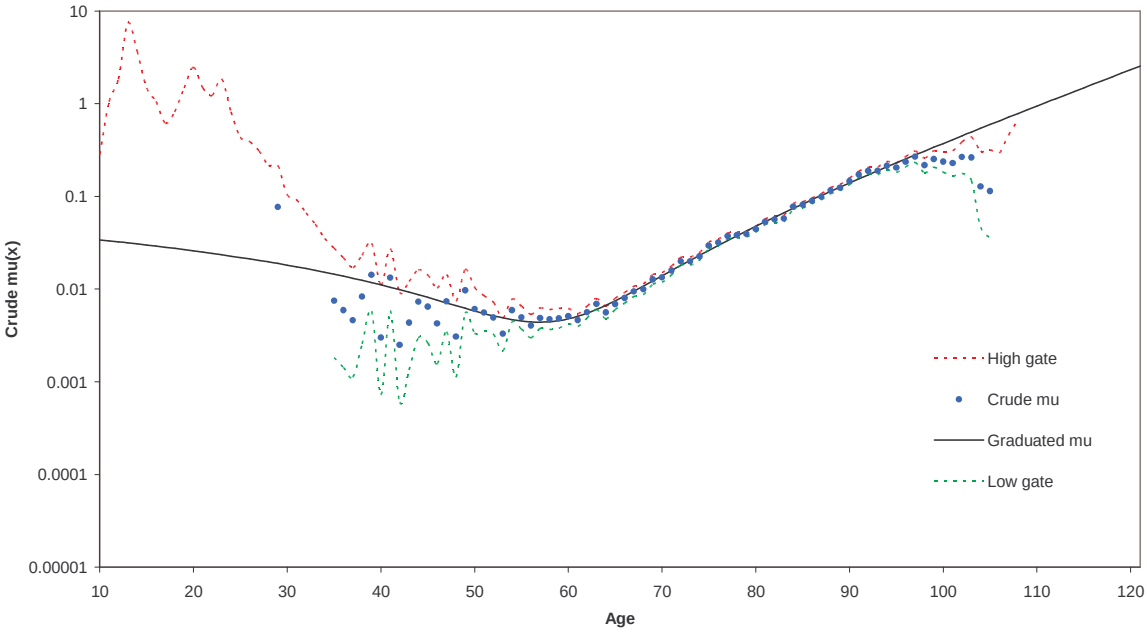


Figure 15. Crude Mu, gates and graduated Mu for Females, Combined, Amounts: GM(2,2) ML

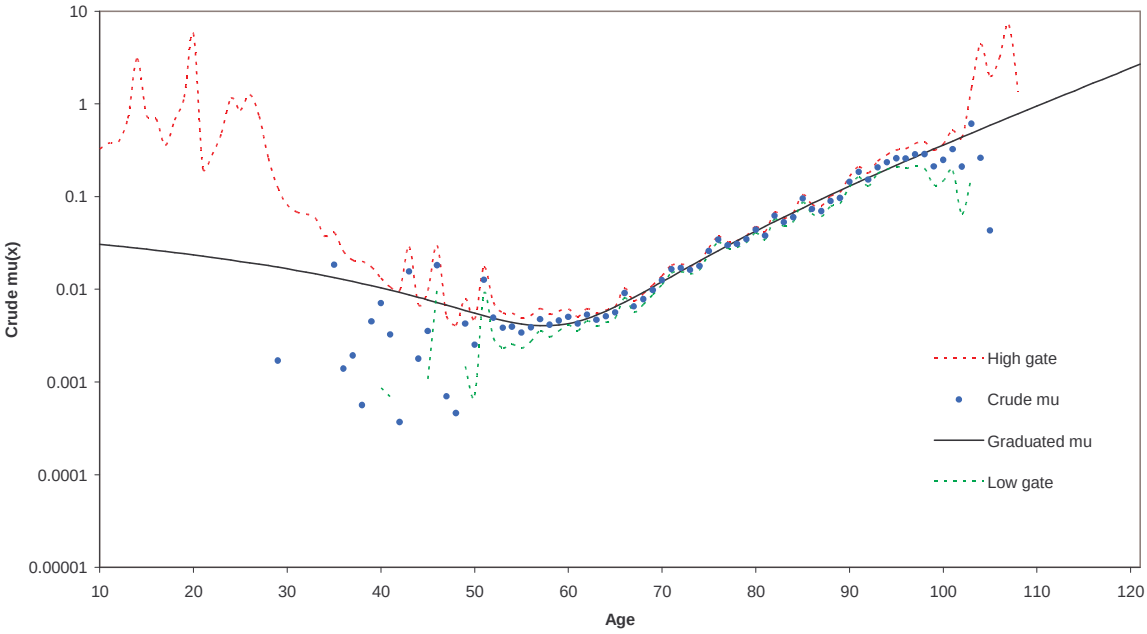


Figure 16. Crude Mu, gates and graduated Mu for Females, Widows, Lives: GM(1,2) ML

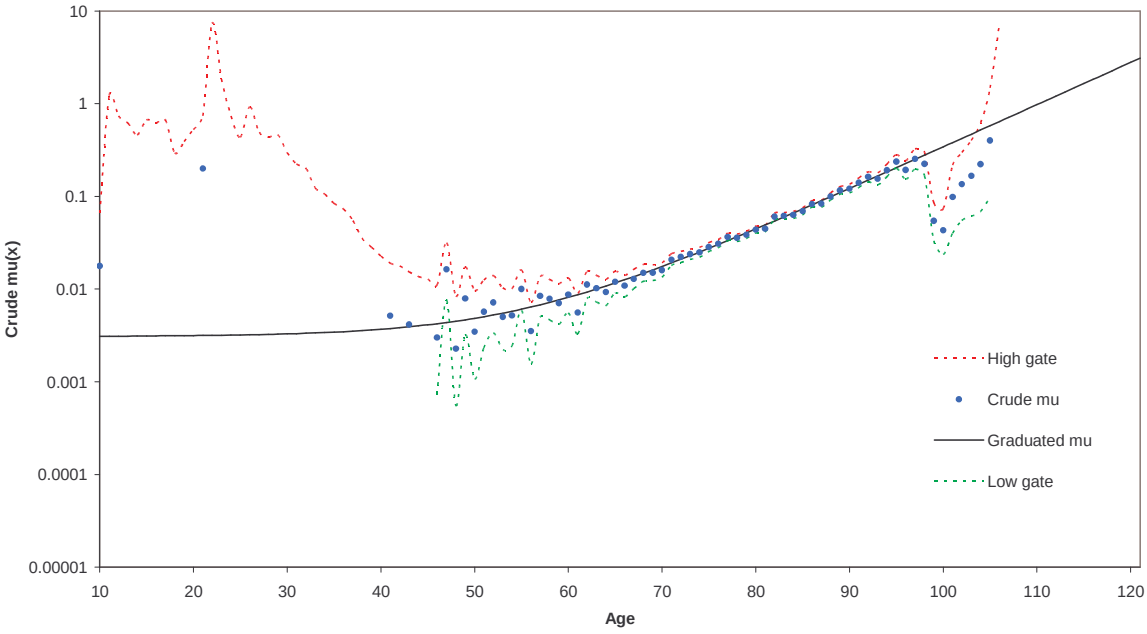
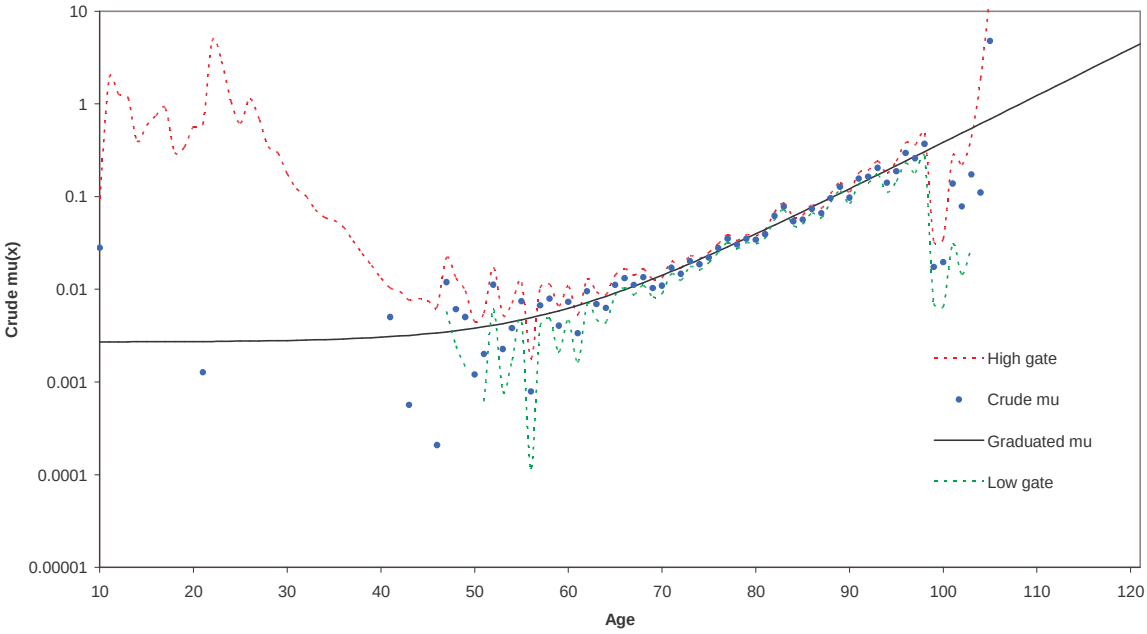


Figure 17. Crude Mu, gates and graduated Mu for Females, Widows, Amounts: GM(1,2) ML



Adjustments

The 'best' curves fitted over the main age range do not necessarily produce sensible results outside the range – in particular, the curves sometimes increase or decrease at a rapid rate at ages above about 100 and below about 50. We have therefore made a number of adjustments to address this.

Furthermore, there are certain relationships between the various categories that we deem to be sensible. For example, we would expect the following relationships to hold generally for a particular age:

- Male rates > Female rates
- Lives rates > Amounts rates
- Early rates > Combined rates > Normal rates

However, there are occasions where the fitted curves cross over, transgressing these relationships. We have therefore added some constraints to avoid this.

Old ages

The approach of blending the old age mortality rates into a fixed upper limit used for the assured lives graduations has been adopted for these experiences. Again we targeted a value of $\mu_{120} = 1$. Unlike the assured lives, the age from which the blending begins and the rate of "curvature" varied by experience in order to produce sensible values of μ_{100} (broadly in the range 0.35 – 0.45). These are summarised in the table below.

Table	Run-in age	Curvature	μ_{100}
Male, Normal, Lives	96	0.75	0.358201
Male, Early, Lives	96	0.75	0.360800
Male, Combined, Lives	97	0.80	0.358178
Male, Normal, Amounts	97	0.70	0.353307
Male, Early, Amounts	94	0.70	0.369564
Male, Combined, Amounts	97	0.80	0.374128
Female, Normal, Lives	97	0.85	0.364379
Female, Early, Lives	95	0.80	0.346480
Female, Combined, Lives	97	0.90	0.364339
Female, Normal, Amounts	97	0.90	0.361713
Female, Early, Amounts	95	0.70	0.426606
Female, Combined, Amounts	97	0.90	0.353212
Widows, Lives	98	0.90	0.337616
Widows, Amount	98	1.10	0.373708

Young ages

There is very little data at the younger ages, and so we are proposing that the standard tables for the Pensioners start at age 50. For females, we observe a "U-shape" to the crude mortality rates in the 50s of age, where rates initially fall as age increases before starting to rise. For males, a flatter shape is observed at these younger ages.

The graduated curves for the male experiences did not exhibit a U-shape at younger ages, except for the Earlies, amounts, and here the minimum of the graduation was at age 50. Thus, the graduated curves were adopted without amendment before the adjustments discussed in the next section were made to ensure the expected relationships between the different experiences.

For females the U-shape is retained for Earlies, removed for Normals but is not completely removed for Combined lives. The Combined rates were adjusted to be the weighted average between Early and Normal rates with the age at which the rates are blended into the graduated rates selected to preserve consistency and to remove large kinks in the rates. The minimum rate for Combined lives (as seen in Table A8 in the Appendix) is age 56. The adjustments were made by starting with arbitrary values of μ_{16} and blending them into the graduated values of μ_{57} for the Normals, lives and amounts, and Combined, amounts experiences, and into the value of μ_{54} for the Combined, lives experience. The starting values of μ_{16} are 0.00020 for Normals, lives, 0.00015 for Normals, amounts, 0.003476 for Combined, lives and 0.003328 for Combined, amounts. In each case the curvature parameter is 1.0.

For the Widows, we recognise that rates below age 50 are likely to be needed. However, again there is very little data. We therefore propose to use a blending method, similar to the approach we have used at the older ages. In this case, we start with arbitrary values of μ_{16} and blend them into the graduated values of μ_{55}. The starting values of μ_{16} are 0.00020 for lives and 0.00015 for amounts, and the curvature parameter is 1.15.

'Crossovers'

The chosen curves sometimes cross over in undesirable ways, generally at younger and older ages. These tend to be features of the curves, rather than the data itself, which is sparse at the extremities of age. The ages at which these crossovers occur are summarised in the tables below.

Category	Amounts > Lives
Males, Combined	90-101
Males, Normal	90-97
Males, Early	17-42, 91-98
Females, Combined	109+
Females, Normal	102+
Females, Early	17-51, 89+

Category	Males < Females
Amounts, Combined	17-49, 102+
Amounts, Normal	17-44, 98+
Amounts, Early	17-52, 93+
Lives, Combined	17-46, 98-117
Lives, Normal	17-44, 97-115
Lives, Early	17-49

Category	Normal > Combined	Early < Combined
Males, Amounts	17-60, 82-90	46-59, 96+
Males, Lives	17-61, 95+	17-59
Females, Amounts	90+	N/A
Females, Lives	91+	91+

A number of constraints have been used to ensure that the relativities of the different tables remain sensible. The approach generally taken was to consider the graduations for the Combined experiences as the 'main' graduations and then consider how the Normal and Early graduations might be adjusted in relation to them. This was done by taking the rate for a given age to be:

$\text{Combined}^{adj} = \text{Combined}$
$\text{Normal}^{adj} = \text{MIN}\{\text{Normal, Combined}\}$
$\text{Early}^{adj} = \text{MAX}\{\text{Early, Combined}\}$

This was carried out separately for the amounts and lives experiences. For males, this results in the same mortality rates being proposed for the three amounts categories up to age 59 and for the three lives categories up to age 60.

There is no particular theoretical justification for taking this approach – it is a pragmatic way to ensure consistency between the various sections. Exceptions to the general approach were:

- For males Normals, mortality rates were higher than the Combined rates for ages 82 to 90. Beyond age 90 the Normal mortality rates were again lower than the Combined rates. Although this feature of the two curves converging then diverging, or even crossing over and back again, could have been retained, it was felt that once there had been a crossover the Combined rates should be maintained for the older ages and at these ages the Combined rates were used. Hence, for males, Normals, amounts the Combined rates were used from ages 91 onwards, even though the graduated Normal rates at these ages were lower than the Combined rates.

- Further adjustments were made after a comparison of lives against amounts. Mortality rates for male lives were lower than for amounts from age 90 for Combined and Normals and from age 91 for Earlies. It was decided to adjust the lives rates to equal the amounts rates at these ages, partly to avoid the male rates dropping below the female

rates. This results in the same mortality rates being adopted for each of the six male categories from age 99 onwards, and for Combined and Normals from age 90 onwards.

— For females, no adjustments are required at younger ages for Combined and Normals. For Earlies, amounts the use of a GM(0,5) curve causes the the mortality rates at the youngest ages to increase very rapidly as age decreases. Also, the unadjusted Early graduated rates at age 50 for amounts are higher than for lives. There is no obvious adjustment; we propose that the Early amounts equal the Early lives up to age 52.

— At older ages, for Combined amounts, the female rates rise above the male rates from age 106 and for combined lives from age 103. These rates have been adjusted to equal the equivalent male rates from these ages.

— For female Normal lives, Combined rates are adopted beyond age 100 even though the Normal lives rates are lower than the Combined rates at these ages following a crossover between ages 91 and 100 (similar to the adjustments made in the case of males Normals amounts.)

— For females Earlies, the graduated amounts rates at ages 89 and above are higher than for lives. The amounts rates have therefore been set to equal the lives rates at these ages to ensure the resulting rates did not exceed the equivalent male rates.

The age ranges over which the Normal and Early rates differ from the Combined are summarised below.

Category	Age range
Normal, Males, Amounts	61-81
Normal, Males, Lives	62-89
Early, Males, Amounts	60-98
Early, Males, Lives	61-98
Normal, Females, Amounts	50-89
Normal, Females, Lives	50-90
Early, Females, Amounts	52-105
Early, Females, Lives	50-90

There is also convergence to the same mortality rates for all male experiences from age 99 and for females from age 106, from which the female rates also equal the male rates.

For Widows, the lives rates were lower than the amounts rates at ages 91 and over. As the lives value of μ_{100} was relatively low, the lives rates were set to equal the amounts rates for these ages.

Final proposed rates are set out in the Appendix, and are represented graphically in the following figures.

Figure 18. Pensioners, Males, Lives and Amounts - values of q

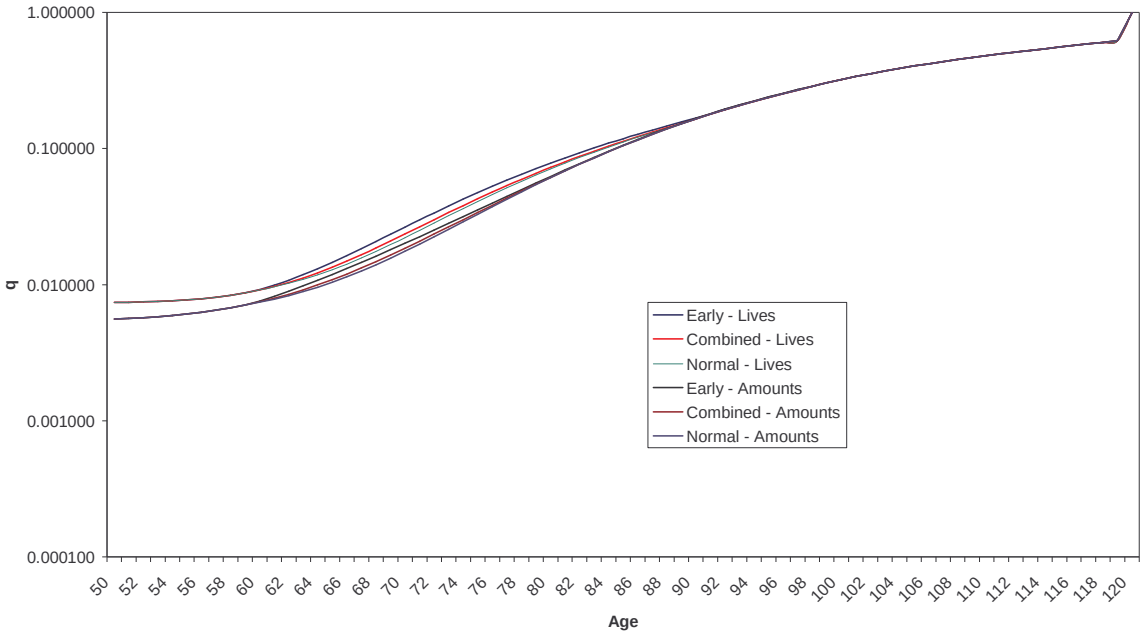


Figure 19. Pensioners, Females, Lives and Amounts - values of q

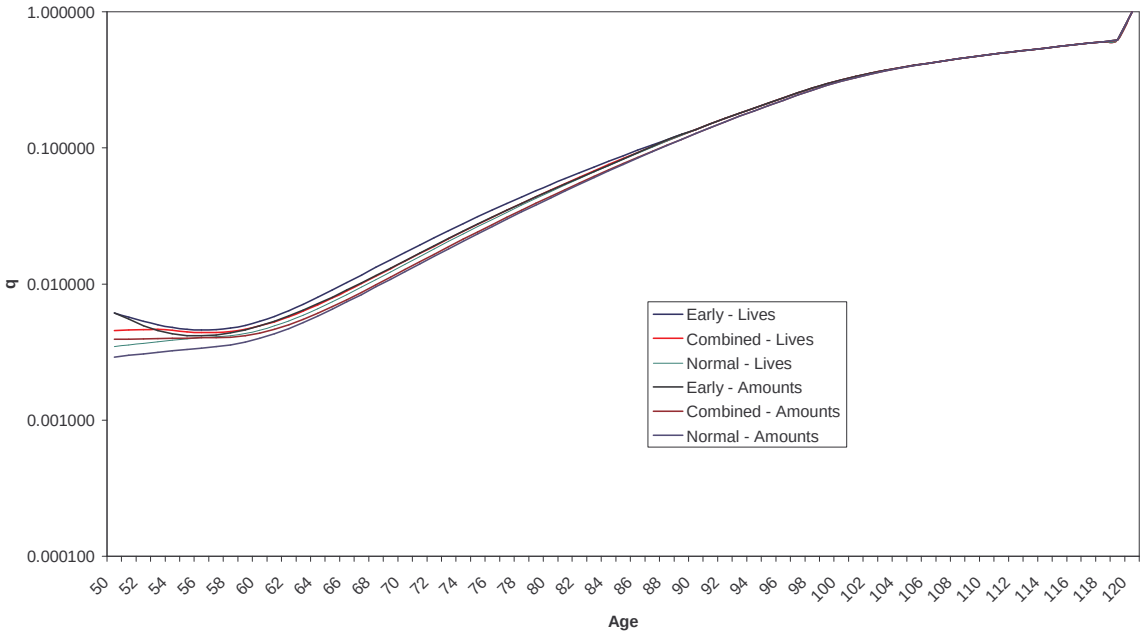
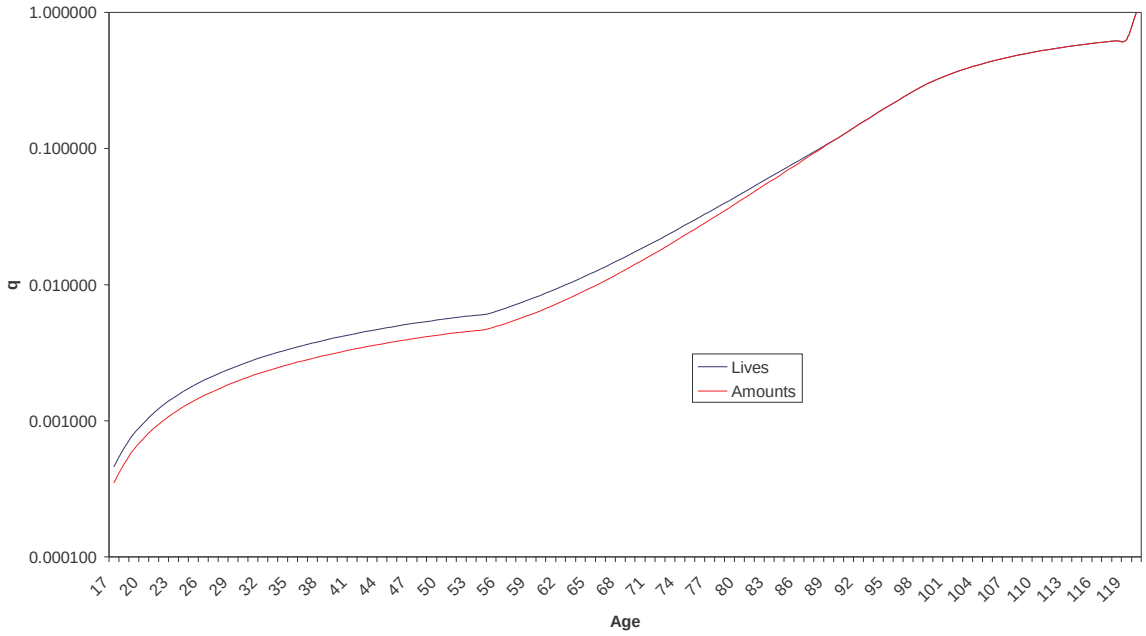


Figure 20. Widows, Lives and Amounts - values of q



Comparison with 1999-2002 experience

Tables 7 to 11 below show how the graduated tables compare with the 1999-2002 experience.

Table 7. Life Office Pensioners, Lives, Females, comparison bases PFL00, PEFL00 and PCFL00

Age	Normals, PFL00		Earlies, PEFL00		Combined, PCFL00	
Group	Deaths	100A/E	Deaths	100A/E	Deaths	100A/E
51-55	58	118	89	105	147	107
56-60	152	123	174	93	326	105
61-65	549	92	346	106	895	97
66-70	837	99	378	92	1,215	97
71-75	1,470	103	610	104	2,080	104
76-80	2,678	101	801	99	3,479	101
81-85	2,873	97	583	102	3,456	97
86-90	2,912	100	377	97	3,289	100
91-95	2,038	104	183	104	2,221	104
96-100	657	88	37	74	694	87
51-100	14,224	100	3,578	100	17,802	100

Table 8. Life Office Pensioners, Amounts, Females, comparison bases PFA00, PEFA00 and PCFA00

Age	Normals, PFA00		Earlies, PEFA00		Combined, PCFA00	
Group	Deaths	100A/E	Deaths	100A/E	Deaths	100A/E
51-55	51,176	114	92,446	129	143,622	121
56-60	167,781	138	174,457	95	342,238	111
61-65	615,343	91	346,588	93	961,931	93
66-70	1,075,761	93	485,731	101	1,561,592	97
71-75	2,078,528	102	638,984	107	2,717,512	103
76-80	3,277,955	106	518,140	95	3,796,095	104
81-85	2,344,710	99	260,333	103	2,605,043	98
86-90	1,314,292	87	101,361	94	1,415,653	87
91-95	843,201	113	49,468	125	892,669	114
96-100	212,388	97	2,593	59	214,981	96
51-100	11,981,135	100	2,670,201	101	14,651,336	100

Table 9. Life Office Pensioners, Lives, Males, comparison bases PML00, PEML00 and PCML00

Age	Normals, PML00		Earlies, PEML00		Combined, PCML00	
Group	Deaths	100A/E	Deaths	100A/E	Deaths	100A/E
51-55	115	97	195	85	310	89
56-60	256	113	507	99	763	104
61-65	1,110	106	1,234	99	2,344	104
66-70	4,124	97	2,069	100	6,193	97
71-75	6,590	102	3,341	99	9,931	101
76-80	10,921	99	5,056	102	15,977	100
81-85	12,351	100	4,217	99	16,568	100
86-90	11,823	100	2,580	100	14,403	100
91-95	5,088	98	861	98	5,949	98
96-100	1,072	85	121	95	1,193	86
51-100	53,450	99	20,181	100	73,631	100

Table 10. Life Office Pensioners, Amounts, Males, comparison bases PMA00, PEMA00 and PCMA00

Age	Normals, PMA00		Earlies, PEMA00		Combined, PCMA00	
Group	Deaths	100A/E	Deaths	100A/E	Deaths	100A/E
51-55	155,175	93	238,185	90	393,360	91
56-60	701,882	148	921,321	106	1,623,203	121
61-65	2,541,136	94	2,462,718	88	5,003,854	92
66-70	8,800,258	98	5,515,119	102	14,315,377	100
71-75	14,184,787	101	8,785,840	103	22,970,627	101
76-80	23,389,320	100	8,733,054	100	32,122,374	100
81-85	19,067,230	99	5,126,229	96	24,193,459	98
86-90	12,687,426	102	2,440,653	107	15,128,079	103
91-95	3,584,702	98	434,167	91	4,018,869	97
96-100	568,351	96	52,339	105	620,690	97
51-100	85,680,267	100	34,709,625	100	120,389,892	100

Table 11. Widows, Lives and Amounts, comparison bases WL00 and WA00

Age	Lives, WL00		Amounts, WA00	
Group	Deaths	100A/E	Deaths	100A/E
41-45	2	37	3,714	27
46-50	14	120	28,823	116
51-55	34	116	68,599	120
56-60	62	100	119,246	98
61-65	158	97	291,586	97
66-70	424	93	728,544	96
71-75	1,188	103	1,752,142	96
76-80	2,272	100	3,377,948	101
81-85	2,604	99	3,690,946	105
86-90	2,312	100	2,772,356	94
91-95	994	102	1,126,730	104
96-100	201	56	262,125	51
41-100	10,265	98	14,222,759	98

The table below shows values of 100 A/Es for the age range 51-100 of each of the sections, split by duration. The comparison basis is the table appropriate to the section (e.g. PEMA00 for males, Earlies, amounts), which is of course an ultimate table. This gives an indication of the select characteristics of the data.

	Duration											
	0	1	2	3	4	5	6	7	8	9	10+	0+
FLN	96	87	89	82	90	85	98	98	104	111	101	100
FLE	112	64	100	93	97	90	87	101	84	96	102	100
FLC	98	78	90	84	92	86	95	98	98	107	101	100
FAN	79	77	78	98	74	170	104	90	80	94	103	100
FAE	126	73	105	77	92	72	74	95	77	89	107	101
FAC	88	74	82	92	78	145	97	91	79	92	104	100
MLN	97	97	88	98	90	95	96	97	93	99	101	99
MLE	108	76	86	88	82	87	94	100	102	102	101	100
MLC	97	90	85	93	86	91	94	97	95	99	101	100
MAN	88	95	84	105	100	93	96	110	86	97	102	100
MAE	100	69	66	84	77	104	92	102	121	111	101	100
MAC	90	86	78	98	92	95	94	107	97	101	102	100

Key to labels:
F = females, M = males
L = lives, A = amounts
N = Normals, E = Earlies, C = Combined

Extension of tables to younger ages

The proposed (non-Widows) tables do not include rates below age 50. The Working Party would be interested to know whether users, in practice, would need younger ages for these tables. The CMI data does not inform as to what such rates should be, and so a possibility might be to blend into the assured lives rates.

Retirement Annuitants and Personal Pensioners

The CMI carries out investigations into the mortality experience of retirement annuities effected under Section 620 of ICTA 1988 ("Retirement Annuitants") and of personal pension policies effected under Chapter IV of Part XIV of ICTA 1988 ("Personal Pensioners"). Each of these investigations is split into two sections – in deferment and in payment. Only lives data is collected for these investigations.

For the "92" Series, standard tables were produced for the in payment ("Vested") section of the Retirement Annuitants only. Non-standard tables were also graduated for the in deferment ("Deferred") section, and also for Vested and Deferred combined. No tables were graduated for the Personal Pensioner experience, since that type of product had only been in existence since 1988, and insufficient data volumes had been built up.

We now propose a more comprehensive suite of tables for these experiences, covering all of the sections described above, namely:

- Retirement Annuitants, Males, Deferred
- Retirement Annuitants, Males, Vested
- Retirement Annuitants, Males, Combined
- Retirement Annuitants, Females, Deferred
- Retirement Annuitants, Females, Vested
- Retirement Annuitants, Females, Combined
- Personal Pensioners, Males, Deferred
- Personal Pensioners, Males, Vested
- Personal Pensioners, Males, Combined
- Personal Pensioners, Females, Deferred
- Personal Pensioners, Females, Vested
- Personal Pensioners, Females, Combined

The data collected for these investigations does not include information on duration, and so select effects cannot be measured. The proposed tables are therefore 'duration 0+ ultimate'.

Details of the initial graduations and their graphical presentations are given in the following tables and figures.

Table 12. Unadjusted graduations for the 1999-2002 retirement annuitant experiences: males

Sex	Male	Male	Male
Category	Deferred	Vested	Combined
Lives / Amounts	Lives	Lives	Lives
Durations in ultimate	0+	0+	0+
GM formula	GM(1,3)	GM(2,2)	GM(1,3)
Age range fitted	30-75	45-95	30-95
Optimised parameters			
$100\times a_1$	0.041244	–1.881491	0.037871
$100\times a_2$		–6.446652	
b_1	–5.954870	–3.260284	–4.289179
b_2	3.983058	4.292047	5.834998
b_3	–1.616713		–0.286044
b_4			
Selected μ_x			
μ_{30}	0.000481	0.033997	0.000498
μ_{65}	0.008903	0.012617	0.010508
μ_{100}	0.044908	0.446567	0.492964
μ_{119}	0.029422	2.493195	3.208642

Table 13. Unadjusted graduations for the 1999-2002 retirement annuitant experiences: females

Sex	Female	Female	Female
Category	Deferred	Vested	Combined
Lives / Amounts	Lives	Lives	Lives
Durations in ultimate	0+	0+	0+
GM formula	GM(0,2)	GM(2,2)	GM(1,3)
Age range fitted	30-75	45-95	30-95
Optimised parameters			
$100\times a_1$		–0.617486	–0.005052
$100\times a_2$		–2.807680	
b_1	–4.787615	–4.152614	–3.512802
b_2	4.035249	5.410052	5.364421
b_3			1.068144
b_4			
Selected μ_x			
μ_{30}	0.000330	0.016494	0.000500
μ_{65}	0.005566	0.005786	0.006071
μ_{100}	0.093812	0.380881	0.552489
μ_{119}	0.434712	3.122094	15.300328

Table 14. Unadjusted graduations for the 1999-2002 personal pensioner experiences: males

Sex	Male	Male	Male
Category	Deferred	Vested	Combined
Lives / Amounts	Lives	Lives	Lives
Durations in ultimate	0+	0+	0+
GM formula	GM(1,3)	GM(0,4)	GM(1,4)
Age range fitted	20-75	30-85	30-80
Optimised parameters			
$100\times a_1$	0.042022		0.042428
$100\times a_2$			
b_1	–5.894375	–1.805621	–4.527817
b_2	3.659673	1.817239	6.335509
b_3	–1.542952	2.323129	–0.359870
b_4		†–0.750000	†0.600000
Selected μ_x			
μ_{30}	0.000516	0.056533	0.000500
μ_{65}	0.009087	0.011265	0.010168
μ_{100}	0.038558	0.514915	0.305453
μ_{119}	0.024446	4.463059	6.325198

Table 15. Unadjusted graduations for the 1999-2002 personal pensioner experiences: females

Sex	Female	Female	Female
Category	Deferred	Vested	Combined
Lives / Amounts	Lives	Lives	Lives
Durations in ultimate	0+	0+	0+
GM formula	GM(0,3)	GM(1,3)	GM(1,4)
Age range fitted	25-75	40-86	25-85
Optimised parameters			
$100\times a_1$		0.410381	†0.010000
$100\times a_2$			
b_1	–5.619389	–6.745098	–4.845442
b_2	3.099457	9.343251	4.792242
b_3	–0.684653	†–1.200000	–0.107757
b_4			†0.250000
Selected μ_x			
μ_{30}	0.000251	0.004104	0.000280
μ_{65}	0.005204	0.005602	0.005928
μ_{100}	0.028212	0.452021	0.113830
μ_{119}	0.040262	3.696693	0.958897

† Fixed parameter.

Figure 21. Crude Mu, gates and graduated Mu for Males, Retirement Annuitants, Deferred: GM(1,3) ML

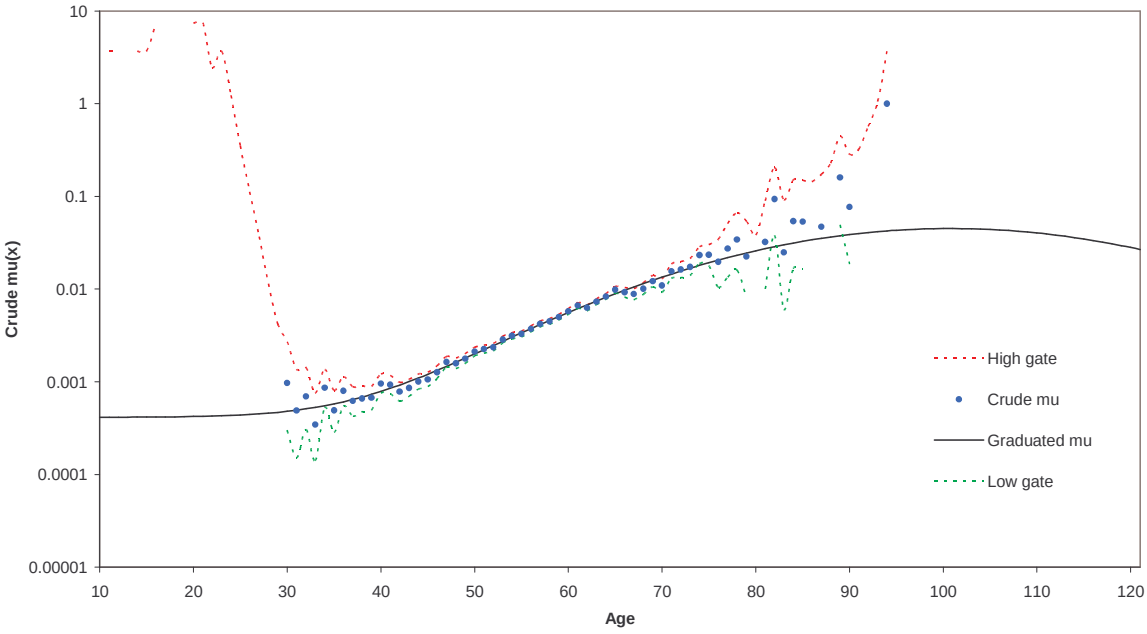


Figure 22. Crude Mu, gates and graduated Mu for Males, Retirement Annuitants, Vested: GM(2,2) ML

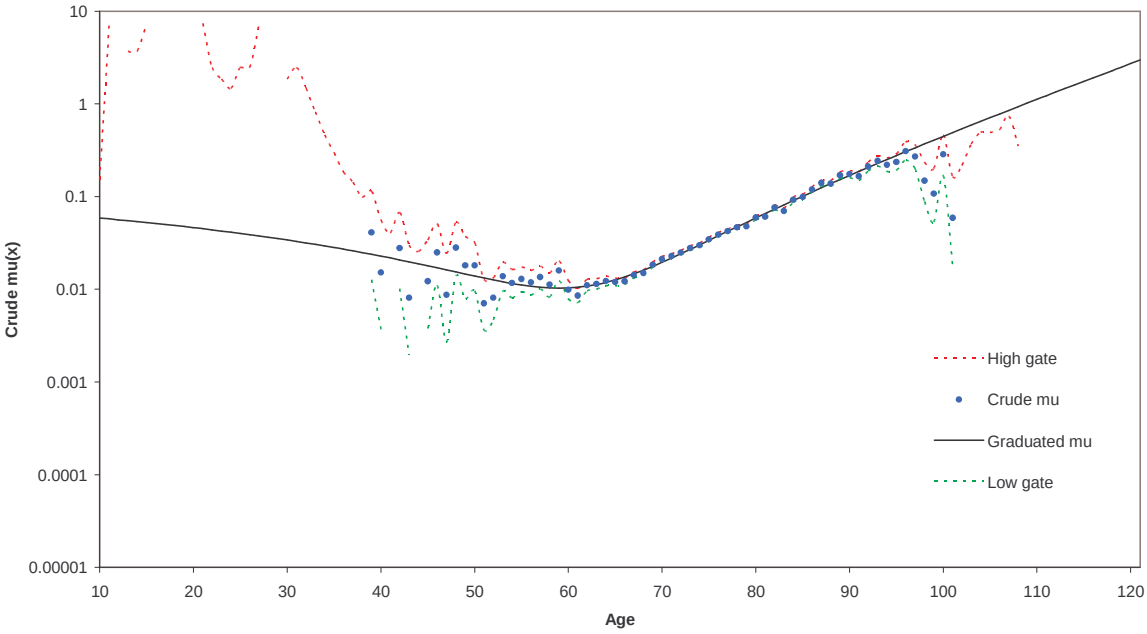


Figure 23. Crude Mu, gates and graduated Mu for Males, Retirement Annuitants, Combined: GM(1,3) ML

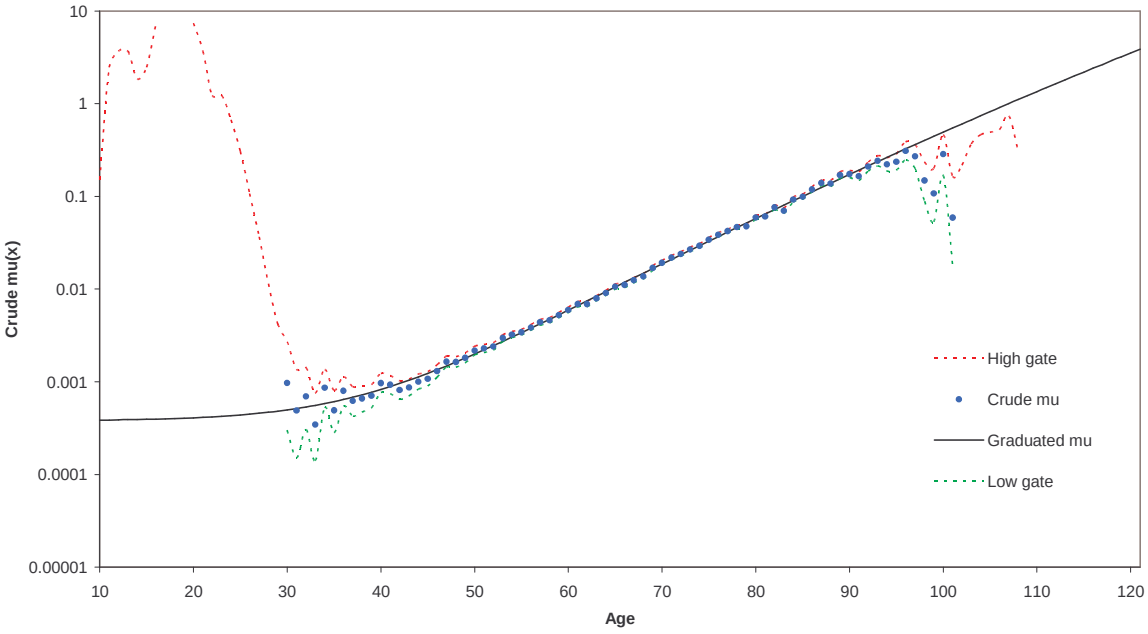


Figure 24. Crude Mu, gates and graduated Mu for Females, Retirement Annuitants, Deferred: GM(0,2) ML

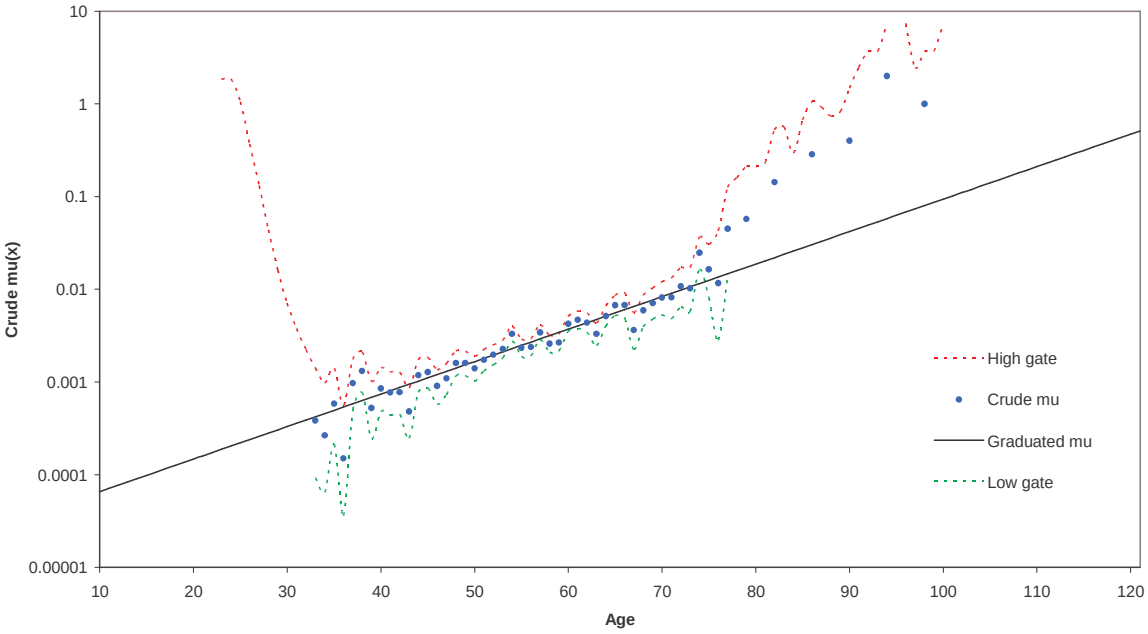


Figure 25. Crude Mu, gates and graduated Mu for Females, Retirement Annuitants, Vested: GM(2,2) ML

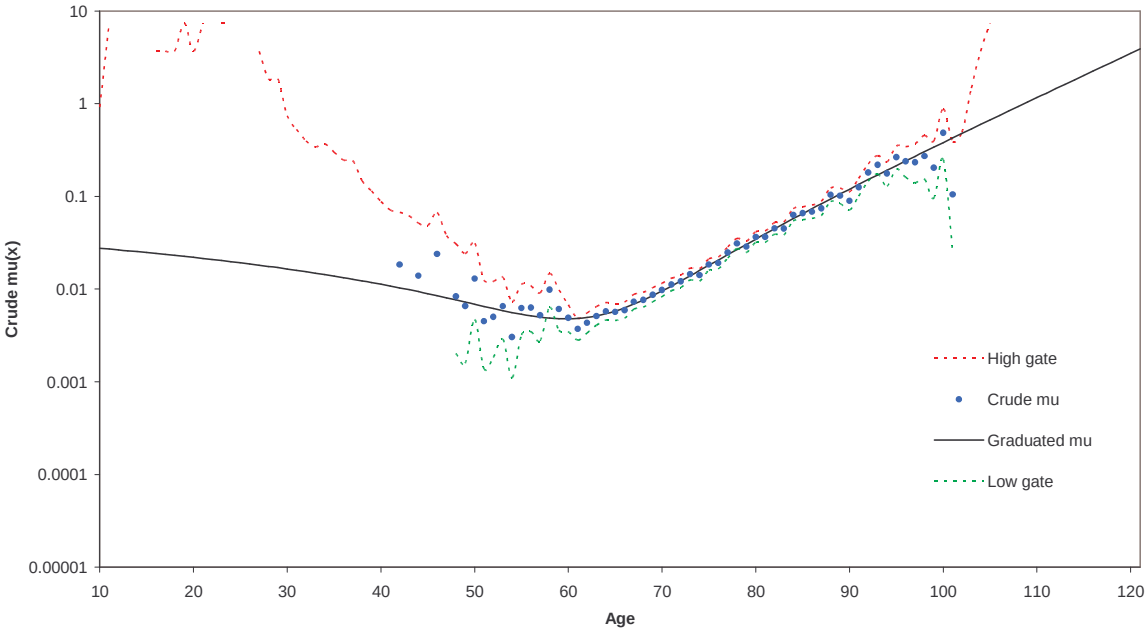


Figure 26. Crude Mu, gates and graduated Mu for Females, Retirement Annuitants, Combined: GM(1,3) ML

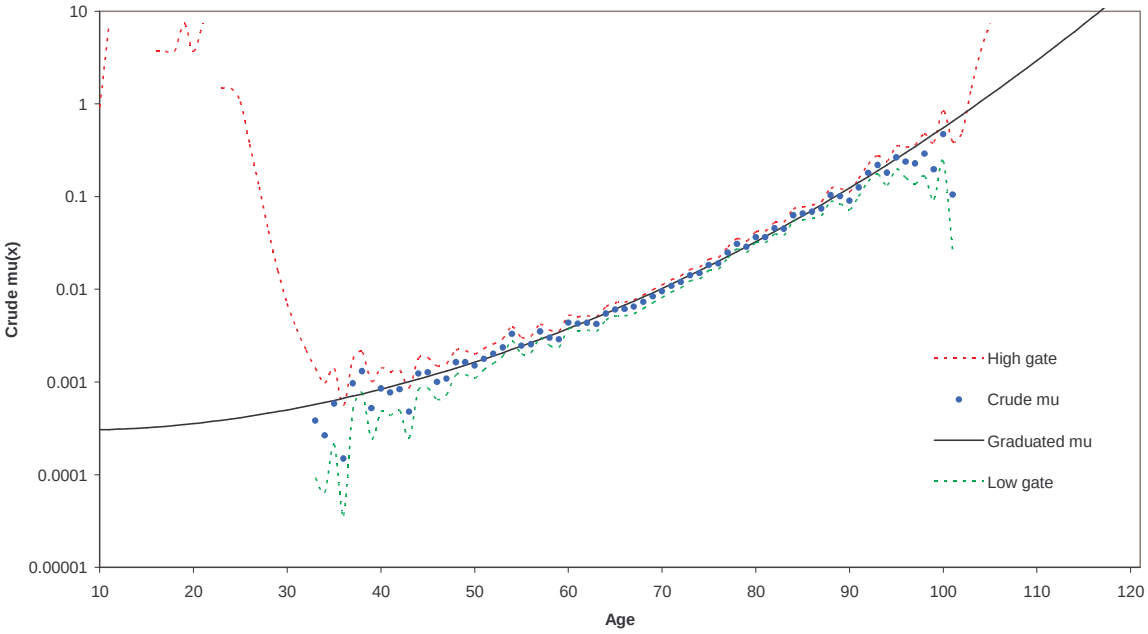


Figure 27. Crude Mu, gates and graduated Mu for Males, Personal Pensioners, Deferred: GM(1,3) ML

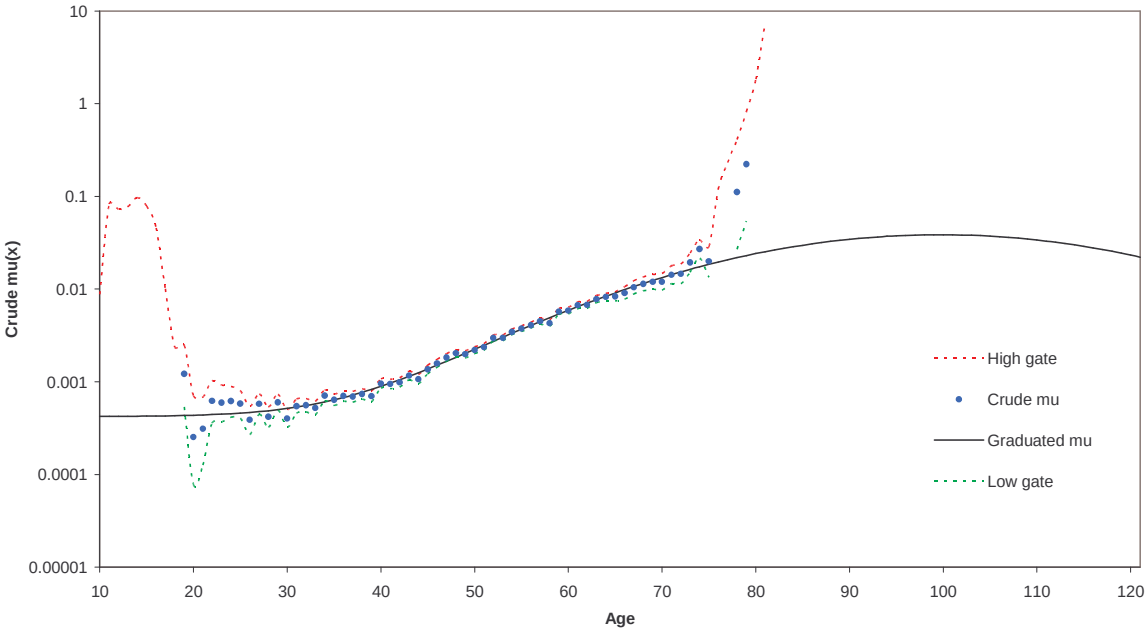


Figure 28. Crude Mu, gates and graduated Mu for Males, Personal Pensioners, Vested: GM(0,4) ML

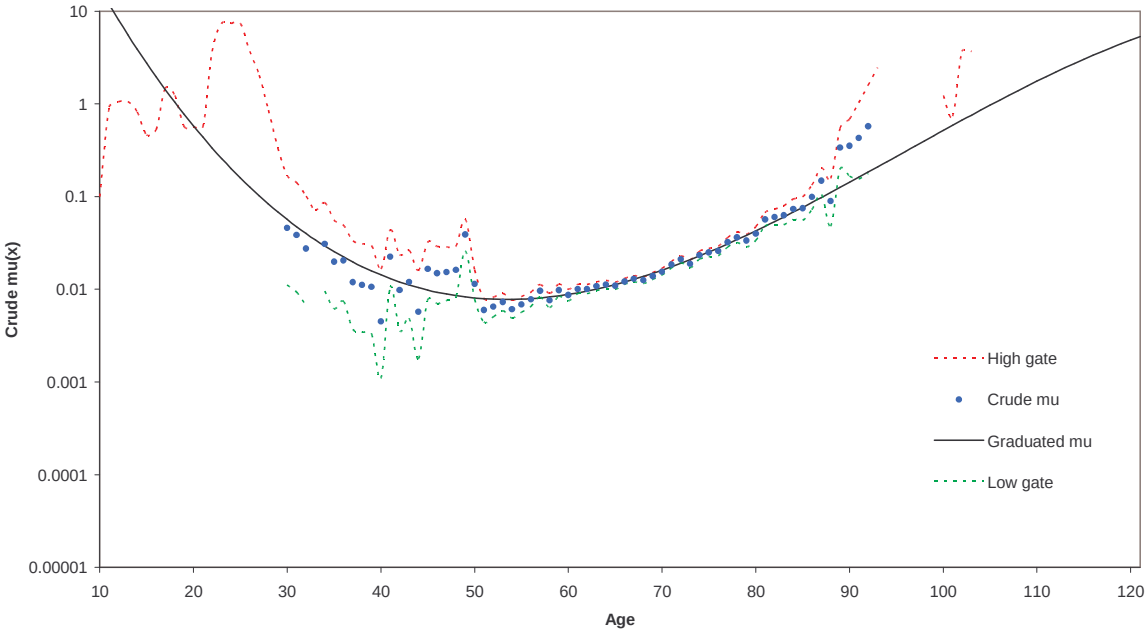


Figure 29. Crude Mu, gates and graduated Mu for Males, Personal Pensioners, Combined: GM(1,4) ML

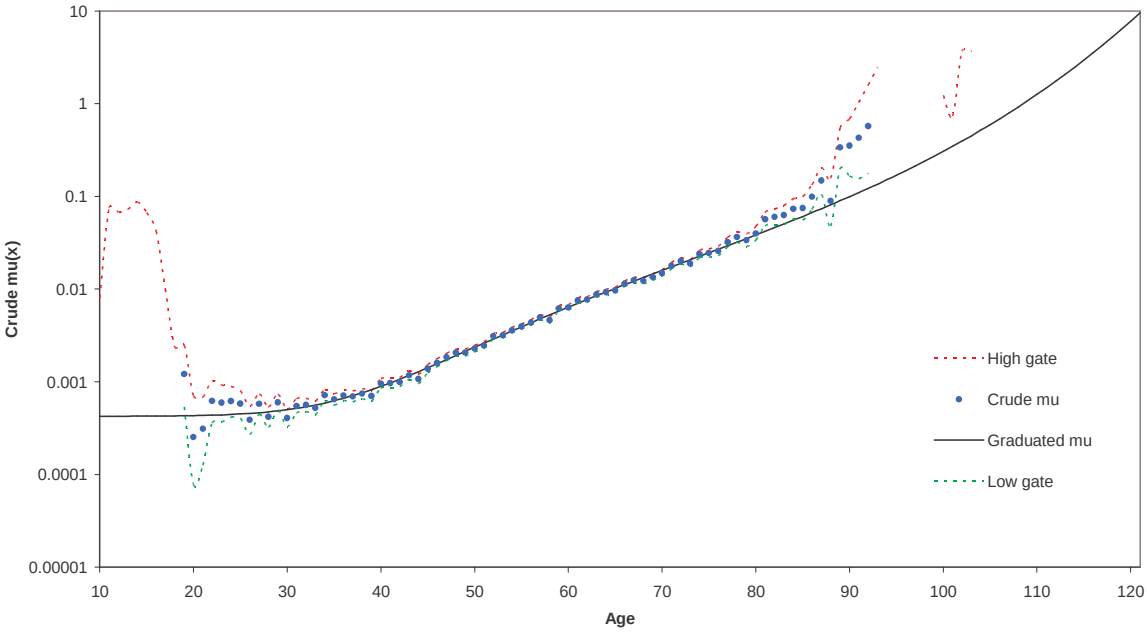


Figure 30. Crude Mu, gates and graduated Mu for Females, Personal Pensioners, Deferred: GM(0,3) ML

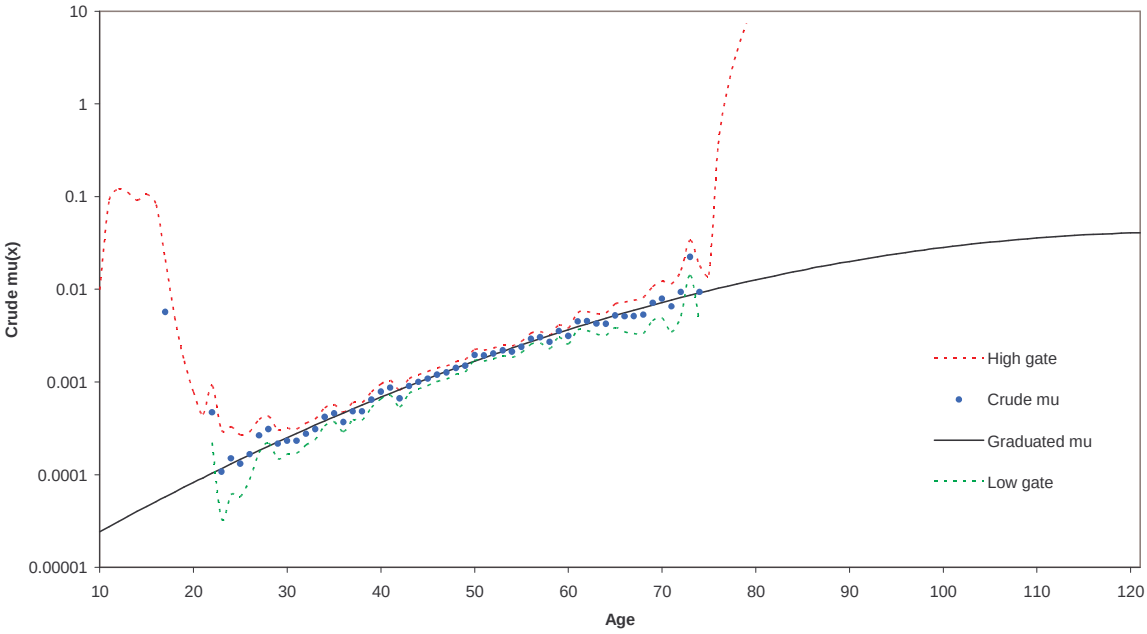


Figure 31. Crude Mu, gates and graduated Mu for Females, Personal Pensioners, Vested: GM(1,3) ML

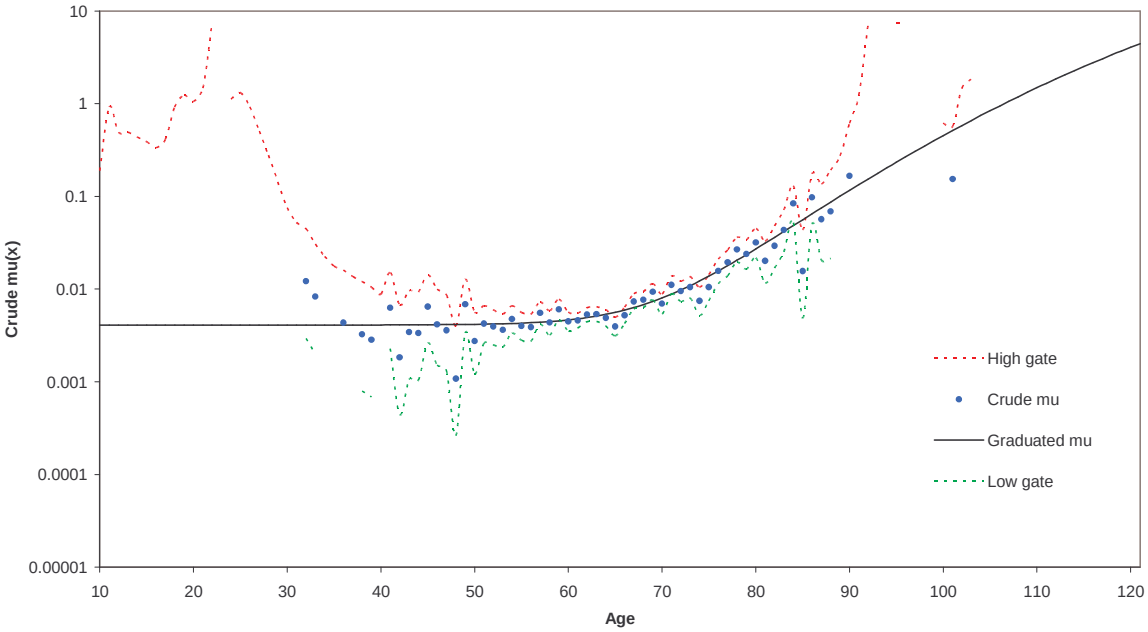
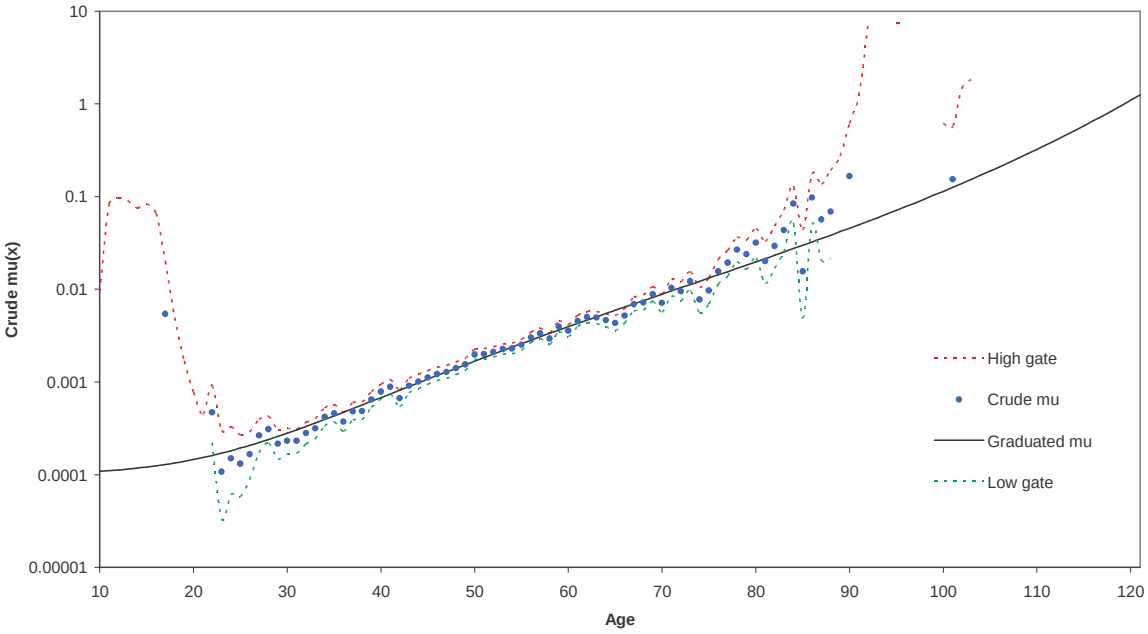


Figure 32. Crude Mu, gates and graduated Mu for Females, Personal Pensioners, Combined: GM(1,4) ML



Adjustments

As the pensions legislation that governs these products specifies that pensions must generally be taken in annuity form between the ages of 50 and 75, there is virtually no data for the Deferred section above age 75 and for the Vested section below age 50. That is, any data which have been supplied must be assumed to be the result of special circumstances, and we decided that these should not be allowed to deflect the courses of the graduations in the normal age ranges.

The Deferred tables cover the age range 17-75. Any attempt to extend the table beyond this would be guesswork, and in any event would be unlikely to serve a useful purpose.

The Vested tables cover the age range 50-120. Similar comments apply at the younger ages. We have again used the method of targeting a value of $\mu_{120} = 1$ to ensure the values at the oldest ages are reasonably sensible.

We have taken the view that the Combined table should effectively be the Deferred table at the younger ages and the Vested table at the older ages – any differences would be down to the fitted graduation formulae over the main age range leading to divergences at the extremes of age, rather than being genuine features of the data. We have therefore added a number of constraints to the Combined rates such that they are set to equal the Deferred rates below a certain age and the Vested rates above a certain age. The ages chosen are the ones where the unadjusted curves would intersect. These are summarised below.

Category	Lower age up to which Combined = Deferred	Upper age from which Combined = Vested
Retirement Annuitants, Male	52	87
Retirement Annuitants, Female	57	75
Personal Pensioners, Male	39	72
Personal Pensioners, Female	48	74

Final proposed rates are set out in the Appendix, and are represented graphically in the following figures.

Figure 33. Retirement Annuitants, Males - values of q

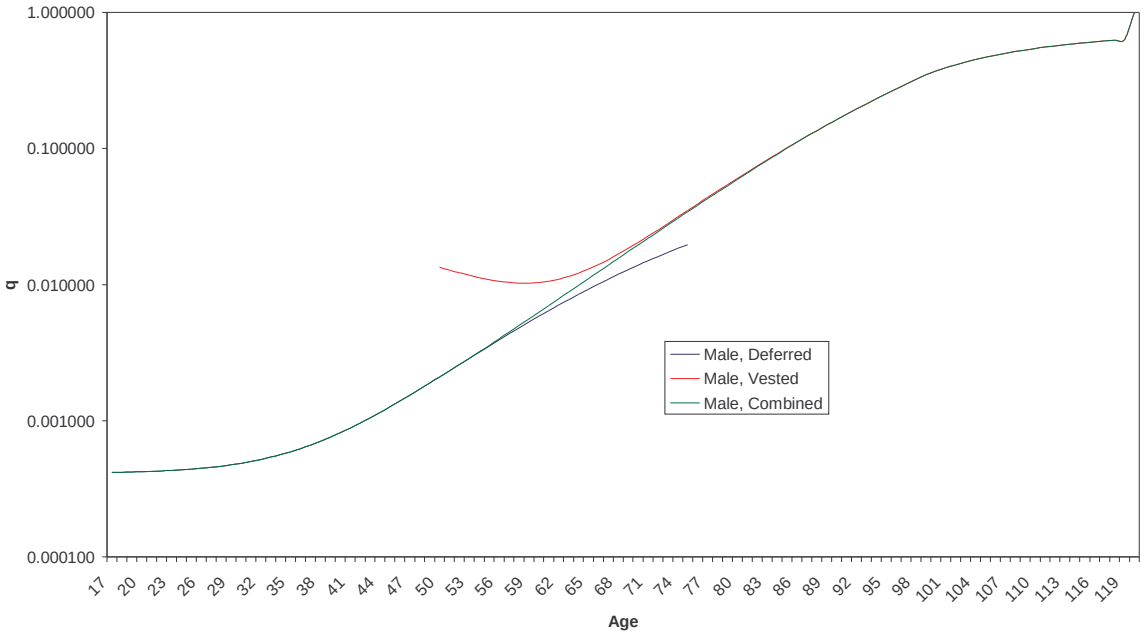


Figure 34. Retirement Annuitants, Females - values of q

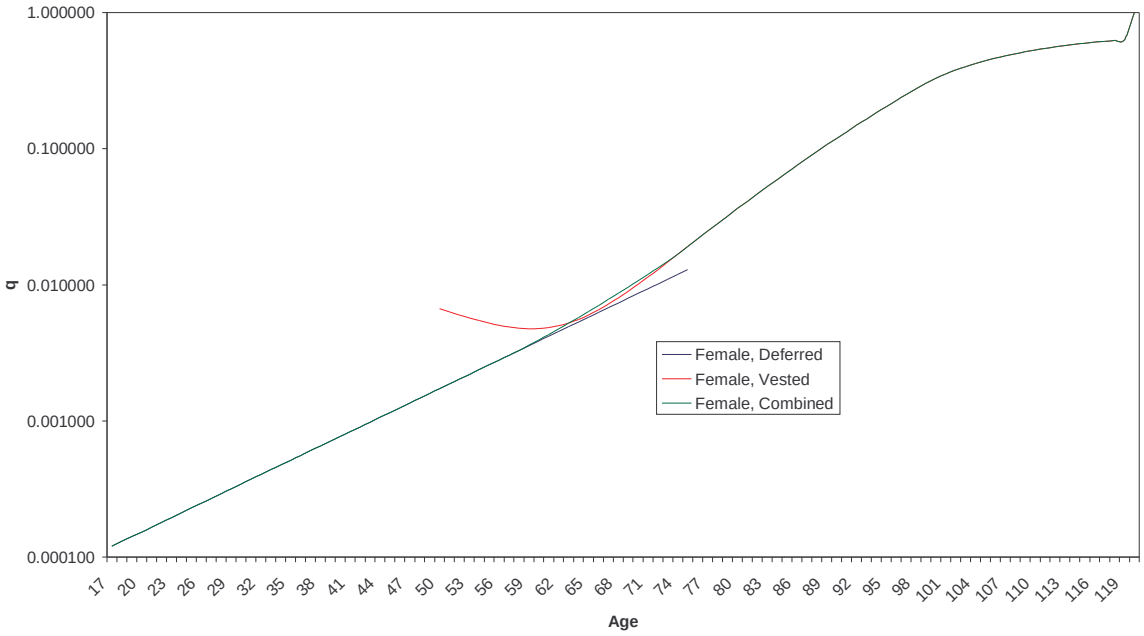


Figure 35. Personal Pensioners, Males - values of q

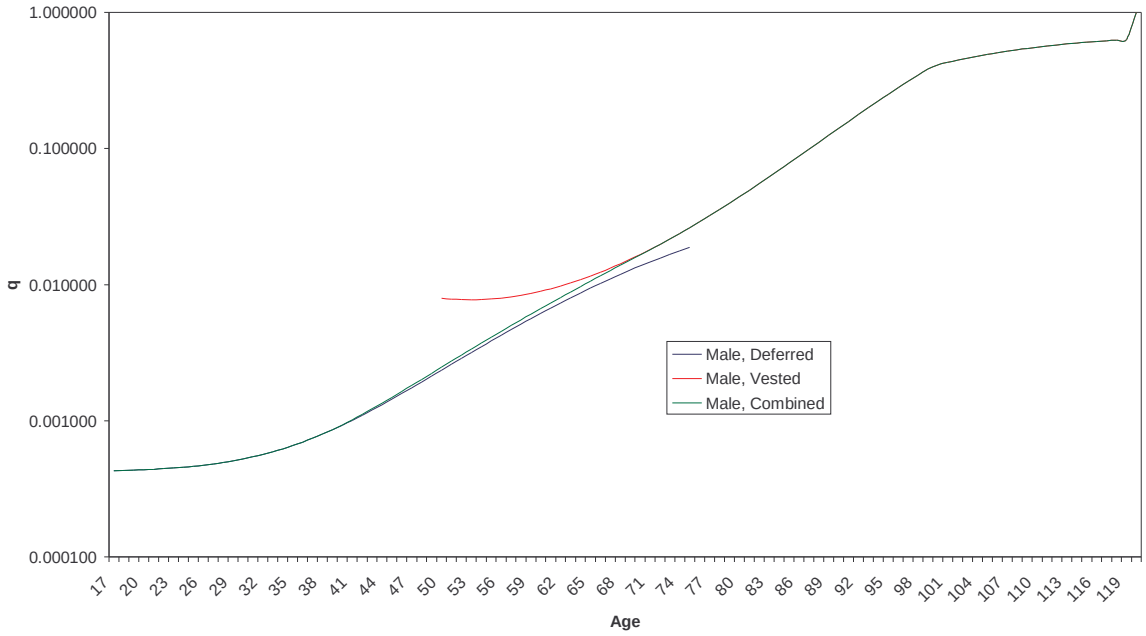
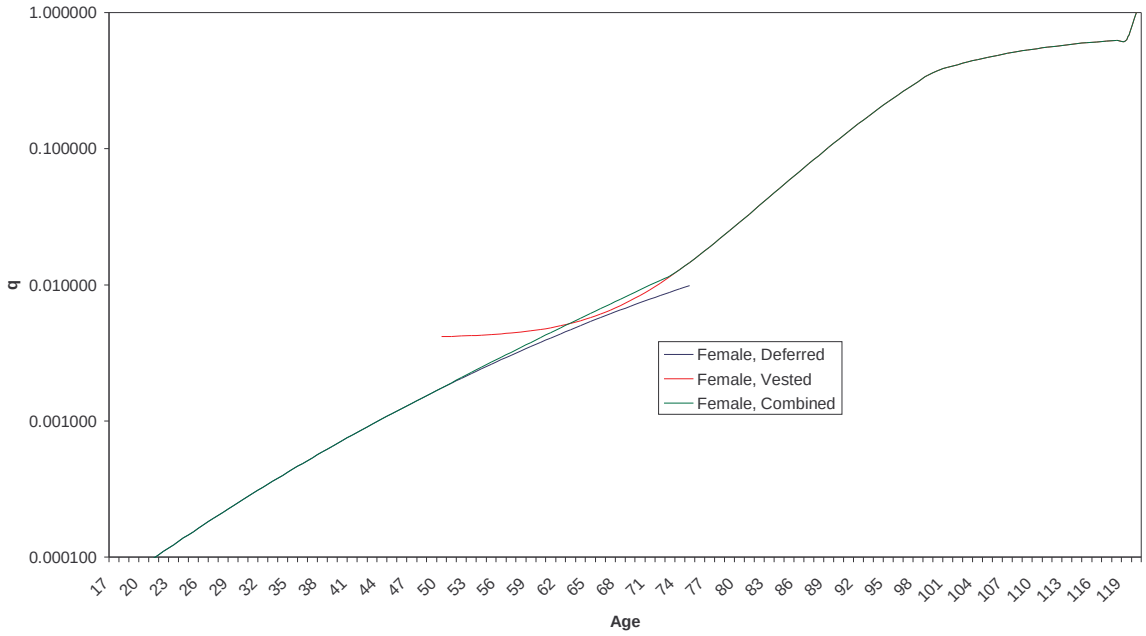


Figure 36. Personal Pensioners, Females - values of q



Comparison with 1999-2002 experience

Tables 16 to 19 below show how the graduated tables compare with the 1999-2002 experience.

Table 16. Retirement Annuitants, Males and Females, Deferred, comparison bases RMD00 and RFD00

Age	Males, Deferred, RMD00		Females, Deferred, RFD00	
Group	Deaths	100A/E	Deaths	100A/E
21-25	0	0	0	0
26-30	2	124	0	0
31-35	38	107	5	79
36-40	194	107	39	122
41-45	456	91	76	95
46-50	1,163	102	153	93
51-55	2,632	100	391	110
56-60	3,743	100	479	95
61-65	3,622	102	309	100
66-70	993	90	117	88
71-75	445	111	66	123
21-75	13,288	100	1,635	100

Table 17. Retirement Annuitants, Males and Females, Vested, comparison bases RMV00 and RFV00

Age	Males, Vested, RMV00		Females, Vested, RFV00	
Group	Deaths	100A/E	Deaths	100A/E
51-55	112	96	21	90
56-60	256	115	82	123
61-65	1,213	97	342	95
66-70	3,978	99	585	101
71-75	6,354	102	840	100
76-80	7,401	99	1,042	103
81-85	5,387	96	830	98
86-90	3,678	107	583	93
91-95	1,088	96	318	109
96-100	148	77	63	93
51-100	29,615	100	4,706	100

Table 18. Personal Pensioners, Males and Females, Deferred, comparison bases PPMD00 and PPFD00

Age	Males, Deferred, PPMD00		Females, Deferred, PPFD00	
Group	Deaths	100A/E	Deaths	100A/E
21-25	85	127	17	128
26-30	318	97	121	112
31-35	790	102	303	99
36-40	1,160	97	441	96
41-45	1,514	95	568	99
46-50	2,323	104	809	103
51-55	3,603	102	1,016	99
56-60	3,449	99	792	98
61-65	2,371	99	299	102
66-70	617	95	97	94
71-75	305	113	43	124
21-75	16,535	100	4,506	100

Table 19. Personal Pensioners, Males and Females, Vested, comparison bases PPMV00 and PPFV00

Age	Males, Vested, PPMV00		Females, Vested, PPFV00	
Group	Deaths	100A/E	Deaths	100A/E
51-55	357	83	112	97
56-60	753	102	240	107
61-65	1,745	102	523	95
66-70	2,988	95	449	106
71-75	2,255	99	246	94
76-80	1,069	95	160	111
81-85	397	108	54	88
86-90	98	131	14	101
91-95	6	236	0	0
96-100	0	0	0	0
51-100	9,668	98	1,798	100

Comparison of proposed "00" Series tables with equivalent "92" Series tables

The following figures show how the proposed graduations compare with the equivalent "92" Series tables.

For the Life Office Pensioner comparisons, the graphs start at age 60, though the proposed new tables start at age 50. This is because the rates in the 50s of age are significantly higher than was the case for the "92" Series tables, which causes problems with the scale of the graphs. We believe this feature to be due to the current graduations reflecting the data at these younger ages, rather than attempting to produce a 'healthy' lives table as has been the case in the past.

Figure 37. Comparison v "92" Series - Immediate Annuitants, Males, Lives - ultimate

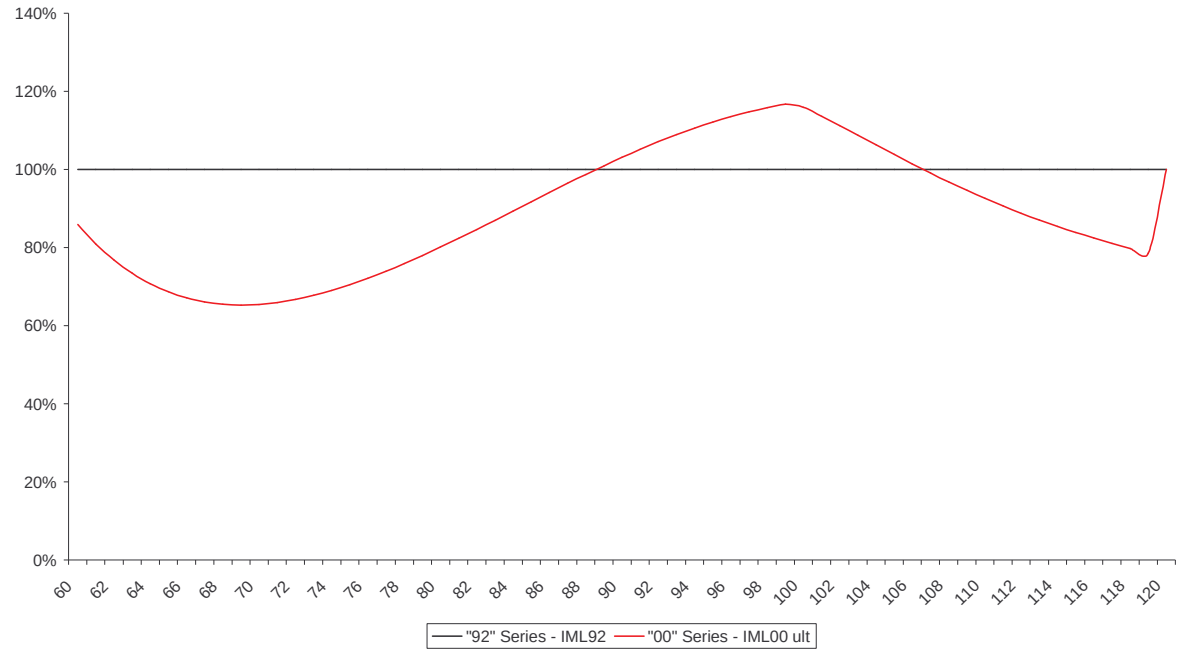


Figure 38. Comparison v "92" Series - Immediate Annuitants, Females, Lives - ultimate

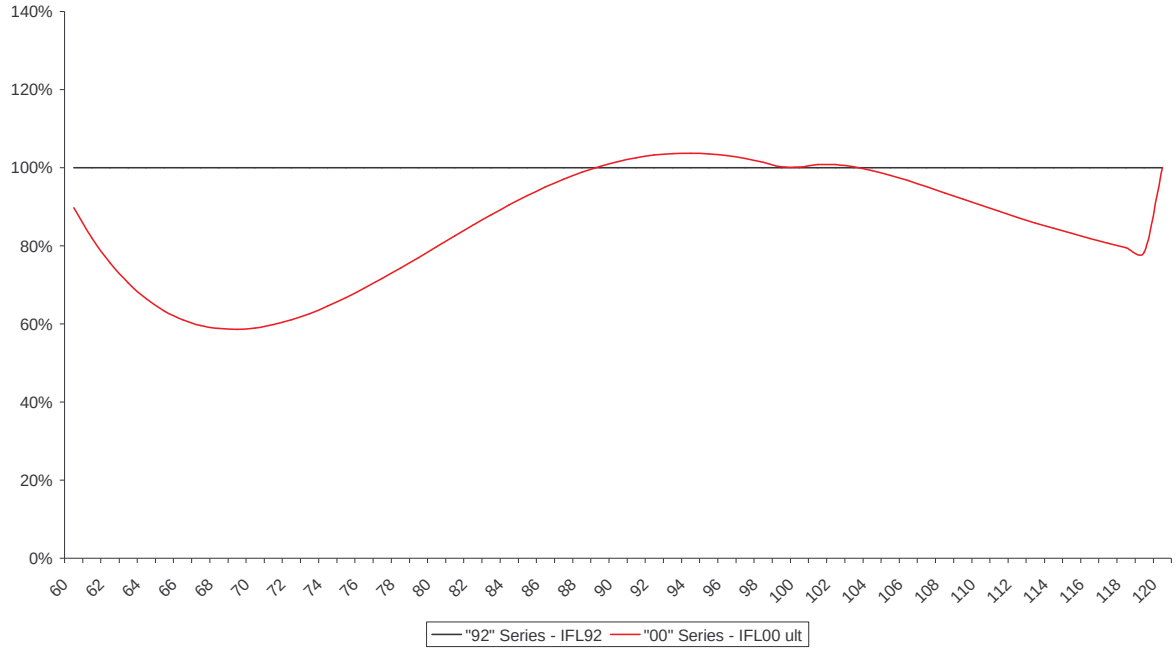


Figure 39. Comparison v "92" Series - Immediate Annuitants, Females, Lives - select

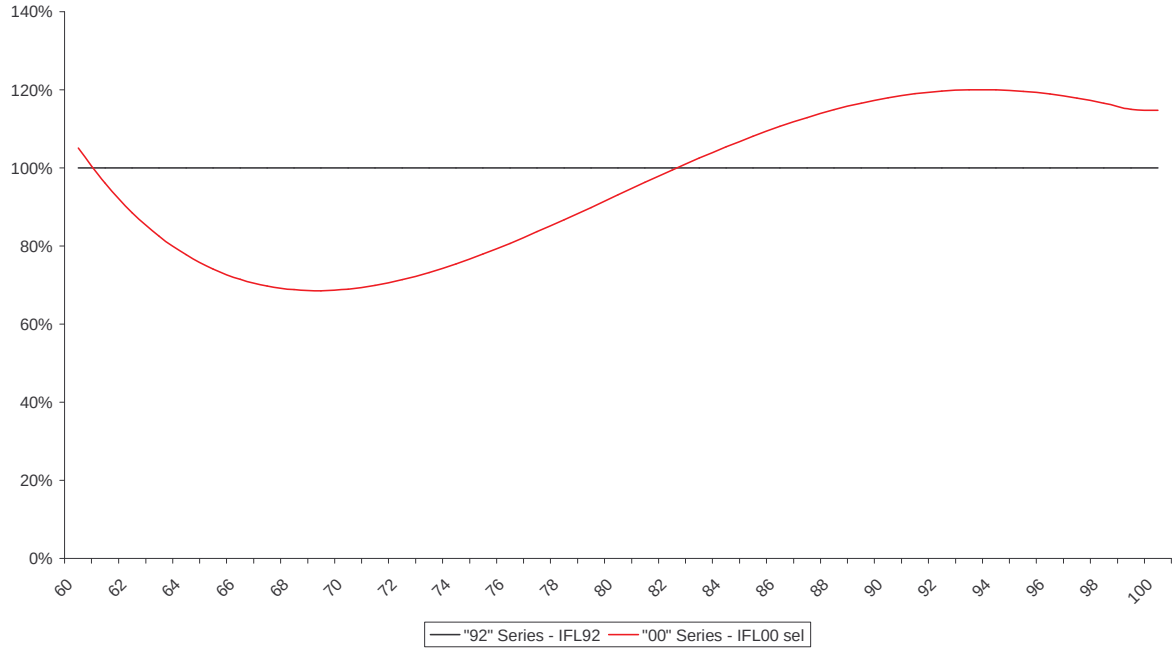


Figure 40. Comparison v "92" Series - Life Office Pensioners, Males, Lives

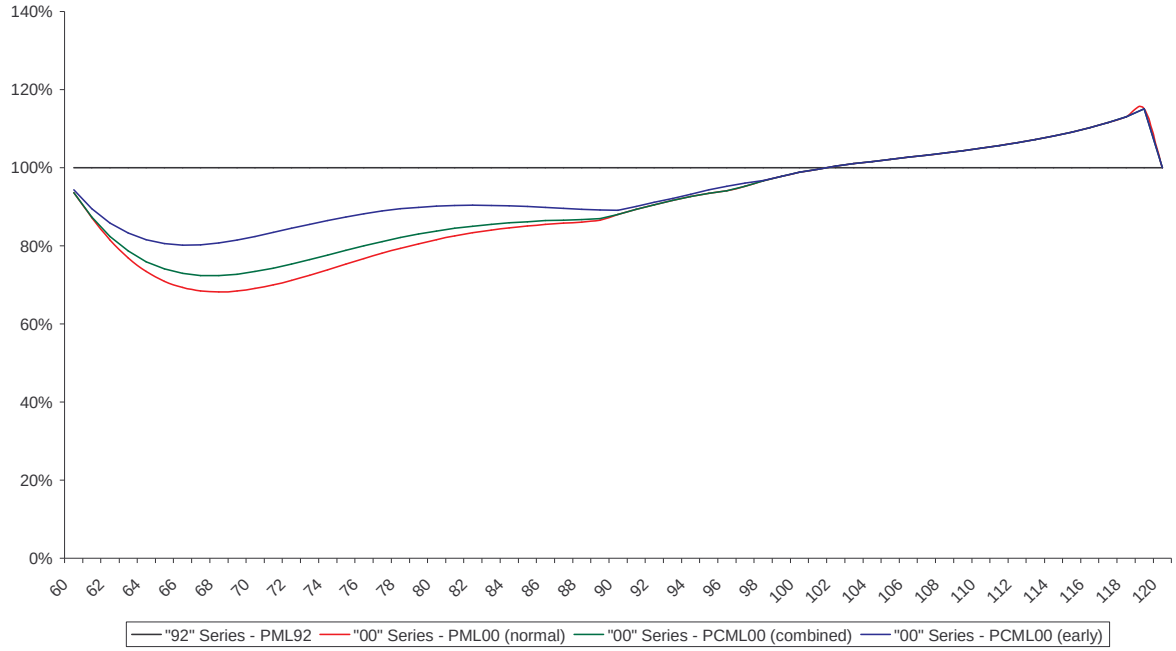


Figure 41. Comparison v "92" Series - Life Office Pensioners, Males, Amounts

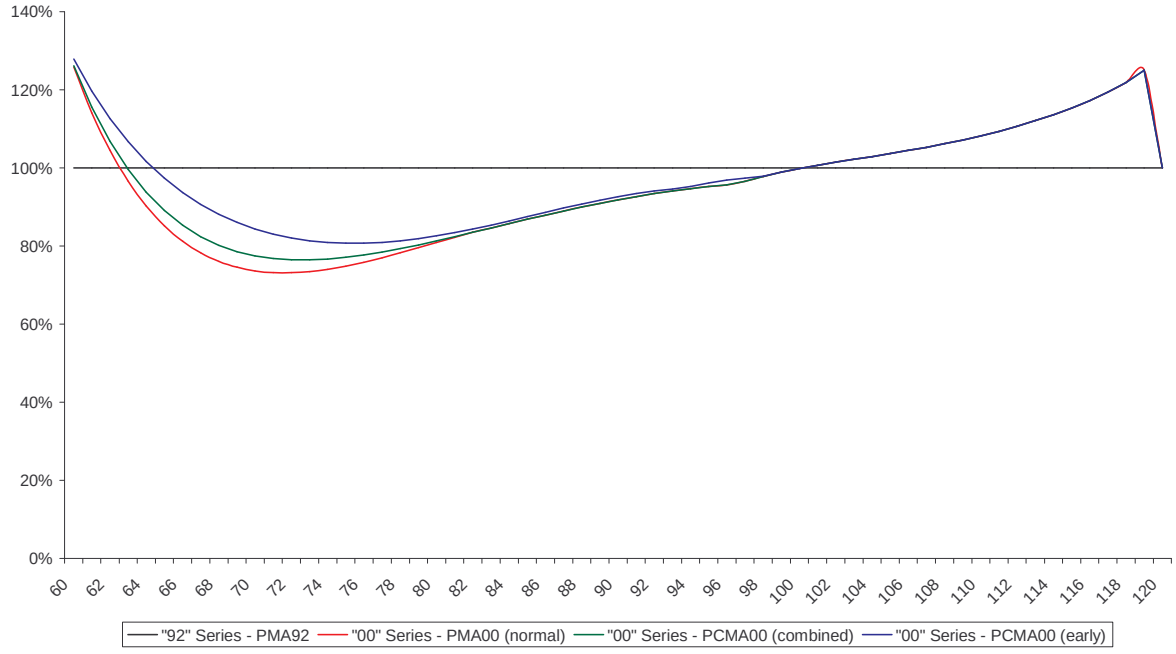


Figure 42. Comparison v "92" Series - Life Office Pensioners, Females, Lives

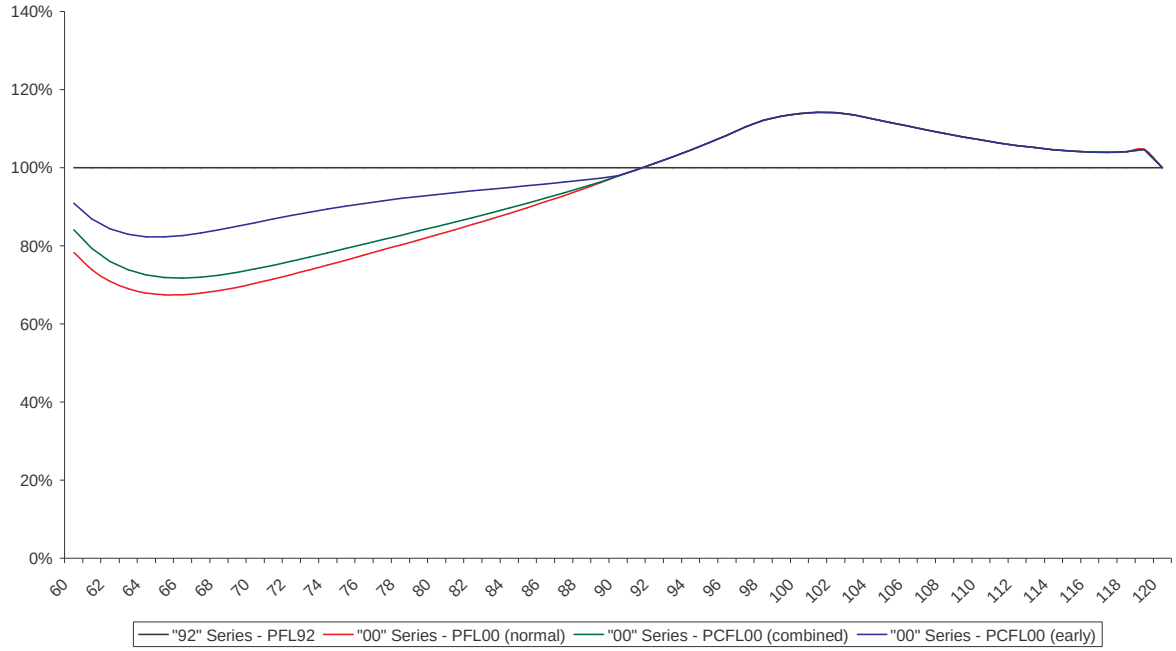
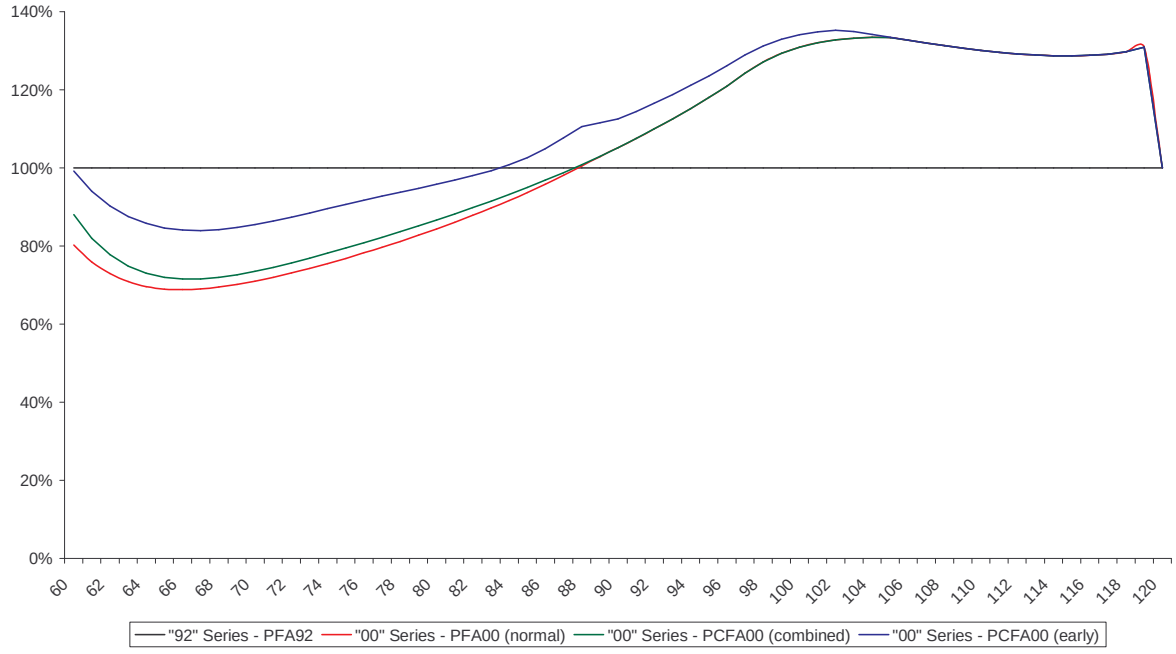


Figure 43. Comparison v "92" Series - Life Office Pensioners, Females, Amounts



Figire 44. Comparison v "92" Series - Retirement Annuitants, Males, Vested

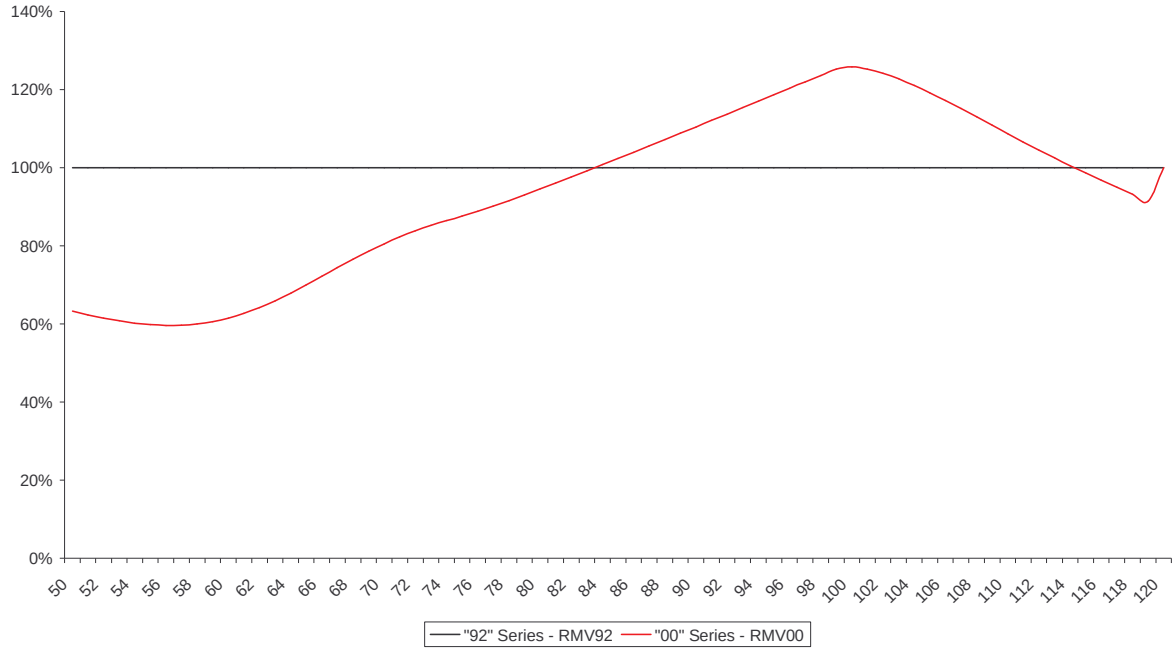


Figure 45. Comparison v "92" Series - Retirement Annuitants, Females, Vested

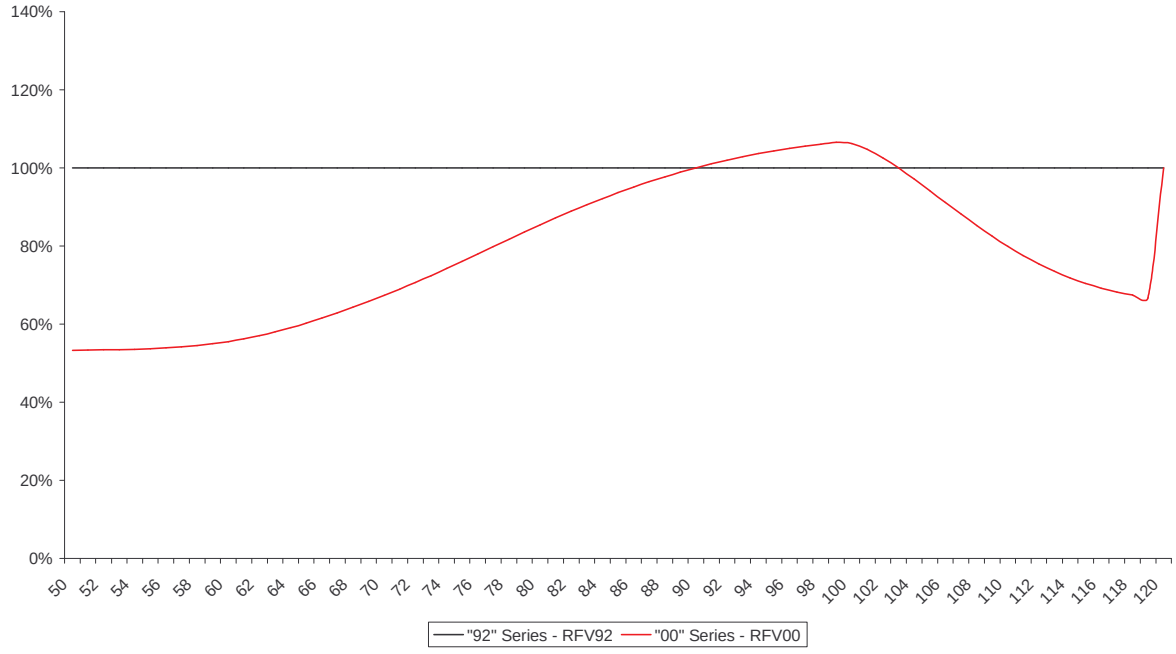


Figure 46. Comparison v "92" Series - Personal Pensioners, Males, Vested

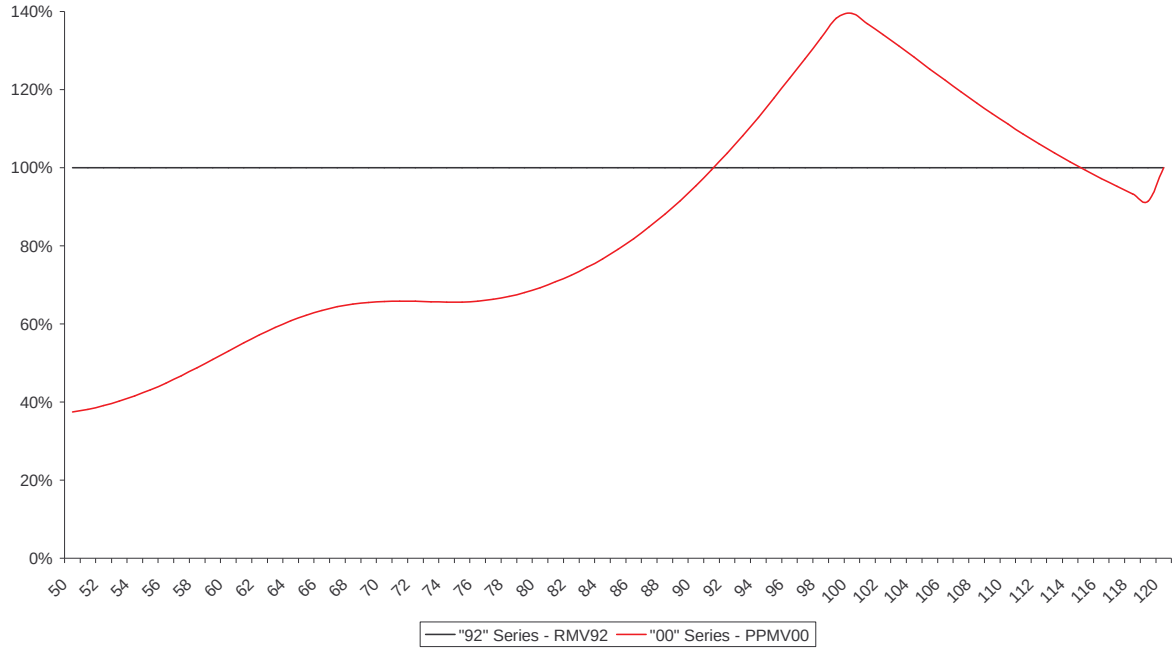
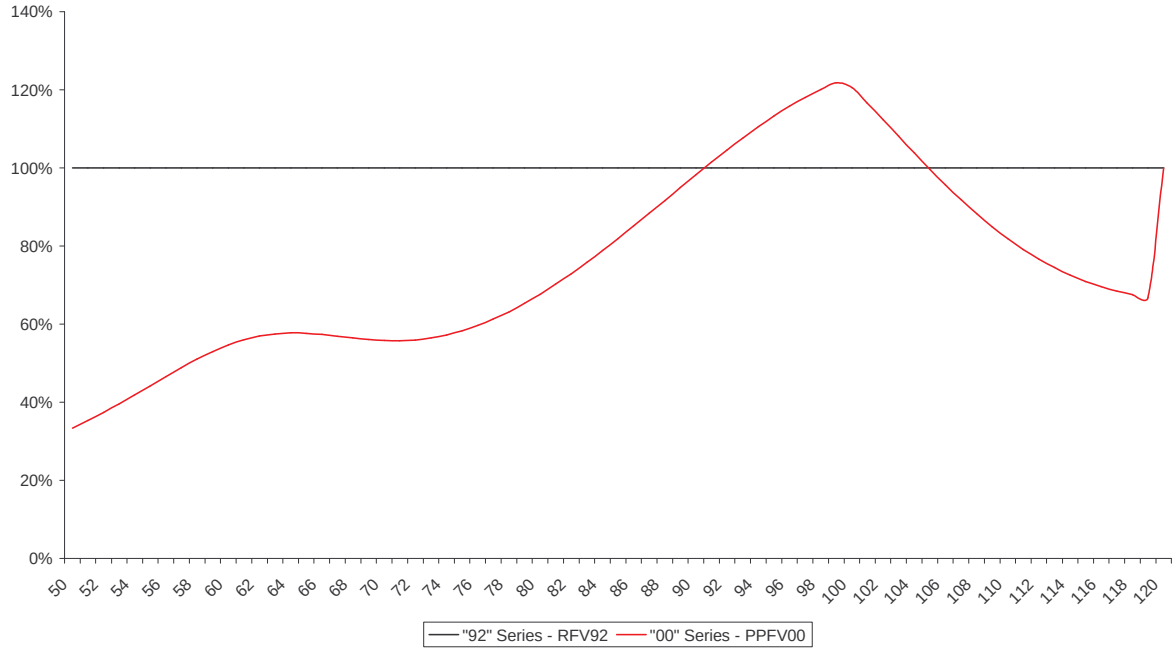


Figure 47. Comparison v "92" Series - Personal Pensioners, Females, Vested



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Appendix

Proposed values of mortality rates for the “00” Series Annuitant and Pensioner tables.

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Table A1. Immediate Annuitants, males, lives – IML00 ultimate: values of q_x

Age x	Durations 0+	Age x	Durations 0+
60	0.006889	90	0.175045
61	0.007290	91	0.193583
62	0.007766	92	0.213426
63	0.008331	93	0.234556
64	0.008998	94	0.256937
65	0.009784	95	0.280516
66	0.010708	96	0.305218
67	0.011791	97	0.330948
68	0.013057	98	0.357594
69	0.014533	99	0.385022
70	0.016248	100	0.408020
71	0.018235	101	0.425685
72	0.020531	102	0.442596
73	0.023176	103	0.458780
74	0.026214	104	0.474261
75	0.029692	105	0.489061
76	0.033661	106	0.503202
77	0.038177	107	0.516703
78	0.043297	108	0.529580
79	0.049083	109	0.541848
80	0.055598	110	0.553517
81	0.062909	111	0.564597
82	0.071083	112	0.575092
83	0.080187	113	0.585000
84	0.090286	114	0.594315
85	0.101447	115	0.603018
86	0.113728	116	0.611074
87	0.127185	117	0.618418
88	0.141867	118	0.624920
89	0.157811	119	0.630211
		120	1.000000

Table A2. Immediate Annuitants, females, lives – IFL00 select and ultimate: values of $q_{[x]}$ and q_x

Age x	Duration 0	Durations 1+	Age x	Duration 0	Durations 1+
60	0.002746	0.003269	90	0.117151	0.137857
61	0.002873	0.003419	91	0.130296	0.153117
62	0.003033	0.003610	92	0.144208	0.169221
63	0.003235	0.003850	93	0.158823	0.186083
64	0.003487	0.004150	94	0.174059	0.203602
65	0.003801	0.004523	95	0.189819	0.221660
66	0.004189	0.004985	96	0.205993	0.240123
67	0.004668	0.005555	97	0.222459	0.258846
68	0.005256	0.006254	98	0.239087	0.277676
69	0.005972	0.007105	99	0.255737	0.296453
70	0.006841	0.008139	100	0.276136	0.319348
71	0.007890	0.009385	101		0.345503
72	0.009148	0.010881	102		0.370321
73	0.010651	0.012667	103		0.393866
74	0.012436	0.014787	104		0.416195
75	0.014543	0.017289	105		0.437364
76	0.017017	0.020226	106		0.457423
77	0.019907	0.023653	107		0.476418
78	0.023261	0.027630	108		0.494390
79	0.027132	0.032215	109		0.511378
80	0.031573	0.037472	110		0.527415
81	0.036637	0.043461	111		0.542528
82	0.042376	0.050241	112		0.556739
83	0.048839	0.057868	113		0.570063
84	0.056072	0.066390	114		0.582503
85	0.064113	0.075850	115		0.594050
86	0.072993	0.086280	116		0.604673
87	0.082733	0.097698	117		0.614302
88	0.093344	0.110110	118		0.622781
89	0.104823	0.123506	119		0.629649
			120		1.000000

Table A3. Pensioners, males, Normal, lives and amounts – PML00 and PMA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.007398	0.005583	85	0.111517	0.104850
51	0.007429	0.005646	86	0.120886	0.115610
52	0.007473	0.005724	87	0.130647	0.127035
53	0.007535	0.005820	88	0.140805	0.139096
54	0.007620	0.005939	89	0.151840	0.151755
55	0.007734	0.006085	90	0.164961	0.164961
56	0.007888	0.006265	91	0.178655	0.178655
57	0.008090	0.006484	92	0.192770	0.192770
58	0.008355	0.006750	93	0.207228	0.207228
59	0.008695	0.007072	94	0.221944	0.221944
60	0.009129	0.007442	95	0.236827	0.236827
61	0.009665	0.007831	96	0.251782	0.251782
62	0.010237	0.008302	97	0.268235	0.268235
63	0.010930	0.008876	98	0.285990	0.285990
64	0.011792	0.009569	99	0.303475	0.303475
65	0.012853	0.010403	100	0.320697	0.320697
66	0.014141	0.011401	101	0.337664	0.337664
67	0.015689	0.012589	102	0.354385	0.354385
68	0.017526	0.013996	103	0.370869	0.370869
69	0.019684	0.015654	104	0.387125	0.387125
70	0.022191	0.017595	105	0.403165	0.403165
71	0.025076	0.019857	106	0.418999	0.418999
72	0.028363	0.022477	107	0.434641	0.434641
73	0.032072	0.025495	108	0.450104	0.450104
74	0.036220	0.028951	109	0.465405	0.465405
75	0.040820	0.032886	110	0.480562	0.480562
76	0.045878	0.037340	111	0.495600	0.495600
77	0.051400	0.042351	112	0.510546	0.510546
78	0.057382	0.047953	113	0.525437	0.525437
79	0.063822	0.054179	114	0.540323	0.540323
80	0.070710	0.061052	115	0.555271	0.555271
81	0.078038	0.068592	116	0.570389	0.570389
82	0.085793	0.076701	117	0.585858	0.585858
83	0.093964	0.085390	118	0.602053	0.602053
84	0.102542	0.094774	119	0.620371	0.620371
			120	1.000000	1.000000

Table A4. Pensioners, females, Normal, lives and amounts – PFL00 and PFA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.003473	0.002910	85	0.082483	0.075556
51	0.003568	0.002990	86	0.091530	0.084246
52	0.003663	0.003070	87	0.101402	0.093798
53	0.003758	0.003150	88	0.112156	0.104282
54	0.003852	0.003230	89	0.123851	0.115681
55	0.003947	0.003310	90	0.136501	0.127766
56	0.004042	0.003390	91	0.149922	0.140859
57	0.004103	0.003464	92	0.164355	0.155048
58	0.004180	0.003571	93	0.179891	0.170393
59	0.004336	0.003742	94	0.196580	0.186955
60	0.004579	0.003984	95	0.214469	0.204789
61	0.004916	0.004304	96	0.233598	0.223947
62	0.005357	0.004710	97	0.254172	0.244888
63	0.005912	0.005210	98	0.275007	0.266347
64	0.006590	0.005816	99	0.295354	0.287292
65	0.007405	0.006537	100	0.315225	0.307737
66	0.008367	0.007386	101	0.334634	0.327696
67	0.009492	0.008375	102	0.353561	0.347184
68	0.010793	0.009518	103	0.370869	0.366213
69	0.012288	0.010833	104	0.387125	0.384799
70	0.013994	0.012335	105	0.403165	0.402809
71	0.015931	0.014043	106	0.418999	0.418999
72	0.018118	0.015979	107	0.434641	0.434641
73	0.020578	0.018166	108	0.450104	0.450104
74	0.023337	0.020627	109	0.465405	0.465405
75	0.026419	0.023390	110	0.480562	0.480562
76	0.029854	0.026484	111	0.495600	0.495600
77	0.033673	0.029942	112	0.510546	0.510546
78	0.037907	0.033799	113	0.525437	0.525437
79	0.042593	0.038092	114	0.540323	0.540323
80	0.047768	0.042863	115	0.555271	0.555271
81	0.053473	0.048156	116	0.570389	0.570389
82	0.059750	0.054019	117	0.585858	0.585858
83	0.066645	0.060502	118	0.602053	0.602053
84	0.074205	0.067662	119	0.620371	0.620371
			120	1.000000	1.000000

Table A5. Pensioners, males, Early, lives and amounts – PEML00 and PEMA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.007398	0.005583	85	0.118047	0.105652
51	0.007429	0.005646	86	0.127076	0.116516
52	0.007473	0.005724	87	0.136461	0.128085
53	0.007535	0.005820	88	0.146216	0.140314
54	0.007620	0.005939	89	0.156362	0.153136
55	0.007734	0.006085	90	0.167039	0.166464
56	0.007888	0.006265	91	0.180188	0.180188
57	0.008090	0.006484	92	0.194176	0.194176
58	0.008355	0.006750	93	0.208276	0.208276
59	0.008695	0.007074	94	0.223303	0.223303
60	0.009201	0.007565	95	0.239168	0.239168
61	0.009912	0.008211	96	0.254898	0.254898
62	0.010783	0.008954	97	0.270499	0.270499
63	0.011838	0.009805	98	0.286259	0.286259
64	0.013102	0.010778	99	0.303475	0.303475
65	0.014602	0.011887	100	0.320697	0.320697
66	0.016361	0.013151	101	0.337664	0.337664
67	0.018406	0.014587	102	0.354385	0.354385
68	0.020760	0.016219	103	0.370869	0.370869
69	0.023445	0.018069	104	0.387125	0.387125
70	0.026481	0.020166	105	0.403165	0.403165
71	0.029884	0.022538	106	0.418999	0.418999
72	0.033667	0.025218	107	0.434641	0.434641
73	0.037841	0.028240	108	0.450104	0.450104
74	0.042412	0.031642	109	0.465405	0.465405
75	0.047383	0.035463	110	0.480562	0.480562
76	0.052753	0.039746	111	0.495600	0.495600
77	0.058519	0.044532	112	0.510546	0.510546
78	0.064676	0.049866	113	0.525437	0.525437
79	0.071215	0.055789	114	0.540323	0.540323
80	0.078129	0.062343	115	0.555271	0.555271
81	0.085408	0.069565	116	0.570389	0.570389
82	0.093045	0.077487	117	0.585858	0.585858
83	0.101033	0.086134	118	0.602053	0.602053
84	0.109367	0.095521	119	0.620371	0.620371
			120	1.000000	1.000000

Table A6. Pensioners, females, Early, lives and amounts – PEFL00 and PEFA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.006126	0.006126	85	0.087635	0.082785
51	0.005695	0.005527	86	0.096091	0.092221
52	0.005327	0.004932	87	0.105176	0.102986
53	0.005027	0.004540	88	0.114922	0.114752
54	0.004800	0.004300	89	0.125360	0.125360
55	0.004652	0.004180	90	0.136699	0.136699
56	0.004589	0.004159	91	0.149922	0.149922
57	0.004616	0.004226	92	0.164355	0.164355
58	0.004742	0.004376	93	0.179891	0.179891
59	0.004972	0.004608	94	0.196580	0.196580
60	0.005315	0.004923	95	0.214469	0.214469
61	0.005779	0.005328	96	0.233598	0.233598
62	0.006373	0.005829	97	0.254172	0.254172
63	0.007107	0.006437	98	0.275007	0.275007
64	0.007989	0.007163	99	0.295354	0.295354
65	0.009032	0.008021	100	0.315225	0.315225
66	0.010247	0.009026	101	0.334634	0.334634
67	0.011646	0.010193	102	0.353561	0.353561
68	0.013242	0.011542	103	0.370869	0.370869
69	0.015048	0.013089	104	0.387125	0.387125
70	0.017080	0.014853	105	0.403165	0.403165
71	0.019353	0.016853	106	0.418999	0.418999
72	0.021884	0.019107	107	0.434641	0.434641
73	0.024690	0.021635	108	0.450104	0.450104
74	0.027789	0.024454	109	0.465405	0.465405
75	0.031202	0.027583	110	0.480562	0.480562
76	0.034949	0.031041	111	0.495600	0.495600
77	0.039051	0.034851	112	0.510546	0.510546
78	0.043532	0.039035	113	0.525437	0.525437
79	0.048415	0.043624	114	0.540323	0.540323
80	0.053726	0.048656	115	0.555271	0.555271
81	0.059490	0.054178	116	0.570389	0.570389
82	0.065734	0.060255	117	0.585858	0.585858
83	0.072487	0.066969	118	0.602053	0.602053
84	0.079777	0.074431	119	0.620371	0.620371
			120	1.000000	1.000000

Table A7. Pensioners, males, Combined, lives and amounts – PCML00 and PCMA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.007398	0.005583	85	0.112976	0.104850
51	0.007429	0.005646	86	0.122239	0.115610
52	0.007473	0.005724	87	0.131889	0.127035
53	0.007535	0.005820	88	0.141929	0.139096
54	0.007620	0.005939	89	0.152437	0.151755
55	0.007734	0.006085	90	0.164961	0.164961
56	0.007888	0.006265	91	0.178655	0.178655
57	0.008090	0.006484	92	0.192770	0.192770
58	0.008355	0.006750	93	0.207228	0.207228
59	0.008695	0.007072	94	0.221944	0.221944
60	0.009129	0.007461	95	0.236827	0.236827
61	0.009674	0.007928	96	0.251782	0.251782
62	0.010352	0.008487	97	0.268235	0.268235
63	0.011186	0.009152	98	0.285990	0.285990
64	0.012201	0.009942	99	0.303475	0.303475
65	0.013423	0.010874	100	0.320697	0.320697
66	0.014879	0.011972	101	0.337664	0.337664
67	0.016596	0.013258	102	0.354385	0.354385
68	0.018603	0.014758	103	0.370869	0.370869
69	0.020925	0.016500	104	0.387125	0.387125
70	0.023589	0.018515	105	0.403165	0.403165
71	0.026617	0.020835	106	0.418999	0.418999
72	0.030030	0.023494	107	0.434641	0.434641
73	0.033846	0.026528	108	0.450104	0.450104
74	0.038079	0.029974	109	0.465405	0.465405
75	0.042740	0.033868	110	0.480562	0.480562
76	0.047836	0.038250	111	0.495600	0.495600
77	0.053371	0.043156	112	0.510546	0.510546
78	0.059345	0.048622	113	0.525437	0.525437
79	0.065754	0.054681	114	0.540323	0.540323
80	0.072594	0.061364	115	0.555271	0.555271
81	0.079857	0.068697	116	0.570389	0.570389
82	0.087535	0.076701	117	0.585858	0.585858
83	0.095619	0.085390	118	0.602053	0.602053
84	0.104102	0.094774	119	0.620371	0.620371
			120	1.000000	1.000000

Table A8. Pensioners, females, Combined, lives and amounts – PCFL00 and PCFA00: values of q_x

Age x	Lives	Amounts	Age x	Lives	Amounts
50	0.004552	0.003920	85	0.083530	0.076588
51	0.004583	0.003937	86	0.092456	0.085118
52	0.004615	0.003954	87	0.102168	0.094442
53	0.004646	0.003972	88	0.112717	0.104618
54	0.004579	0.003989	89	0.124157	0.115706
55	0.004454	0.004006	90	0.136541	0.127766
56	0.004393	0.004024	91	0.149922	0.140859
57	0.004402	0.004029	92	0.164355	0.155048
58	0.004488	0.004067	93	0.179891	0.170393
59	0.004656	0.004178	94	0.196580	0.186955
60	0.004916	0.004369	95	0.214469	0.204789
61	0.005275	0.004648	96	0.233598	0.223947
62	0.005741	0.005022	97	0.254172	0.244888
63	0.006326	0.005502	98	0.275007	0.266347
64	0.007039	0.006097	99	0.295354	0.287292
65	0.007892	0.006818	100	0.315225	0.307737
66	0.008897	0.007677	101	0.334634	0.327696
67	0.010069	0.008687	102	0.353561	0.347184
68	0.011420	0.009862	103	0.370869	0.366213
69	0.012969	0.011218	104	0.387125	0.384799
70	0.014730	0.012771	105	0.403165	0.402809
71	0.016725	0.014539	106	0.418999	0.418999
72	0.018971	0.016542	107	0.434641	0.434641
73	0.021491	0.018803	108	0.450104	0.450104
74	0.024309	0.021343	109	0.465405	0.465405
75	0.027449	0.024188	110	0.480562	0.480562
76	0.030938	0.027366	111	0.495600	0.495600
77	0.034805	0.030907	112	0.510546	0.510546
78	0.039082	0.034840	113	0.525437	0.525437
79	0.043800	0.039202	114	0.540323	0.540323
80	0.048996	0.044028	115	0.555271	0.555271
81	0.054708	0.049357	116	0.570389	0.570389
82	0.060974	0.055232	117	0.585858	0.585858
83	0.067836	0.061697	118	0.602053	0.602053
84	0.075339	0.068799	119	0.620371	0.620371
			120	1.000000	1.000000

Table A9. Widows, lives – WL00: values of q_x

Age x	Lives	Age x	Lives	Age x	Lives
		50	0.005556	85	0.074123
		51	0.005678	86	0.081685
17	0.000458	52	0.005794	87	0.090013
18	0.000630	53	0.005904	88	0.099177
19	0.000800	54	0.006002	89	0.109248
20	0.000970	55	0.006204	90	0.120594
21	0.001139	56	0.006551	91	0.134138
22	0.001308	57	0.006937	92	0.149167
23	0.001475	58	0.007365	93	0.165747
24	0.001642	59	0.007841	94	0.183995
25	0.001808	60	0.008369	95	0.204028
26	0.001973	61	0.008955	96	0.225957
27	0.002137	62	0.009606	97	0.249882
28	0.002300	63	0.010329	98	0.275188
29	0.002462	64	0.011131	99	0.299847
30	0.002623	65	0.012021	100	0.323553
31	0.002784	66	0.013009	101	0.346342
32	0.002943	67	0.014106	102	0.368246
33	0.003101	68	0.015323	103	0.389297
34	0.003258	69	0.016672	104	0.409526
35	0.003414	70	0.018170	105	0.428961
36	0.003568	71	0.019831	106	0.447629
37	0.003722	72	0.021673	107	0.465556
38	0.003874	73	0.023715	108	0.482765
39	0.004024	74	0.025978	109	0.499277
40	0.004173	75	0.028487	110	0.515113
41	0.004321	76	0.031266	111	0.530290
42	0.004467	77	0.034344	112	0.544821
43	0.004611	78	0.037752	113	0.558719
44	0.004753	79	0.041524	114	0.571989
45	0.004893	80	0.045696	115	0.584629
46	0.005031	81	0.050311	116	0.596628
47	0.005167	82	0.055410	117	0.607950
48	0.005300	83	0.061044	118	0.618511
49	0.005429	84	0.067263	119	0.628025
				120	1.000000

Table A10. Widows, amounts – WA00: values of q_x

Age x	Amounts	Age x	Amounts	Age x	Amounts
		50	0.004296	85	0.070238
		51	0.004390	86	0.078281
17	0.000350	52	0.004481	87	0.087238
18	0.000482	53	0.004566	88	0.097200
19	0.000614	54	0.004641	89	0.108267
20	0.000746	55	0.004793	90	0.120543
21	0.000877	56	0.005053	91	0.134138
22	0.001007	57	0.005345	92	0.149167
23	0.001137	58	0.005673	93	0.165747
24	0.001266	59	0.006042	94	0.183995
25	0.001394	60	0.006457	95	0.204028
26	0.001522	61	0.006922	96	0.225957
27	0.001649	62	0.007445	97	0.249882
28	0.001775	63	0.008033	98	0.275188
29	0.001900	64	0.008693	99	0.299847
30	0.002025	65	0.009434	100	0.323553
31	0.002149	66	0.010266	101	0.346342
32	0.002273	67	0.011200	102	0.368246
33	0.002395	68	0.012249	103	0.389297
34	0.002516	69	0.013427	104	0.409526
35	0.002637	70	0.014749	105	0.428961
36	0.002757	71	0.016233	106	0.447629
37	0.002875	72	0.017897	107	0.465556
38	0.002993	73	0.019765	108	0.482765
39	0.003110	74	0.021860	109	0.499277
40	0.003225	75	0.024209	110	0.515113
41	0.003339	76	0.026842	111	0.530290
42	0.003452	77	0.029793	112	0.544821
43	0.003564	78	0.033099	113	0.558719
44	0.003674	79	0.036801	114	0.571989
45	0.003783	80	0.040944	115	0.584629
46	0.003890	81	0.045580	116	0.596628
47	0.003995	82	0.050764	117	0.607950
48	0.004098	83	0.056555	118	0.618511
49	0.004198	84	0.063023	119	0.628025
				120	1.000000

Table A11. Retirement Annuitants, males and females, deferred – RMD00 and RFD00: values of q_x

Age x	Males	Females	Age x	Males	Females
			45	0.001266	0.001153
			46	0.001396	0.001250
17	0.000418	0.000120	47	0.001542	0.001355
18	0.000419	0.000131	48	0.001707	0.001469
19	0.000421	0.000142	49	0.001893	0.001592
20	0.000423	0.000153	50	0.002101	0.001726
21	0.000425	0.000166	51	0.002333	0.001871
22	0.000428	0.000180	52	0.002590	0.002028
23	0.000432	0.000195	53	0.002877	0.002198
24	0.000436	0.000212	54	0.003193	0.002383
25	0.000441	0.000230	55	0.003542	0.002583
26	0.000448	0.000249	56	0.003926	0.002800
27	0.000455	0.000270	57	0.004347	0.003035
28	0.000464	0.000293	58	0.004806	0.003289
29	0.000475	0.000317	59	0.005307	0.003565
30	0.000487	0.000344	60	0.005850	0.003864
31	0.000502	0.000373	61	0.006437	0.004188
32	0.000519	0.000404	62	0.007071	0.004540
33	0.000540	0.000438	63	0.007752	0.004920
34	0.000564	0.000475	64	0.008482	0.005333
35	0.000592	0.000515	65	0.009261	0.005780
36	0.000625	0.000558	66	0.010091	0.006264
37	0.000663	0.000605	67	0.010970	0.006789
38	0.000707	0.000656	68	0.011899	0.007357
39	0.000758	0.000711	69	0.012877	0.007973
40	0.000817	0.000770	70	0.013904	0.008640
41	0.000884	0.000835	71	0.014977	0.009363
42	0.000962	0.000905	72	0.016094	0.010146
43	0.001050	0.000981	73	0.017253	0.010994
44	0.001151	0.001064	74	0.018450	0.011913
			75	0.019682	0.012907

Table A12. Retirement Annuitants, males and females, vested – RMV00 and RFV00: values of q_x

Age x	Males	Females	Age x	Males	Females
50	0.013435	0.006660	85	0.100962	0.066938
51	0.012799	0.006319	86	0.111444	0.075349
52	0.012220	0.006002	87	0.122828	0.084691
53	0.011703	0.005713	88	0.135167	0.095048
54	0.011254	0.005454	89	0.148512	0.106508
55	0.010878	0.005230	90	0.162916	0.119162
56	0.010583	0.005044	91	0.178429	0.133107
57	0.010376	0.004900	92	0.195098	0.148441
58	0.010264	0.004804	93	0.212967	0.165261
59	0.010257	0.004761	94	0.232076	0.183665
60	0.010364	0.004776	95	0.252456	0.203745
61	0.010595	0.004857	96	0.274131	0.225588
62	0.010960	0.005012	97	0.297115	0.249270
63	0.011472	0.005247	98	0.321410	0.274853
64	0.012145	0.005574	99	0.347003	0.302378
65	0.012990	0.006001	100	0.371104	0.329779
66	0.014025	0.006541	101	0.392217	0.354898
67	0.015266	0.007206	102	0.412351	0.378758
68	0.016729	0.008009	103	0.431547	0.401415
69	0.018434	0.008968	104	0.449840	0.422923
70	0.020402	0.010098	105	0.467266	0.443333
71	0.022655	0.011420	106	0.483856	0.462689
72	0.025217	0.012954	107	0.499639	0.481035
73	0.028113	0.014724	108	0.514640	0.498410
74	0.031370	0.016755	109	0.528883	0.514847
75	0.035019	0.019076	110	0.542386	0.530376
76	0.039090	0.021719	111	0.555166	0.545024
77	0.043618	0.024718	112	0.567233	0.558808
78	0.048636	0.028111	113	0.578591	0.571742
79	0.054184	0.031941	114	0.589237	0.583827
80	0.060301	0.036252	115	0.599156	0.595052
81	0.067028	0.041094	116	0.608313	0.605387
82	0.074411	0.046523	117	0.616640	0.614760
83	0.082496	0.052596	118	0.623994	0.623018
84	0.091329	0.059378	119	0.629968	0.629712
			120	1.000000	1.000000

Table A13. Retirement Annuitants, males, combined – RMC00: values of q_x

Age x	Males	Age x	Males	Age x	Males
		50	0.002101	85	0.100491
		51	0.002333	86	0.111358
17	0.000418	52	0.002590	87	0.122828
18	0.000419	53	0.002878	88	0.135167
19	0.000421	54	0.003207	89	0.148512
20	0.000423	55	0.003578	90	0.162916
21	0.000425	56	0.003997	91	0.178429
22	0.000428	57	0.004468	92	0.195098
23	0.000432	58	0.004998	93	0.212967
24	0.000436	59	0.005594	94	0.232076
25	0.000441	60	0.006265	95	0.252456
26	0.000448	61	0.007018	96	0.274131
27	0.000455	62	0.007864	97	0.297115
28	0.000464	63	0.008813	98	0.321410
29	0.000475	64	0.009878	99	0.347003
30	0.000487	65	0.011072	100	0.371104
31	0.000502	66	0.012410	101	0.392217
32	0.000519	67	0.013907	102	0.412351
33	0.000540	68	0.015583	103	0.431547
34	0.000564	69	0.017456	104	0.449840
35	0.000592	70	0.019550	105	0.467266
36	0.000625	71	0.021887	106	0.483856
37	0.000663	72	0.024496	107	0.499639
38	0.000707	73	0.027403	108	0.514640
39	0.000758	74	0.030642	109	0.528883
40	0.000817	75	0.034248	110	0.542386
41	0.000884	76	0.038257	111	0.555166
42	0.000962	77	0.042712	112	0.567233
43	0.001050	78	0.047656	113	0.578591
44	0.001151	79	0.053139	114	0.589237
45	0.001266	80	0.059211	115	0.599156
46	0.001396	81	0.065928	116	0.608313
47	0.001542	82	0.073350	117	0.616640
48	0.001707	83	0.081540	118	0.623994
49	0.001893	84	0.090563	119	0.629968
				120	1.000000

Table A14. Retirement Annuitants, females, combined – RFC00: values of q_x

Age x	Females	Age x	Females	Age x	Females
		50	0.001726	85	0.066938
		51	0.001871	86	0.075349
17	0.000120	52	0.002028	87	0.084691
18	0.000131	53	0.002198	88	0.095048
19	0.000142	54	0.002383	89	0.106508
20	0.000153	55	0.002583	90	0.119162
21	0.000166	56	0.002800	91	0.133107
22	0.000180	57	0.003035	92	0.148441
23	0.000195	58	0.003291	93	0.165261
24	0.000212	59	0.003594	94	0.183665
25	0.000230	60	0.003937	95	0.203745
26	0.000249	61	0.004320	96	0.225588
27	0.000270	62	0.004748	97	0.249270
28	0.000293	63	0.005227	98	0.274853
29	0.000317	64	0.005763	99	0.302378
30	0.000344	65	0.006364	100	0.329779
31	0.000373	66	0.007040	101	0.354898
32	0.000404	67	0.007800	102	0.378758
33	0.000438	68	0.008655	103	0.401415
34	0.000475	69	0.009620	104	0.422923
35	0.000515	70	0.010710	105	0.443333
36	0.000558	71	0.011942	106	0.462689
37	0.000605	72	0.013336	107	0.481035
38	0.000656	73	0.014917	108	0.498410
39	0.000711	74	0.016766	109	0.514847
40	0.000770	75	0.019076	110	0.530376
41	0.000835	76	0.021719	111	0.545024
42	0.000905	77	0.024718	112	0.558808
43	0.000981	78	0.028111	113	0.571742
44	0.001064	79	0.031941	114	0.583827
45	0.001153	80	0.036252	115	0.595052
46	0.001250	81	0.041094	116	0.605387
47	0.001355	82	0.046523	117	0.614760
48	0.001469	83	0.052596	118	0.623018
49	0.001592	84	0.059378	119	0.629712
				120	1.000000

Table A15. Personal Pensioners, males and females, deferred – PPMD00 and PPFD00: values of q_x

Age x	Males	Females	Age x	Males	Females
			45	0.001442	0.001133
			46	0.001587	0.001238
17	0.000429	0.000061	47	0.001749	0.001351
18	0.000431	0.000069	48	0.001929	0.001472
19	0.000434	0.000078	49	0.002130	0.001602
20	0.000437	0.000087	50	0.002353	0.001743
21	0.000440	0.000098	51	0.002599	0.001893
22	0.000445	0.000110	52	0.002870	0.002054
23	0.000450	0.000123	53	0.003169	0.002226
24	0.000456	0.000138	54	0.003496	0.002410
25	0.000463	0.000154	55	0.003854	0.002606
26	0.000472	0.000172	56	0.004244	0.002815
27	0.000482	0.000192	57	0.004668	0.003038
28	0.000494	0.000214	58	0.005126	0.003275
29	0.000508	0.000238	59	0.005622	0.003526
30	0.000524	0.000265	60	0.006155	0.003792
31	0.000544	0.000294	61	0.006727	0.004074
32	0.000566	0.000326	62	0.007339	0.004372
33	0.000592	0.000361	63	0.007992	0.004687
34	0.000623	0.000399	64	0.008685	0.005019
35	0.000658	0.000442	65	0.009420	0.005368
36	0.000698	0.000488	66	0.010196	0.005735
37	0.000744	0.000538	67	0.011012	0.006121
38	0.000798	0.000593	68	0.011867	0.006525
39	0.000859	0.000652	69	0.012761	0.006948
40	0.000928	0.000717	70	0.013692	0.007391
41	0.001007	0.000788	71	0.014657	0.007853
42	0.001097	0.000864	72	0.015655	0.008335
43	0.001199	0.000947	73	0.016682	0.008837
44	0.001313	0.001037	74	0.017736	0.009358
			75	0.018812	0.009900

Table A16. Personal Pensioners, males and females, vested – PPMV00 and PPFV00: values of q_x

Age x	Males	Females	Age x	Males	Females
50	0.007954	0.004166	85	0.078047	0.058546
51	0.007834	0.004184	86	0.087749	0.067447
52	0.007765	0.004206	87	0.098717	0.077611
53	0.007744	0.004233	88	0.111096	0.089172
54	0.007771	0.004266	89	0.125039	0.102274
55	0.007844	0.004307	90	0.140708	0.117061
56	0.007963	0.004358	91	0.158268	0.133677
57	0.008131	0.004420	92	0.177883	0.152262
58	0.008347	0.004496	93	0.199712	0.172948
59	0.008615	0.004588	94	0.223903	0.195849
60	0.008938	0.004701	95	0.250578	0.221061
61	0.009320	0.004838	96	0.279832	0.248647
62	0.009767	0.005004	97	0.311710	0.278633
63	0.010283	0.005205	98	0.346205	0.311000
64	0.010877	0.005449	99	0.383234	0.345673
65	0.011557	0.005742	100	0.411401	0.374418
66	0.012333	0.006096	101	0.428757	0.395216
67	0.013215	0.006520	102	0.445378	0.415057
68	0.014218	0.007028	103	0.461290	0.433979
69	0.015356	0.007637	104	0.476516	0.452018
70	0.016646	0.008363	105	0.491078	0.469207
71	0.018110	0.009227	106	0.504996	0.485576
72	0.019769	0.010254	107	0.518288	0.501153
73	0.021650	0.011472	108	0.530971	0.515964
74	0.023784	0.012913	109	0.543056	0.530030
75	0.026204	0.014614	110	0.554557	0.543369
76	0.028950	0.016617	111	0.565480	0.555998
77	0.032067	0.018970	112	0.575828	0.567925
78	0.035605	0.021728	113	0.585602	0.579155
79	0.039622	0.024952	114	0.594793	0.589684
80	0.044184	0.028711	115	0.603382	0.599495
81	0.049362	0.033083	116	0.611334	0.608555
82	0.055241	0.038153	117	0.618586	0.616795
83	0.061911	0.044016	118	0.625008	0.624075
84	0.069475	0.050776	119	0.630234	0.629989
			120	1.000000	1.000000

Table A17. Personal Pensioners, males, combined – PPMC00: values of q_x

Age x	Males	Age x	Males	Age x	Males
		50	0.002475	85	0.078047
		51	0.002742	86	0.087749
17	0.000429	52	0.003036	87	0.098717
18	0.000431	53	0.003360	88	0.111096
19	0.000434	54	0.003716	89	0.125039
20	0.000437	55	0.004107	90	0.140708
21	0.000440	56	0.004534	91	0.158268
22	0.000445	57	0.005002	92	0.177883
23	0.000450	58	0.005512	93	0.199712
24	0.000456	59	0.006068	94	0.223903
25	0.000463	60	0.006673	95	0.250578
26	0.000472	61	0.007332	96	0.279832
27	0.000482	62	0.008048	97	0.311710
28	0.000494	63	0.008826	98	0.346205
29	0.000508	64	0.009671	99	0.383234
30	0.000524	65	0.010588	100	0.411401
31	0.000544	66	0.011583	101	0.428757
32	0.000566	67	0.012664	102	0.445378
33	0.000592	68	0.013837	103	0.461290
34	0.000623	69	0.015110	104	0.476516
35	0.000658	70	0.016493	105	0.491078
36	0.000698	71	0.018011	106	0.504996
37	0.000744	72	0.019769	107	0.518288
38	0.000798	73	0.021650	108	0.530971
39	0.000859	74	0.023784	109	0.543056
40	0.000931	75	0.026204	110	0.554557
41	0.001017	76	0.028950	111	0.565480
42	0.001114	77	0.032067	112	0.575828
43	0.001224	78	0.035605	113	0.585602
44	0.001348	79	0.039622	114	0.594793
45	0.001488	80	0.044184	115	0.603382
46	0.001645	81	0.049362	116	0.611334
47	0.001821	82	0.055241	117	0.618586
48	0.002016	83	0.061911	118	0.625008
49	0.002234	84	0.069475	119	0.630234
				120	1.000000

Table A18. Personal Pensioners, females, combined – PPFC00: values of q_x

Age x	Females	Age x	Females	Age x	Females
		50	0.001750	85	0.058546
		51	0.001910	86	0.067447
17	0.000061	52	0.002084	87	0.077611
18	0.000069	53	0.002272	88	0.089172
19	0.000078	54	0.002476	89	0.102274
20	0.000087	55	0.002697	90	0.117061
21	0.000098	56	0.002935	91	0.133677
22	0.000110	57	0.003193	92	0.152262
23	0.000123	58	0.003471	93	0.172948
24	0.000138	59	0.003772	94	0.195849
25	0.000154	60	0.004097	95	0.221061
26	0.000172	61	0.004448	96	0.248647
27	0.000192	62	0.004827	97	0.278633
28	0.000214	63	0.005236	98	0.311000
29	0.000238	64	0.005678	99	0.345673
30	0.000265	65	0.006155	100	0.374418
31	0.000294	66	0.006670	101	0.395216
32	0.000326	67	0.007227	102	0.415057
33	0.000361	68	0.007828	103	0.433979
34	0.000399	69	0.008478	104	0.452018
35	0.000442	70	0.009180	105	0.469207
36	0.000488	71	0.009939	106	0.485576
37	0.000538	72	0.010761	107	0.501153
38	0.000593	73	0.011654	108	0.515964
39	0.000652	74	0.012913	109	0.530030
40	0.000717	75	0.014614	110	0.543369
41	0.000788	76	0.016617	111	0.555998
42	0.000864	77	0.018970	112	0.567925
43	0.000947	78	0.021728	113	0.579155
44	0.001037	79	0.024952	114	0.589684
45	0.001133	80	0.028711	115	0.599495
46	0.001238	81	0.033083	116	0.608555
47	0.001351	82	0.038153	117	0.616795
48	0.001472	83	0.044016	118	0.624075
49	0.001603	84	0.050776	119	0.629989
				120	1.000000