ISSN 0954-2388
CMIR **23** (2009)

Continuous Mortality Investigation Reports

Number 23

Published by the Institute of Actuaries
and the Faculty of Actuaries
2009

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INTRODUCTION

The Executive Committee of the Continuous Mortality Investigation (CMI) of the Institute of Actuaries and Faculty of Actuaries has pleasure in presenting this, its twenty-third report.

This report is devoted entirely to the range of mortality tables based on the 1999-2002 life office experience. This range, known as the "00" Series, is even more extensive than the "92" Series introduced by *C.M.I.R.* **17** (1999)**.** The innovations include:

— Smoker and non-smoker tables for the permanent and temporary assurance investigations.
— Early and combined retirement tables for the life office pensioner investigations.
— Tables for the personal pensioner investigations.
— Tables for the deferred and combined sections of the retirement annuitant and personal pensioner investigations.

The "00" Series tables were exposed to the profession in a consultation process via a series of Working Papers and public meetings. The final tables were then published in Working Papers 21 and 22 in July 2006, and were adopted by the Actuarial Profession with effect from 1 September 2006. Subsequently, extensions to younger ages for the life office pensioner early and combined retirement tables were published in Working Paper 26. This report draws together and completes the work contained in the Working Papers and presents the finally adopted "00" Series mortality tables.

A Working Party consisting of A S Macdonald, J R Ellam, A P Gallop, S Spencer, J C Wells, A D Wilkie and R C Willets prepared the report. The Committee is grateful to them for all the work undertaken.

The CMI has not produced a separate volume to accompany the "00" Series, as has previously been the case when a new suite of tables is produced. This is due to the lack of demand experienced for the "92" Series volume and increased preference from practitioners for obtaining such information electronically. The CMI Tables Program (STP) has been updated to include all of the "00" Series tables and it is intended that a future release will contain the extensions to younger ages of the pensioner tables introduced in Working Paper 26. In addition, all

mortality tables published by the CMI are available in spreadsheet form on the CMI section of the Actuarial Profession's website.

It should be noted that no mortality projections are included in this Report. This does not mean that no work has been carried out on mortality projections – far from it: a wealth of material on developing mortality projection methodologies has been published in recent years. However, the CMI concluded that it was unable to present a single view of the future and so decided not to issue projections alongside the "00" Series tables.

It is over three years since the last C.M.I. Report was published. This long interval reflects the increased use of Working Papers for the dissemination of information. During this time the CMI has issued nineteen Working Papers – approximately one every two months – covering a wide range of topics from all of the investigation Committees.

Working Papers allow new research, consultations and work in progress to be communicated more quickly than would be possible with a C.M.I. Report. The contents of a Working Paper may in due course assume full C.M.I. Report status – as is the case with this volume – though any work carried out for a Working Paper will be of the same standard as for a C.M.I. Report and will have been closely supervised by the relevant sponsoring Committee.

I would particularly like to mention a number of developments since the publication of *C.M.I.R.* **22**:

— The Self-Administered Pension Schemes (SAPS) Mortality Committee has been welcomed as a new CMI investigation committee. The SAPS investigation was initially carried out under the auspices of the Pensions Board of the Actuarial Profession. In June 2006 it was incorporated within the CMI and the SAPS Working Party then became a fully fledged CMI Committee. In the short time since its establishment the CMI SAPS Mortality Committee has been very active. Most notably during 2008 it published formally its first set of mortality tables (the SAPS S1 tables) – the first to be based on self-administered pension scheme experience.

— The publication of Working Paper 30 and the associated Library of Mortality Projections. This brings together in one

place standardised definitions of over 50 different mortality projection bases.

— Improved communications with stakeholders. This has been achieved through a number of channels: regular email communication and use of the Actuarial Profession's "e-bulletins"; greater volumes of information posted on the CMI website; and the setting up of the Insurance Forum (for life office members) and the SAPS User Group (for SAPS members) to provide direct two-way channels of communication between the CMI and the organisations that contribute to the CMI and use its output. Such communications are very important for the successful operation of the CMI, and I intend to build further on these initiatives.

I would like to thank all those involved with the work of the CMI – the member firms that provide the data and financial support, the Secretariat for carrying out all the processing and administrative work and for providing valuable support to the Committees, and the members of all the Committees and Working Parties who give so much of their time, on a voluntary basis, to the service of the profession and its stakeholders.

My tenure as Chairman of the CMI commenced on 1 July 2008 following Brian Ridsdale's retirement. I would like to pay tribute to Brian's enthusiastic leadership of and contribution to the CMI over his four years at the helm, and I wish him well for the future.

The CMI welcomes feedback on this report, or indeed on any other aspect of its work. This can be sent by email to info@cmib.org.uk.

February 2009

Gordon Sharp
Chairman, Executive Committee

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GRADUATIONS OF THE 1999-2002 LIFE OFFICE MORTALITY EXPERIENCES

1. INTRODUCTION

1.1 *Background*

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

1.1.2 The work of the MGWP was exposed to the actuarial profession via a series of Working Papers:

- 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.
- Working Paper 16, published in September 2005, contained proposed graduations for the annuitant and pensioner tables.
- Working Paper 21, published in July 2006, contained the final assured lives tables, which were adopted by the Actuarial Profession on 1 September 2006.
- Working Paper 22, published in July 2006, contained the final annuitant and pensioner tables, which were adopted by the Actuarial Profession on 1 September 2006.
- Working Paper 26, published in April 2007, contained extensions to younger ages of the Early and Combined Pensioner tables.

1.1.3 This *C.M.I.R.* draws together and completes this work and presents the "00" Series base mortality tables finally adopted by the UK Actuarial Profession.

1.1.4 There was a debate within the profession over the meaning of 'adoption', especially following the formation of the Board for Actuarial Standards (BAS). It was agreed that it was still appropriate in the new environment for the profession to adopt the tables as part of its remit to provide members with useful tools and that this does not stray into the responsibility of the BAS for setting technical actuarial standards.

1.1.5 In the past, the tables were commonly referred to as 'standard tables'. This is no longer appropriate. Indeed, the CMI has never seen itself as responsible for setting standards for the profession regarding base mortality or future projections and all tables have carried warnings to the effect that: **It is the responsibility of any actuary or other person using a published table to ensure that it is appropriate for the particular purpose to which it is put.**

1.1.6 By approving the publication of the "00" Series tables in the name of the UK actuarial profession, FIMC confirmed the CMI's view that the tables are well-constructed and suitable for use by actuaries. It is certainly not the case that actuaries should assume the tables can be used blindly or that they are mandated by the profession in any sense. Clearly, though, the CMI hopes that the tables will be a welcome addition to actuaries' toolkits, whether they work in the life or pensions sector.

1.1.7 During its work on graduating the "00" Series tables the CMI also undertook extensive research into mortality projections, but came to the conclusion that it was unable to present a single view of the future, as had been attempted with preceding mortality tables. The final "00" Series tables presented in this report therefore do not contain any projections.

1.2 *Methodology*

1.2.1 As for both the 1979-1982 ("80" Series) and 1991-1994 ("92" Series) graduations, the methodology was to use central exposed to risk, fit a formula of the μ_x = GM(r,s) class, and in the first place choose the parameters by maximum likelihood, taking account also of the usual diagnostic tests (numbers of positive and negative deviations, runs, Kolmogorov-Smirnov, serial correlations and χ^2).

1.2.2 For each of the experiences, alternative orders of formula were considered, i.e. different values of r and s in the GM(r,s) formula. The following pairs of values were used: (0,2), (0,3), (1,2), (0,4), (1,3), (2,2), (0,5), (1,4), (2,3), (3,2), i.e. each combination for which $r+s \leq 5$ and $s \geq 2$. (Formulae with $s = 0$ or 1 were not tried because the underlying shape is always of Gompertz, GM(0,2), type, i.e. to a first approximation $\log \mu_x$ is linear in x.)

1.2.3 Note that, for example, the GM(2,3) formula is parameterised as:

$$a_1 + a_2 t + \exp\{b_1 + b_2 t + b_3(2t^2 - 1)\}$$

where $t = (x - 70) / 50$. The first two terms of this formula can be described as the "r" part, with two terms, and the exponential can be described as the "s" part, with three terms inside the parentheses.

1.2.4 In order to maintain sensible relationships between the different sections of the data it was also necessary to make some *ad hoc* adjustments to the resulting fitted rates, particularly at the extremes of age where there was very little data. An adjustment common to all the graduations relates to the oldest ages, and this is described in the following paragraph. Other adjustments specific to the individual graduations are described further in the relevant sections below.

1.2.5 At the oldest ages values of μ_x, for $x > a$, were blended into an arbitrary μ_{120} equal to 1 using the formula:

$$\mu_x = \frac{(120 - x)^c}{(120 - a)^c} \times \mu_a + \left(1 - \frac{(120 - x)^c}{(120 - a)^c}\right) \times \mu_{120}$$

where a represents a "run-in" age (typically 100) and c represents a "curvature" parameter (typically 1.25).

1.2.6 Finally, values of q_x were derived from the (adjusted as necessary) values of μ_x by using the formula:

$$q_x = 1 - e^{-\int_0^1 \mu_{x+t} \mathrm{d}t}$$

where the following approximate integration formula was used to evaluate the integral:

$$\int_0^1 \mu_{x+t}\mathrm{d}t \approx \left[7\mu_x + 32\mu_{x+1/4} + 12\mu_{x+1/2} + 32\mu_{x+3/4} + 7\mu_{x+1}\right]/90$$

and rounded to six decimal places.

1.2.7 For the mortality rates contained in the "00" Series tables the value of q_x applies on average to a life attaining age x in the middle of 2000 and gives the probability of death before the attainment of age x+1 in the middle of 2001. The age definition is therefore age exact – not last, nearest or next.

1.2.8 The following sections describe more closely the graduations of broad categories of the experience. In these sections more information is given about the data, the fitted formulae for μ_x, specific features of the experience and any adjustments made to the final graduations. Each section then includes a number of tables setting out information on the underlying data and the graduation results. Final values of q_x for all the tables are presented in Appendix A. For ease of reference, the graduation formulae for all tables are summarised in Appendix C.

1.3 *Summary of tables*

1.3.1 The following paragraphs summarise the finally adopted "00" Series tables and set out where they can be found in this report.

1.3.2 Part 2 provides a description of the graduation of the Permanent and Temporary Assurance experiences. These are all lives tables with a select period and separate tables have been produced for different smoker statuses. Table 1.1 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x.

1.3.3 Part 3 provides a description of the graduation of the Immediate Annuitant experiences. These are all lives tables with a select period for females only. Table 1.2 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x.

1.3.4 Part 4 provides a description of the graduation of the Retirement Annuitant experiences. These are all lives tables with no select period. Separate tables have been produced for deferred, vested and combined business. Table 1.3 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x.

1.3.5 Part 5 provides a description of the graduation of the Personal Pensioner experiences. These are all lives tables with no select period. Separate tables have been produced for deferred, vested and combined business. Table 1.4 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x.

1.3.6 Part 6 provides a description of the graduation of the Life Office Pensioner experiences. These include both lives and amounts tables with no select period. Separate tables have been produced for Normal retirements (those retiring at or after normal retirement age) and Early retirements (those retiring before normal retirement age) as well as the Combined (i.e. Normals and Earlies aggregated) experience. Table 1.5 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x. Further details on possible extensions of the Early and Combined tables to younger ages are provided in Part 8 and Appendix B.

1.3.7 Part 7 provides a description of the graduation of the Widows experiences (that is, spouses granted pensions on the death of life office pension scheme members). These include both lives and amounts tables with no select period. Table 1.6 gives summary details of these mortality tables and also states which table in Appendix A contains the finally adopted values of q_x.

Table 1.1. Summary of assured lives tables.

Table name	Sex	Smoker status	Select period	Age range	App A Location
Permanent Assurances					
AMC00	Male	Combined	2 years	17-120	A1
AMS00	Male	Smokers	2 years	17-120	A2
AMN00	Male	Non-smokers	2 years	17-120	A3
AFC00	Female	Combined	2 years	17-120	A4
AFS00	Female	Smokers	2 years	17-120	A5
AFN00	Female	Non-smokers	2 years	17-120	A6
Temporary Assurances					
TMC00	Male	Combined	5 years	17-120	A7
TMS00	Male	Smokers	5 years	17-120	A8
TMN00	Male	Non-smokers	5 years	17-120	A9
TFC00	Female	Combined	5 years	17-120	A10
TFS00	Female	Smokers	5 years	17-120	A11
TFN00	Female	Non-smokers	5 years	17-120	A12

Table 1.2. Summary of immediate annuitant tables.

Table name	Sex	Select period	Age range	App A Location
IML00	Male	None	60-120	A13
IFL00	Female	1 year	60-120	A14

Table 1.3. Summary of retirement annuitant tables.

Table name	**Sex**	**Category**	**Age range**	**App A Location**
RMD00	Male	Deferred	17-75	A19
RMV00	Male	Vested	50-120	A19
RMC00	Male	Combined	17-120	A19
RFD00	Female	Deferred	17-75	A20
RFV00	Female	Vested	50-120	A20
RFC00	Female	Combined	17-120	A20

Table 1.4. Summary of personal pensioner tables.

Table name	**Sex**	**Category**	**Age range**	**App A Location**
PPMD00	Male	Deferred	17-75	A21
PPMV00	Male	Vested	50-120	A21
PPMC00	Male	Combined	17-120	A21
PPFD00	Female	Deferred	17-75	A22
PPFV00	Female	Vested	50-120	A22
PPFC00	Female	Combined	17-120	A22

Table 1.5. Summary of life office pensioner tables.

Table name	**Category**	**Sex**	**Lives / Amounts**	**Age range**	**App A Location**
PNML00	Normal	Male	Lives	20-120	A15
PNMA00	Normal	Male	Amounts	20-120	A15
PNFL00	Normal	Female	Lives	20-120	A15
PNFA00	Normal	Female	Amounts	20-120	A15
PEML00	Early	Male	Lives	50-120	A16
PEMA00	Early	Male	Amounts	50-120	A16
PEFL00	Early	Female	Lives	50-120	A16
PEFA00	Early	Female	Amounts	50-120	A16
PCML00	Combined	Male	Lives	50-120	A17
PCMA00	Combined	Male	Amounts	50-120	A17
PCFL00	Combined	Female	Lives	50-120	A17
PCFA00	Combined	Female	Amounts	50-120	A17

Table 1.6. Summary of widows tables.

Table name	**Sex**	**Lives / Amounts**	**Age range**	**App A Location**
WL00	Female	Lives	17-120	A18
WA00	Female	Amounts	17-120	A18

2. PERMANENT AND TEMPORARY ASSURANCES

2.1 *The data*

2.1.1 Data are collected separately for permanent (whole life and endowment) assurances and temporary assurances – denoted hereinafter as "Permanents" and "Temporaries" respectively – for both sexes and subdivided by curtate duration since entry up to 5 years and over. Furthermore, for both of these investigations subdivisions by smoker and non-smoker status are included. Only lives data are collected for these investigations.

2.1.2 The Permanent experiences have been rapidly declining in size in recent years. This is due to both a fall in the number of contributing offices and a fall in the volumes submitted by some offices. In contrast, the Temporary experiences have been relatively stable. However, both these experiences remain sufficiently large for meaningful graduations to be carried out. Total numbers of exposed to risk and of deaths are shown in Tables 2.1 and 2.2 for Permanents and in Tables 2.3 and 2.4 for Temporaries, which also include comparisons with the corresponding numbers for the 1991-1994 and 1979-1982 experiences.

2.1.3 The data cover a wide range of adult ages. The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Tables 2.5 and 2.6.

2.1.4 Data differentiated by smoker status have only been collected since 1988. At the time of the "92" Series graduations data volumes had not built up sufficiently for smoker/non-smoker graduations to be considered. However, data volumes have since increased and the MGWP has been able to produce separate smoker/non-smoker graduations of the assured lives tables for the "00" Series. Feedback received in the consultation process appeared to support the inclusion of these new tables.

2.2 *Ultimate graduations*

2.2.1 The experience at different durations was considered, and results published in CMI Working Paper 8. The initial conclusion was that the experience of Permanents at durations 2 and over was very similar to that of Temporaries at durations 5 and over. It was therefore decided to amalgamate these experiences at these respective ultimate durations.

2.2.2 This resulted in six separate graduations of ultimate rates, applicable to both Permanents and Temporaries:

- Males, Combined
- Males, Smokers
- Males, Non-smokers
- Females, Combined
- Females, Smokers
- Females, Non-smokers

2.2.3 The combined experiences include smokers and non-smokers together with business sold undifferentiated or where the smoker status has not been advised to the CMI.

2.2.4 The experience at select durations (i.e. 0 and 1 for Permanents and 0, 1, 2, 3 and 4 for Temporaries) were, however, very different. The approach taken to produce select rates is described in more detail below.

2.2.5 The key statistics from the resulting unadjusted ultimate graduations are shown in Tables 2.7 and 2.8. These tables also show the '–Log likelihood' value calculated from the adjusted ultimate graduations.

2.3 *Variance ratios*

2.3.1 The investigations are carried out on the basis of policies rather than lives. Ideally, the MGWP would have liked to have analysed the distribution of policies per life to take account of the possible effect of duplicates in the data. For the "92" Series graduations this was done by using information from the cause of death investigation to calculate "variance ratios" – that is, m_2/m_1 at each age where m_2 and m_1 are the second and first moments, respectively, of the distribution of policies among lives (or rather deaths). The exposed to risk and actual deaths at each age are then divided by the ratio applicable to that age. While this does not affect the actual graduated rates, it does affect the results of the statistical tests.

2.3.2 Unfortunately, the cause of death investigation was discontinued in approximately 1995, and so it was not possible to calculate variance ratios corresponding to the 1999-2002 dataset. In the absence of such information, the MGWP has used the same variance ratios that were used for the "92" Series graduations.
2.3.3 Summaries of the exposed to risk and deaths, both before and after the application of variance ratios, are given in Tables 2.9 to 2.14.

2.4 *Adjustments*
2.4.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages, with a "run-in" age of 100 and a "curvature" parameter of 1.25.
2.4.2 Additionally, the rates for smokers and non-smokers were constrained to ensure the following relationship held at all ages, separately for males and females:

$$\mu_x[\text{smoker}] \geq \mu_x[\text{combined}] \geq \mu_x[\text{non-smoker}].$$

2.4.3 The effect of the adjustments can be seen in Tables 2.15 and 2.16, which show the calculated values of μ_x both pre- and post-adjustments. Adjusted values that differ from unadjusted values are highlighted in bold.
2.4.4 Details of the ultimate rates graduation, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in tables 2.17 to 2.22.

2.5 *Select rates*
2.5.1 Two-year select rates for the Permanents and five-year select rates for the Temporaries were produced. Relatively low data volumes meant that it was not straightforward to simply apply the methodology used for graduating the ultimate data, as it did not prove possible to retain sensible relationships between the various durations. Instead, the following approach was adopted.
2.5.2 It was assumed that the mortality rate $q(x,t)$ at age x and duration t (where t = 0, 1 for Permanents, t = 0, 1, 2, 3, 4 for Temporaries) could be expressed as a function of the graduated ultimate rate at age x, $q(x)$, as follows:

$$q(x,t) = q(x) \times f(x,t).$$

2.5.3 The function $f(x,t)$ was obtained by smoothing (using rolling averages) another function, denoted $uf(x,t)$. The function uf(x,t) was a fourth-order polynomial in x plus a term in t that ensured that the graduated rates at different select durations are parallel.

$$uf(x,t) = [a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4] + b(t).$$

2.5.4 For all except female Temporaries, the polynomial was assumed to apply to the age range $30 \le x \le 80$, while for ages $x < 30$ it is assumed that $uf(x,t) = uf(30,t)$, and for ages $x > 80$ it is assumed that $uf(x,t) = uf(80,t)$. For female Temporaries, which had few deaths at higher ages, age 70 was substituted for age 80.

2.5.5 The smoothed $f(x,t)$ was then calculated as

$$f(x,t) = [uf(x-2,t) + 2\times uf(x-1,t) + 3\times uf(x,t) + 2\times uf(x+1,t) + uf(x+2,t)]\div 9.$$

2.5.6 The following constraints were applied:

- $uf(x,t) \le 1.0$; $uf(x,t) \ge 0.2$ (it is assumed that select rates cannot exceed ultimate rates and, arbitrarily, that select rates at duration 0 cannot fall below 20% of ultimate rates).
- $uf(x,2) = 1.0$ for Permanents; $uf(x,5) = 1.0$ for Temporaries.
- $a_0 = 0$; $a_1 = 0$; $b(0) = 0$.
- $b(t) \ge b(t-1)$.
- $b(t) - b(t-1) \ge b(t+1) - b(t)$.

2.5.7 Parameters a_2, a_3, a_4 and $b(t)$ were then found which maximised the function:

$$\Sigma_x\Sigma_t\{E_{x,t} \times \log(f(x,t) \times q_x) + (E_{x,t} - A_{x,t}) \times \log(1 - f(x,t) \times q_x)\} \qquad (1)$$

where E and A are the 1999-2002 exposures and actual deaths respectively for the relevant ages and durations, and q is the graduated ultimate mortality rate.

2.5.8 Separate functions were fitted for the following investigations:

- Males, Permanents.
- Males, Temporaries.
- Females, Permanents.
- Females, Temporaries.

2.5.9 For non-smokers and smokers a simple adjustment factor was applied to the combined $uf(x,t)$ before deriving the smoothed $f(x,t)$. The adjustment was again found by maximising formula (1), given the parameters a and b fitted to the combined experiences. The resulting mortality rates were further constrained to be not greater/lower (as appropriate) than the relevant combined select rates.

2.5.10 The parameters fitted for the various investigations were as follows:

Parameter	Males		Females	
	Permanent Assurances	Temporary Assurances	Permanent Assurances	Temporary Assurances
100,000 a_0	0.0000	0.0000	0.0000	0.0000
100,000 a_1	0.0000	0.0000	0.0000	0.0000
100,000 a_2	159.0392	113.5889	64.1485	13.2721
100,000 a_3	–3.7226	–2.7468	–1.2016	0.6237
100,000 a_4	0.0235	0.0174	0.0064	–0.0100
$b(0)$	0.0000	0.0000	0.0000	0.0000
$b(1)$	0.2253	0.1258	0.3158	0.1050
$b(2)$	-	0.2203	-	0.2101
$b(3)$	-	0.3148	-	0.3151
$b(4)$	-	0.4093	-	0.4202
Non-smoker adj	0.9980	1.0368	1.0501	1.0116
Smoker adj	1.1720	1.1108	1.3157	0.9976

2.5.11 Select rates have been assumed to end at age 90+t, as was the case with the "92" Series tables.

2.5.12 Select values of μ have been calculated using the methodology set out in *C.M.I.R.* **10**, 31-34, that is:

Define, for $d = 0, 1, \ldots, n$, where n is the select period in years,

$$q_x^d = q_{[x-d]+d}$$

$$\mu_x^d = \mu_{[x-d]+d}$$

$$\lambda_x^d = -\log\left(1 - q_x^d\right).$$

then, for duration 0,

$$\mu_x^0 = \frac{3\lambda_x^0 - \lambda_{x+1}^1}{2}$$

and, for durations 1 to 4,

$$\mu_x^d = \frac{\lambda_{x-1}^{d-1} + \lambda_x^d}{2}.$$

2.5.13 Select values of μ are not reproduced in this report. Interested readers should refer to CMI Working Paper 21.

Table 2.1. Permanent assurances, males: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982, durations 0, 1 and 2+.

	1999-2002	1991-1994	1979-1982
Combined			
Duration 0			
Central exposed	106,050.1	837,360.3	1,799,039.7
Deaths	165	1,345	1,795
Duration 1			
Central exposed	161,467.4	835,252.4	1,776,058.3
Deaths	346	1,774	2,287
Durations 2+			
Central exposed	8,027,210.4	15,139,004.8	22,239,148.0
Deaths	42,644	68,963	90,941
Non-smoker			
Duration 0			
Central exposed	46,094.5	245,698.0	-
Deaths	62	283	-
Duration 1			
Central exposed	62,373.0	243,689.5	-
Deaths	132	384	-
Durations 2+			
Central exposed	1,744,388.5	1,375,974.0	-
% of Combined	21.7%	9.1%	
Deaths	5,744	3,391	-
Smoker			
Duration 0			
Central exposed	13,905.5	76,287.5	-
Deaths	42	192	-
Duration 1			
Central exposed	18,694.0	70,730.5	-
Deaths	82	236	-
Durations 2+			
Central exposed	488,452.0	493,166.0	-
% of Combined	6.1%	3.3%	
Deaths	3,286	2,367	-

Table 2.2. Permanent assurances, females: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982, durations 0, 1 and 2+.

	1999-2002	1991-1994	1979-1982
Combined			
Duration 0			
Central exposed	103,864.0	765,376.5	719,974.5
Deaths	89	613	421
Duration 1			
Central exposed	156,360.7	733,713.3	664,893.5
Deaths	245	802	601
Durations 2+			
Central exposed	4,125,815.1	4,931,581.6	3,375,844.5
Deaths	14,023	12,214	6,368
Non-smoker			
Duration 0			
Central exposed	47,633.0	270,948.0	-
Deaths	44	181	-
Duration 1			
Central exposed	64,948.0	258,199.5	-
Deaths	107	209	-
Durations 2+			
Central exposed	1,573,914.5	1,029,922.5	-
% of Combined	38.1%	20.9%	
Deaths	4,243	1,668	-
Smoker			
Duration 0			
Central exposed	12,728.5	79,864.0	-
Deaths	32	113	-
Duration 1			
Central exposed	17,857.0	72,637.0	-
Deaths	70	113	-
Durations 2+			
Central exposed	382,780.0	286,888.5	-
% of Combined	9.3%	5.8%	
Deaths	2,114	862	-

Table 2.3. Temporary assurances, males: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982, durations 0, 1-4 and 5+.

	1999-2002	1991-1994	1979-1982
Combined			
Duration 0			
Central exposed	449,702.5	343,230.2	530,080.0
Deaths	302	397	507
Durations 1-4			
Central exposed	1,093,494.6	1,076,950.8	1,679,654.0
Deaths	1,470	1,816	2,180
Durations 5+			
Central exposed	1,742,288.4	2,629,063.5	2,038,825.5
Deaths	4,792	6,831	4,968
Non-smoker			
Duration 0			
Central exposed	327,371.6	184,287.0	-
Deaths	200	194	-
Durations 1-4			
Central exposed	780,639.9	525,512.5	-
Deaths	935	782	-
Durations 5+			
Central exposed	809,224.9	373,948.5	-
% of Combined	46.4%	14.2%	
Deaths	1,634	738	-
Smoker			
Duration 0			
Central exposed	99,253.7	49,558.0	-
Deaths	81	71	-
Durations 1-4			
Central exposed	204,190.9	128,278.5	-
Deaths	394	342	-
Durations 5+			
Central exposed	187,477.2	88,232.5	-
% of Combined	10.8%	3.4%	
Deaths	689	354	-

Table 2.4. Temporary assurances, females: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982, durations 0, 1-4 and 5+.

	1999-2002	1991-1994	1979-1982
Combined			
Duration 0			
Central exposed	351,269.0	233,720.8	-
Deaths	103	86	-
Durations 1-4			
Central exposed	824,378.0	702,119.7	-
Deaths	525	614	-
Durations 5+			
Central exposed	1,378,134.2	1,068,159.7	-
Deaths	1,988	1,299	-
Non-smoker			
Duration 0			
Central exposed	256,163.2	129,508.5	-
Deaths	64	42	-
Durations 1-4			
Central exposed	579,179.7	354,122.5	-
Deaths	322	233	-
Durations 5+			
Central exposed	787,595.0	235,596.5	-
% of Combined	57.1%	22.1%	
Deaths	809	223	-
Smoker			
Duration 0			
Central exposed	78,579.0	37,291.5	-
Deaths	28	21	-
Durations 1-4			
Central exposed	158,405.8	91,185.0	-
Deaths	147	102	-
Durations 5+			
Central exposed	172,629.2	55,093.0	-
% of Combined	12.5%	5.2%	
Deaths	336	94	-

Table 2.5. Permanent assurances, males and females: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Combined			
Duration 0	10-97	16-76†	no ages
Duration 1	10-88	16-78†	66-69†
Durations 2+	10-100	10-100	24-100
Non-smoker			
Duration 0	10-87	16-75	no ages
Duration 1	10-88	17-77	67
Durations 2+	10-99	10-92	29-90†
Smoker			
Duration 0	16-82	19-62†	no ages
Duration 1	17-83	19-68	no ages
Durations 2+	10-100	19-86†	39-87†
Females			
Combined			
Duration 0	10-89	16-77	no ages
Duration 1	10-92	16-80†	single ages
Durations 2+	10-100	10-98	28-99†
Non-smoker			
Duration 0	10-89	17-76	no ages
Duration 1	10-92	17-78	no ages
Durations 2+	10-100	10-93	33-94†
Smoker			
Duration 0	16-83	20-63†	no ages
Duration 1	17-84	20-70	no ages
Durations 2+	10-100	19-87†	45-89†

† Some other single ages outside the range given meet the criterion.

Table 2.6. Temporary assurances, males and females: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Combined			
Duration 0	15-89	18-77	52-54†
Durations 1-4	10-91	19-81	31-76†
Durations 5+	10-93	23-81	36-80†
Non-smoker			
Duration 0	15-89	19-76	single ages
Durations 1-4	10-90	19-81	40-73†
Durations 5+	10-92	23-80	37-76†
Smoker			
Duration 0	17-83	19-66	no ages
Durations 1-4	17-84	20-72	49-61†
Durations 5+	14-86	25-73	43-66†
Females			
Combined			
Duration 0	13-89	18-71	no ages
Durations 1-4	10-93	19-82	42-59†
Durations 5+	10-94	23-81	34-79
Non-smoker			
Duration 0	13-89	18-71	no ages
Durations 1-4	10-93	19-81	46-49†
Durations 5+	10-92	23-80	35-63†
Smoker			
Duration 0	17-83	19-61	no ages
Durations 1-4	16-89	20-67	50
Durations 5+	19-89	25-72	54-58†

† Some other single ages outside the range given meet the criterion.

Table 2.7. Unadjusted graduations of the male assured lives ultimate experience: key statistics.

Section	Combined	Non-smoker	Smoker
GM formula	GM(1,3)	GM(1,3)	GM(1,3)
Age range fitted	20-90	20-90	20-90
Optimised parameters:			
$100\times a_1$	0.044726	0.034421	0.067019
T-ratio	16.3	7.1	6.2
b_1	–4.594470	–4.259447	–4.492762
T-ratio	–65.9	–23.3	–17.3
b_2	5.890200	6.275162	5.578582
T-ratio	173.5	72.5	44.1
b_3	–0.575750	–0.033485	–1.023187
T-ratio	–7.8	–0.2	–3.8
–Log likelihood	176,255.6	30,145.7	14,529.7
–Log likelihood (adj.)*	176,255.6	30,146.4	14,529.7
Sign test: +/–	38 / 31	35 / 32	30 / 33
Sign test: p(pos)	0.7648	0.5964	0.4007
Runs test: p(runs)	0.4372	0.2343	0.3125
K-S test: $p(KS)$	0.9790	0.9730	0.9760
Serial correlation test:			
T-ratio 1	0.56	0.25	0.98
T-ratio 2	1.96	–0.72	0.88
T-ratio 3	1.39	–0.42	–0.72
χ^2 test:			
χ^2	85.63	66.92	65.30
Degrees of freedom	65	63	59
$p(\chi^2)$	0.0442	0.3441	0.2671

* Calculated from adjusted ultimate graduations.

Table 2.8. Unadjusted graduations of the female assured lives ultimate experience: key statistics.

Section	Combined	Non-smoker	Smoker
GM formula	GM(1,2)	GM(1,2)	GM(1,3)
Age range fitted	20-90	20-90	30-90
Optimised parameters:			
$100\times a_1$	0.014423	0.022054	0.023434
T-ratio	6.7	7.5	2.0
b_1	–4.389068	–4.621657	–4.435892
T-ratio	–395.0	–225.9	–14.6
b_2	5.584346	5.850592	5.487066
T-ratio	106.3	58.7	37.1
b_3			–0.736004
T-ratio			–2.3
–Log likelihood	63,628.0	21,223.5	9,224.1
–Log likelihood (adj.)*	63,628.0	21,223.5	9,224.1
Sign test: +/–	30 / 37	35 / 30	30 / 28
Sign test: *p*(pos)	0.2319	0.6899	0.5522
Runs test: *p*(runs)	0.5361	0.5000	0.9887
K-S test: *p*(*KS*)	0.6056	0.7565	1.0000
Serial correlation test:			
T-ratio 1	0.87	2.02	–1.87
T-ratio 2	2.15	1.88	2.07
T-ratio 3	0.82	0.34	–1.15
χ^2 test:			
χ^2	87.22	76.15	44.06
Degrees of freedom	64	62	54
$p(\chi^2)$	0.0285	0.1067	0.8308

* Calculated from adjusted ultimate graduations.

Table 2.9. Assured lives, males, combined, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	1,881.5	0	1.19	1,584.8	0.00	0.000000
11	430.5	0	1.19	362.5	0.00	0.000000
12	458.8	0	1.19	386.2	0.00	0.000000
13	674.0	0	1.19	567.0	0.00	0.000000
14	812.8	0	1.19	683.3	0.00	0.000000
15	1,080.3	0	1.19	907.3	0.00	0.000000
16	1,200.0	1	1.19	1,006.6	0.84	0.000833
17	1,358.8	1	1.19	1,138.0	0.84	0.000736
18	1,685.6	1	1.20	1,409.0	0.84	0.000593
19	2,994.8	3	1.20	2,497.3	2.50	0.001002
20	4,912.8	6	1.20	4,084.3	4.99	0.001221
21	7,483.1	6	1.21	6,198.0	4.97	0.000802
22	10,823.9	3	1.21	8,924.8	2.47	0.000277
23	15,053.5	6	1.22	12,345.4	4.92	0.000399
24	20,534.8	20	1.23	16,732.7	16.30	0.000974
25	27,660.6	16	1.24	22,369.6	12.94	0.000578
26	36,182.1	19	1.25	29,005.4	15.23	0.000525
27	45,556.4	28	1.26	36,154.0	22.22	0.000615
28	56,877.4	26	1.27	44,624.9	20.40	0.000457
29	70,145.1	32	1.29	54,332.6	24.79	0.000456
30	84,018.9	35	1.31	64,160.0	26.73	0.000417
31	98,225.4	41	1.33	73,850.6	30.83	0.000417
32	112,719.7	62	1.35	83,335.5	45.84	0.000550
33	127,798.8	63	1.38	92,805.0	45.75	0.000493
34	142,858.8	92	1.40	101,802.5	65.56	0.000644
35	158,259.2	89	1.43	110,589.5	62.19	0.000562
36	171,818.9	119	1.46	117,681.1	81.50	0.000693
37	183,338.4	105	1.49	123,055.3	70.48	0.000573
38	193,574.4	124	1.52	127,338.2	81.57	0.000641
39	201,483.7	156	1.55	129,958.6	100.62	0.000774
40	209,313.1	151	1.58	132,478.8	95.57	0.000721
41	217,851.4	198	1.61	135,445.1	123.10	0.000909
42	226,356.4	217	1.64	138,435.9	132.71	0.000959
43	236,328.4	217	1.66	142,412.3	130.76	0.000918
44	247,555.3	277	1.68	147,269.8	164.79	0.001119

Table 2.9. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	259,965.2	310	1.70	153,002.0	182.45	0.001192
46	273,346.3	368	1.71	159,532.0	214.77	0.001346
47	287,734.9	422	1.72	166,937.9	244.84	0.001467
48	303,347.4	473	1.73	175,408.3	273.51	0.001559
49	319,856.9	541	1.73	184,823.9	312.61	0.001691
50	335,789.1	597	1.73	194,406.9	345.64	0.001778
51	358,382.7	750	1.72	208,435.1	436.20	0.002093
52	389,879.8	931	1.71	228,367.6	545.32	0.002388
53	406,701.8	1,026	1.69	240,495.9	606.71	0.002523
54	400,777.1	1,137	1.67	239,794.2	680.29	0.002837
55	381,379.1	1,198	1.65	231,358.0	726.75	0.003141
56	353,610.3	1,275	1.62	217,885.5	785.62	0.003606
57	330,169.3	1,376	1.60	206,958.2	862.51	0.004168
58	309,276.4	1,483	1.57	197,458.0	946.82	0.004795
59	284,111.6	1,500	1.54	184,928.2	976.35	0.005280
60	238,670.1	1,352	1.51	158,476.2	897.72	0.005665
61	210,410.9	1,347	1.48	142,564.6	912.66	0.006402
62	202,387.5	1,487	1.45	139,924.9	1,028.07	0.007347
63	195,303.6	1,533	1.42	137,737.1	1,081.14	0.007849
64	179,464.3	1,676	1.39	129,030.4	1,205.00	0.009339
65	117,492.6	1,067	1.37	86,047.5	781.43	0.009081
66	78,294.0	883	1.34	58,347.8	658.05	0.011278
67	67,744.7	814	1.32	51,312.7	616.56	0.012016
68	61,508.1	907	1.30	47,290.2	697.34	0.014746
69	56,269.9	904	1.28	43,854.3	704.54	0.016065
70	50,928.4	916	1.27	40,177.9	722.64	0.017986
71	45,856.2	1,028	1.25	36,569.4	819.81	0.022418
72	41,915.1	926	1.24	33,744.3	745.49	0.022092
73	38,415.9	982	1.23	31,181.7	797.08	0.025562
74	35,095.1	1,068	1.22	28,686.8	872.98	0.030432
75	30,893.3	954	1.22	25,402.6	784.45	0.030880
76	27,529.4	1,012	1.21	22,749.5	836.29	0.036761
77	25,148.9	1,090	1.21	20,868.1	904.46	0.043342
78	23,072.6	1,023	1.20	19,209.9	851.74	0.044338
79	21,034.6	1,076	1.20	17,561.2	898.32	0.051154
80	17,924.1	1,015	1.20	14,997.3	849.26	0.056628
81	15,027.9	951	1.19	12,596.0	797.10	0.063282
82	12,391.9	891	1.19	10,400.9	747.84	0.071902

Table 2.9. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	10,196.3	839	1.19	8,567.2	704.95	0.082285
84	8,688.8	790	1.19	7,306.7	664.33	0.090922
85	7,583.3	749	1.19	6,381.1	630.25	0.098770
86	6,685.8	718	1.19	5,628.5	604.46	0.107392
87	5,779.8	648	1.19	4,867.6	545.73	0.112115
88	4,924.0	647	1.19	4,148.0	545.03	0.131397
89	4,079.0	525	1.19	3,436.8	442.35	0.128708
90	3,336.8	477	1.19	2,811.9	401.96	0.142951
91	2,745.8	382	1.19	2,314.1	321.94	0.139122
92	2,235.5	316	1.19	1,884.2	266.34	0.141355
93	1,789.8	315	1.19	1,508.6	265.51	0.175997
94	1,344.5	213	1.19	1,133.3	179.54	0.158423
95	1,020.8	161	1.19	860.5	135.71	0.157719
96	759.3	116	1.19	640.1	97.78	0.152772
97	595.8	51	1.19	502.2	42.99	0.085599
98	507.3	43	1.19	427.6	36.25	0.084762
99	426.8	28	1.19	359.8	23.60	0.065604
100	383.8	15	1.19	323.5	12.64	0.039083
Totals	9,769,497.8	47,436		6,317,556.4	34,663.98	

Table 2.10. Assured lives, males, non-smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	104.5	0	1.19	88.0	0.00	0.000000
11	121.0	0	1.19	101.9	0.00	0.000000
12	138.5	0	1.19	116.6	0.00	0.000000
13	156.0	0	1.19	131.2	0.00	0.000000
14	168.0	0	1.19	141.2	0.00	0.000000
15	325.5	0	1.19	273.4	0.00	0.000000
16	344.5	0	1.19	289.0	0.00	0.000000
17	365.5	0	1.19	306.1	0.00	0.000000
18	560.0	0	1.20	468.1	0.00	0.000000
19	1,330.0	2	1.20	1,109.0	1.67	0.001504
20	2,215.0	3	1.20	1,841.4	2.49	0.001354
21	3,473.5	1	1.21	2,877.0	0.83	0.000288
22	5,311.0	1	1.21	4,379.2	0.82	0.000188
23	7,591.5	3	1.22	6,225.8	2.46	0.000395
24	10,454.8	8	1.23	8,519.1	6.52	0.000765
25	14,147.3	6	1.24	11,441.2	4.85	0.000424
26	18,127.5	8	1.25	14,531.9	6.41	0.000441
27	21,850.5	14	1.26	17,340.8	11.11	0.000641
28	26,733.3	9	1.27	20,974.4	7.06	0.000337
29	32,520.3	15	1.29	25,189.4	11.62	0.000461
30	38,690.3	14	1.31	29,545.4	10.69	0.000362
31	45,118.0	13	1.33	33,921.9	9.77	0.000288
32	51,572.0	23	1.35	38,128.0	17.00	0.000446
33	58,192.5	25	1.38	42,258.3	18.15	0.000430
34	64,464.5	37	1.40	45,938.0	26.37	0.000574
35	70,423.5	41	1.43	49,211.0	28.65	0.000582
36	74,730.0	42	1.46	51,183.6	28.77	0.000562
37	77,477.3	44	1.49	52,002.2	29.53	0.000568
38	79,249.0	37	1.52	52,132.0	24.34	0.000467
39	79,804.0	48	1.55	51,474.2	30.96	0.000601
40	79,837.8	57	1.58	50,531.1	36.08	0.000714
41	79,472.8	69	1.61	49,410.8	42.90	0.000868
42	78,424.3	68	1.64	47,963.0	41.59	0.000867
43	77,705.3	42	1.66	46,825.5	25.31	0.000541
44	76,678.0	68	1.68	45,615.5	40.45	0.000887

Table 2.10. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	75,290.3	72	1.70	44,312.0	42.38	0.000956
46	73,941.5	73	1.71	43,154.2	42.60	0.000987
47	72,878.3	91	1.72	42,282.5	52.80	0.001249
48	72,302.3	92	1.73	41,808.2	53.20	0.001272
49	72,341.5	101	1.73	41,801.3	58.36	0.001396
50	72,681.5	91	1.73	42,079.4	52.68	0.001252
51	74,681.3	127	1.72	43,434.6	73.86	0.001701
52	77,844.0	132	1.71	45,596.2	77.32	0.001696
53	78,131.3	183	1.69	46,201.6	108.21	0.002342
54	74,435.5	154	1.67	44,536.5	92.14	0.002069
55	69,683.5	161	1.65	42,272.5	97.67	0.002310
56	63,192.5	175	1.62	38,937.6	107.83	0.002769
57	57,197.0	167	1.60	35,852.5	104.68	0.002920
58	52,235.8	224	1.57	33,350.0	143.01	0.004288
59	46,960.8	223	1.54	30,566.8	145.15	0.004749
60	40,583.3	193	1.51	26,947.2	128.15	0.004756
61	35,620.5	198	1.48	24,134.8	134.16	0.005559
62	33,554.0	175	1.45	23,198.3	120.99	0.005215
63	31,697.8	229	1.42	22,354.8	161.50	0.007224
64	28,771.5	217	1.39	20,686.0	156.02	0.007542
65	22,855.5	198	1.37	16,738.6	145.01	0.008663
66	17,553.5	145	1.34	13,081.6	108.06	0.008260
67	15,613.3	142	1.32	11,826.2	107.56	0.009095
68	14,440.0	169	1.30	11,102.1	129.93	0.011704
69	13,371.3	159	1.28	10,421.0	123.92	0.011891
70	12,035.0	188	1.27	9,494.5	148.32	0.015621
71	10,774.3	191	1.25	8,592.3	152.32	0.017727
72	9,957.8	152	1.24	8,016.6	122.37	0.015264
73	9,195.8	172	1.23	7,464.1	139.61	0.018704
74	8,246.3	219	1.22	6,740.5	179.01	0.026557
75	6,596.0	180	1.22	5,423.7	148.01	0.027289
76	5,510.3	179	1.21	4,553.5	147.92	0.032485
77	4,876.3	201	1.21	4,046.3	166.79	0.041220
78	4,376.5	153	1.20	3,643.8	127.39	0.034959
79	3,804.5	158	1.20	3,176.3	131.91	0.041530
80	3,031.8	168	1.20	2,536.7	140.57	0.055413
81	2,374.5	143	1.19	1,990.2	119.86	0.060223
82	1,770.0	115	1.19	1,485.6	96.52	0.064972

Table 2.10. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	1,302.0	108	1.19	1,094.0	90.74	0.082949
84	971.0	78	1.19	816.5	65.59	0.080330
85	738.0	76	1.19	621.0	63.95	0.102981
86	599.0	67	1.19	504.3	56.41	0.111853
87	474.5	57	1.19	399.6	48.00	0.120126
88	372.0	42	1.19	313.4	35.38	0.112903
89	289.5	51	1.19	243.9	42.97	0.176166
90	214.5	41	1.19	180.8	34.55	0.191142
91	144.5	7	1.19	121.8	5.90	0.048443
92	102.5	14	1.19	86.4	11.80	0.136585
93	59.5	15	1.19	50.2	12.64	0.252101
94	35.5	6	1.19	29.9	5.06	0.169014
95	17.5	3	1.19	14.8	2.53	0.171429
96	4.5	3	1.19	3.8	2.53	0.666667
97	2.5	0	1.19	2.1	0.00	0.000000
98	1.0	1	1.19	0.8	0.84	1.000000
99	1.0	1	1.19	0.8	0.84	1.000000
100	0.0	0	1.19	0.0	0.00	-
Totals	2,553,613.4	7,378		1,670,809.6	5,333.93	

Table 2.11. Assured lives, males, smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	143.0	0	1.19	120.4	0.00	0.000000
11	124.5	0	1.19	104.8	0.00	0.000000
12	111.0	0	1.19	93.4	0.00	0.000000
13	98.0	0	1.19	82.4	0.00	0.000000
14	90.0	0	1.19	75.7	0.00	0.000000
15	85.0	0	1.19	71.4	0.00	0.000000
16	77.5	0	1.19	65.0	0.00	0.000000
17	83.0	0	1.19	69.5	0.00	0.000000
18	88.0	0	1.20	73.6	0.00	0.000000
19	139.0	0	1.20	115.9	0.00	0.000000
20	259.0	0	1.20	215.3	0.00	0.000000
21	447.0	2	1.21	370.2	1.66	0.004474
22	685.5	0	1.21	565.2	0.00	0.000000
23	1,099.5	1	1.22	901.7	0.82	0.000910
24	1,597.3	4	1.23	1,301.6	3.26	0.002504
25	2,225.3	2	1.24	1,799.6	1.62	0.000899
26	3,111.5	3	1.25	2,494.3	2.40	0.000964
27	4,226.8	3	1.26	3,354.4	2.38	0.000710
28	5,366.5	4	1.27	4,210.5	3.14	0.000745
29	6,944.8	5	1.29	5,379.3	3.87	0.000720
30	8,747.3	5	1.31	6,679.8	3.82	0.000572
31	10,526.5	6	1.33	7,914.3	4.51	0.000570
32	12,482.0	10	1.35	9,228.1	7.39	0.000801
33	14,294.3	11	1.38	10,380.2	7.99	0.000770
34	15,949.0	18	1.40	11,365.4	12.83	0.001129
35	17,517.3	12	1.43	12,240.9	8.39	0.000685
36	18,564.5	23	1.46	12,715.1	15.75	0.001239
37	18,999.0	11	1.49	12,752.0	7.38	0.000579
38	19,352.8	16	1.52	12,730.8	10.53	0.000827
39	19,453.3	19	1.55	12,547.5	12.26	0.000977
40	19,706.0	22	1.58	12,472.4	13.92	0.001116
41	19,843.5	30	1.61	12,337.3	18.65	0.001512
42	19,635.8	20	1.64	12,008.9	12.23	0.001019
43	19,370.0	26	1.66	11,672.4	15.67	0.001342
44	19,297.8	33	1.68	11,480.2	19.63	0.001710

Table 2.11. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	19,384.5	30	1.70	11,408.7	17.66	0.001548
46	19,409.0	54	1.71	11,327.6	31.52	0.002782
47	19,521.3	55	1.72	11,325.9	31.91	0.002817
48	19,701.8	65	1.73	11,392.4	37.59	0.003299
49	19,864.0	43	1.73	11,478.1	24.85	0.002165
50	20,121.5	53	1.73	11,649.5	30.68	0.002634
51	20,664.5	61	1.72	12,018.5	35.48	0.002952
52	21,578.5	92	1.71	12,639.4	53.89	0.004264
53	22,133.3	101	1.69	13,088.1	59.72	0.004563
54	21,667.5	116	1.67	12,964.2	69.41	0.005354
55	20,899.3	117	1.65	12,678.3	70.98	0.005598
56	19,370.5	116	1.62	11,935.6	71.48	0.005988
57	17,967.3	141	1.60	11,262.3	88.38	0.007848
58	16,730.3	158	1.57	10,681.5	100.88	0.009444
59	15,421.3	134	1.54	10,037.7	87.22	0.008689
60	13,324.3	125	1.51	8,847.3	83.00	0.009381
61	11,744.0	152	1.48	7,957.2	102.99	0.012943
62	10,991.5	131	1.45	7,599.2	90.57	0.011918
63	10,315.5	120	1.42	7,275.0	84.63	0.011633
64	9,187.8	121	1.39	6,605.8	87.00	0.013170
65	6,730.3	104	1.37	4,929.0	76.17	0.015453
66	5,010.8	90	1.34	3,734.2	67.07	0.017961
67	4,390.5	100	1.32	3,325.5	75.74	0.022776
68	4,125.5	117	1.30	3,171.9	89.95	0.028360
69	3,755.5	110	1.28	2,926.9	85.73	0.029290
70	3,357.8	99	1.27	2,649.0	78.10	0.029484
71	2,968.5	114	1.25	2,367.3	90.91	0.038403
72	2,635.0	102	1.24	2,121.3	82.12	0.038710
73	2,328.3	109	1.23	1,889.9	88.47	0.046815
74	2,051.5	98	1.22	1,676.9	80.11	0.047770
75	1,600.5	89	1.22	1,316.0	73.18	0.055608
76	1,272.5	76	1.21	1,051.6	62.80	0.059725
77	1,045.5	81	1.21	867.5	67.21	0.077475
78	860.0	68	1.20	716.0	56.62	0.079070
79	697.5	61	1.20	582.3	50.93	0.087455
80	551.5	49	1.20	461.4	41.00	0.088849
81	425.5	45	1.19	356.6	37.72	0.105758
82	324.0	43	1.19	271.9	36.09	0.132716

Table 2.11. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	233.0	16	1.19	195.8	13.44	0.068670
84	170.5	30	1.19	143.4	25.23	0.175953
85	136.0	23	1.19	114.4	19.35	0.169118
86	113.5	16	1.19	95.6	13.47	0.140969
87	96.0	17	1.19	80.8	14.32	0.177083
88	87.0	7	1.19	73.3	5.90	0.080460
89	69.5	11	1.19	58.6	9.27	0.158273
90	53.0	4	1.19	44.7	3.37	0.075472
91	33.0	8	1.19	27.8	6.74	0.242424
92	21.5	2	1.19	18.1	1.69	0.093023
93	14.5	5	1.19	12.2	4.21	0.344828
94	9.0	4	1.19	7.6	3.37	0.444444
95	5.5	4	1.19	4.6	3.37	0.727273
96	3.5	0	1.19	3.0	0.00	0.000000
97	5.0	0	1.19	4.2	0.00	0.000000
98	5.5	2	1.19	4.6	1.69	0.363636
99	2.0	0	1.19	1.7	0.00	0.000000
100	1.5	0	1.19	1.3	0.00	0.000000
Totals	675,929.2	3,975		439,468.9	2,815.25	

Table 2.12. Assured lives, females, combined, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	1,502.0	0	1.19	1,265.1	0.00	0.000000
11	399.5	0	1.19	336.4	0.00	0.000000
12	423.3	0	1.19	356.3	0.00	0.000000
13	627.8	0	1.19	528.1	0.00	0.000000
14	748.3	0	1.19	629.0	0.00	0.000000
15	1,602.7	0	1.19	1,346.0	0.00	0.000000
16	1,626.1	0	1.19	1,364.0	0.00	0.000000
17	1,746.1	0	1.19	1,462.4	0.00	0.000000
18	1,944.2	0	1.20	1,625.2	0.00	0.000000
19	2,668.8	0	1.20	2,225.4	0.00	0.000000
20	3,871.4	3	1.20	3,218.5	2.49	0.000775
21	5,883.1	0	1.21	4,872.8	0.00	0.000000
22	8,733.0	3	1.21	7,200.8	2.47	0.000344
23	11,994.6	0	1.22	9,836.8	0.00	0.000000
24	16,157.6	3	1.23	13,166.0	2.44	0.000186
25	22,014.7	2	1.24	17,803.7	1.62	0.000091
26	29,556.8	10	1.25	23,694.2	8.02	0.000338
27	38,555.8	8	1.26	30,598.3	6.35	0.000207
28	49,455.1	12	1.27	38,801.5	9.41	0.000243
29	60,954.6	20	1.29	47,213.9	15.49	0.000328
30	72,170.9	16	1.31	55,112.5	12.22	0.000222
31	84,371.2	26	1.33	63,434.4	19.55	0.000308
32	97,122.9	25	1.35	71,804.5	18.48	0.000257
33	110,055.4	30	1.38	79,920.1	21.79	0.000273
34	122,712.2	42	1.40	87,445.8	29.93	0.000342
35	134,592.1	45	1.43	94,051.3	31.45	0.000334
36	145,583.2	68	1.46	99,711.9	46.57	0.000467
37	154,702.6	69	1.49	103,835.2	46.31	0.000446
38	161,935.8	58	1.52	106,525.5	38.15	0.000358
39	167,015.9	92	1.55	107,726.6	59.34	0.000551
40	170,376.9	96	1.58	107,835.3	60.76	0.000563
41	173,113.3	120	1.61	107,630.0	74.61	0.000693
42	174,867.6	130	1.64	106,946.2	79.51	0.000743
43	176,107.4	145	1.66	106,122.9	87.38	0.000823
44	176,133.7	144	1.68	104,781.3	85.67	0.000818

Table 2.12. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	175,825.4	172	1.70	103,481.7	101.23	0.000978
46	176,011.6	164	1.71	102,724.9	95.71	0.000932
47	175,723.4	213	1.72	101,951.1	123.58	0.001212
48	174,673.2	264	1.73	101,003.4	152.66	0.001511
49	173,227.1	271	1.73	100,096.3	156.59	0.001564
50	171,372.5	247	1.73	99,217.1	143.00	0.001441
51	171,326.4	269	1.72	99,643.3	156.45	0.001570
52	175,448.4	377	1.71	102,766.9	220.82	0.002149
53	173,464.4	325	1.69	102,575.1	192.18	0.001874
54	163,713.9	436	1.67	97,953.8	260.87	0.002663
55	151,288.4	347	1.65	91,776.9	210.50	0.002294
56	136,070.9	384	1.62	83,843.4	236.61	0.002822
57	123,298.8	397	1.60	77,286.7	248.85	0.003220
58	113,338.2	372	1.57	72,360.9	237.50	0.003282
59	102,180.6	384	1.54	66,509.3	249.95	0.003758
60	85,328.9	330	1.51	56,658.1	219.12	0.003867
61	72,527.3	328	1.48	49,141.1	222.24	0.004522
62	67,229.2	332	1.45	46,480.3	229.54	0.004938
63	62,221.6	330	1.42	43,881.5	232.73	0.005304
64	56,572.1	310	1.39	40,674.0	222.88	0.005480
65	46,720.3	301	1.37	34,216.3	220.44	0.006443
66	39,901.3	301	1.34	29,736.0	224.32	0.007544
67	36,465.6	341	1.32	27,620.6	258.29	0.009351
68	34,029.7	317	1.30	26,163.6	243.72	0.009315
69	31,479.4	318	1.28	24,533.7	247.84	0.010102
70	28,224.4	329	1.27	22,266.5	259.55	0.011657
71	25,267.6	401	1.25	20,150.4	319.79	0.015870
72	22,971.7	351	1.24	18,493.7	282.58	0.015280
73	20,704.1	377	1.23	16,805.2	306.01	0.018209
74	18,667.1	370	1.22	15,258.5	302.44	0.019821
75	16,723.1	373	1.22	13,750.9	306.71	0.022304
76	15,004.1	382	1.21	12,398.9	315.67	0.025460
77	13,453.2	365	1.21	11,163.2	302.87	0.027131
78	11,957.1	390	1.20	9,955.3	324.71	0.032617
79	10,635.9	340	1.20	8,879.6	283.86	0.031967
80	8,964.4	329	1.20	7,500.6	275.28	0.036701
81	7,357.9	297	1.19	6,167.2	248.94	0.040365
82	5,917.5	285	1.19	4,966.7	239.21	0.048162

Table 2.12. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	4,756.1	259	1.19	3,996.2	217.62	0.054456
84	4,055.8	257	1.19	3,410.6	216.12	0.063366
85	3,555.1	236	1.19	2,991.5	198.58	0.066384
86	3,142.5	257	1.19	2,645.6	216.36	0.081782
87	2,690.3	242	1.19	2,265.7	203.81	0.089953
88	2,247.0	221	1.19	1,892.9	186.17	0.098353
89	1,758.5	199	1.19	1,481.6	167.67	0.113165
90	1,356.5	131	1.19	1,143.1	110.39	0.096572
91	1,040.8	135	1.19	877.2	113.77	0.129708
92	777.5	149	1.19	655.3	125.58	0.191640
93	591.0	103	1.19	498.1	86.82	0.174281
94	434.3	86	1.19	366.1	72.49	0.198020
95	307.0	40	1.19	258.8	33.72	0.130293
96	232.0	43	1.19	195.6	36.25	0.185345
97	162.3	27	1.19	136.8	22.76	0.166359
98	116.3	25	1.19	98.0	21.07	0.214961
99	67.0	14	1.19	56.5	11.80	0.208955
100	44.5	1	1.19	37.5	0.84	0.022472
Totals	5,503,947.8	16,011		3,583,487.8	11,677.06	

Table 2.13. Assured lives, females, non-smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	103.5	0	1.19	87.2	0.00	0.000000
11	121.5	0	1.19	102.3	0.00	0.000000
12	141.0	0	1.19	118.7	0.00	0.000000
13	149.5	0	1.19	125.8	0.00	0.000000
14	155.5	0	1.19	130.7	0.00	0.000000
15	879.0	0	1.19	738.2	0.00	0.000000
16	815.5	0	1.19	684.1	0.00	0.000000
17	791.5	0	1.19	662.9	0.00	0.000000
18	865.0	0	1.20	723.1	0.00	0.000000
19	1,307.0	0	1.20	1,089.9	0.00	0.000000
20	1,890.0	3	1.20	1,571.3	2.49	0.001587
21	2,909.0	0	1.21	2,409.4	0.00	0.000000
22	4,533.5	1	1.21	3,738.1	0.82	0.000221
23	6,477.8	0	1.22	5,312.5	0.00	0.000000
24	8,821.3	2	1.23	7,188.0	1.63	0.000227
25	12,005.3	2	1.24	9,708.9	1.62	0.000167
26	15,709.3	7	1.25	12,593.4	5.61	0.000446
27	19,886.5	4	1.26	15,782.1	3.17	0.000201
28	25,145.0	5	1.27	19,728.3	3.92	0.000199
29	30,872.8	13	1.29	23,913.3	10.07	0.000421
30	36,431.0	9	1.31	27,820.1	6.87	0.000247
31	42,727.3	15	1.33	32,124.5	11.28	0.000351
32	49,333.3	7	1.35	36,472.9	5.18	0.000142
33	55,988.8	17	1.38	40,658.0	12.35	0.000304
34	62,561.5	20	1.40	44,581.9	14.25	0.000320
35	68,313.3	23	1.43	47,736.5	16.07	0.000337
36	73,279.0	36	1.46	50,189.8	24.66	0.000491
37	76,840.5	31	1.49	51,574.7	20.81	0.000403
38	79,684.8	25	1.52	52,418.7	16.45	0.000314
39	81,208.0	36	1.55	52,379.8	23.22	0.000443
40	81,674.8	36	1.58	51,693.8	22.79	0.000441
41	81,465.3	45	1.61	50,649.6	27.98	0.000552
42	80,516.0	52	1.64	49,242.3	31.80	0.000646
43	78,841.0	52	1.66	47,509.9	31.34	0.000660
44	76,412.8	61	1.68	45,457.7	36.29	0.000798

Table 2.13. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	73,975.5	68	1.70	43,538.1	40.02	0.000919
46	71,978.8	52	1.71	42,008.7	30.35	0.000722
47	70,061.0	71	1.72	40,647.9	41.19	0.001013
48	68,221.5	106	1.73	39,448.6	61.29	0.001554
49	66,473.8	87	1.73	38,410.8	50.27	0.001309
50	64,984.3	74	1.73	37,623.0	42.84	0.001139
51	64,700.8	82	1.72	37,629.9	47.69	0.001267
52	66,086.0	114	1.71	38,709.1	66.77	0.001725
53	65,034.5	97	1.69	38,457.0	57.36	0.001492
54	60,747.3	127	1.67	36,346.5	75.99	0.002091
55	56,108.0	101	1.65	34,037.1	61.27	0.001800
56	50,200.3	110	1.62	30,932.1	67.78	0.002191
57	45,136.5	111	1.60	28,292.7	69.58	0.002459
58	41,348.8	123	1.57	26,399.2	78.53	0.002975
59	37,138.5	110	1.54	24,173.4	71.60	0.002962
60	31,670.3	95	1.51	21,029.0	63.08	0.003000
61	27,669.0	110	1.48	18,747.2	74.53	0.003976
62	25,693.0	105	1.45	17,763.4	72.59	0.004087
63	23,751.0	99	1.42	16,750.3	69.82	0.004168
64	21,725.3	78	1.39	15,620.0	56.08	0.003590
65	19,084.3	90	1.37	13,976.7	65.91	0.004716
66	16,916.3	85	1.34	12,606.7	63.35	0.005025
67	15,578.3	120	1.32	11,799.7	90.89	0.007703
68	14,587.0	99	1.30	11,215.2	76.12	0.006787
69	13,508.8	104	1.28	10,528.2	81.05	0.007699
70	11,914.3	107	1.27	9,399.3	84.41	0.008981
71	10,542.5	131	1.25	8,407.4	104.47	0.012426
72	9,511.3	126	1.24	7,657.2	101.44	0.013247
73	8,421.5	123	1.23	6,835.6	99.84	0.014605
74	7,503.0	118	1.22	6,133.0	96.45	0.015727
75	6,543.8	109	1.22	5,380.8	89.63	0.016657
76	5,717.8	118	1.21	4,725.0	97.51	0.020637
77	5,063.5	109	1.21	4,201.6	90.45	0.021527
78	4,475.5	117	1.20	3,726.2	97.41	0.026142
79	3,939.0	94	1.20	3,288.6	78.48	0.023864
80	3,254.0	104	1.20	2,722.7	87.02	0.031961
81	2,560.0	76	1.19	2,145.7	63.70	0.029688
82	2,006.5	87	1.19	1,684.1	73.02	0.043359

Table 2.13. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	1,567.0	74	1.19	1,316.6	62.18	0.047224
84	1,317.5	73	1.19	1,107.9	61.39	0.055408
85	1,182.0	73	1.19	994.6	61.43	0.061760
86	1,063.5	73	1.19	895.3	61.46	0.068641
87	940.5	85	1.19	792.1	71.58	0.090377
88	769.0	76	1.19	647.8	64.02	0.098830
89	594.5	66	1.19	500.9	55.61	0.111018
90	442.5	39	1.19	372.9	32.86	0.088136
91	329.0	38	1.19	277.3	32.03	0.115502
92	221.5	44	1.19	186.7	37.08	0.198646
93	149.5	30	1.19	126.0	25.29	0.200669
94	99.5	17	1.19	83.9	14.33	0.170854
95	55.5	8	1.19	46.8	6.74	0.144144
96	41.0	4	1.19	34.6	3.37	0.097561
97	24.5	7	1.19	20.7	5.90	0.285714
98	12.5	4	1.19	10.5	3.37	0.320000
99	7.0	2	1.19	5.9	1.69	0.285714
100	4.5	0	1.19	3.8	0.00	0.000000
Totals	2,361,509.5	5,052		1,547,339.8	3,670.78	

Table 2.14. Assured lives, females, smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): central exposed to risk (R_x), actual deaths (A_x), variance ratios, adjusted R_x and A_x and crude μ_x.

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
10	127.5	0	1.19	107.4	0.00	0.000000
11	99.5	0	1.19	83.8	0.00	0.000000
12	89.0	0	1.19	74.9	0.00	0.000000
13	85.0	0	1.19	71.5	0.00	0.000000
14	80.5	0	1.19	67.7	0.00	0.000000
15	84.0	0	1.19	70.5	0.00	0.000000
16	80.5	0	1.19	67.5	0.00	0.000000
17	77.0	0	1.19	64.5	0.00	0.000000
18	89.0	0	1.20	74.4	0.00	0.000000
19	124.0	0	1.20	103.4	0.00	0.000000
20	190.0	0	1.20	158.0	0.00	0.000000
21	316.0	0	1.21	261.7	0.00	0.000000
22	524.5	0	1.21	432.5	0.00	0.000000
23	776.5	0	1.22	636.8	0.00	0.000000
24	1,166.0	0	1.23	950.1	0.00	0.000000
25	1,761.8	0	1.24	1,424.8	0.00	0.000000
26	2,680.5	0	1.25	2,148.8	0.00	0.000000
27	3,865.3	0	1.26	3,067.5	0.00	0.000000
28	5,362.8	1	1.27	4,207.5	0.78	0.000186
29	6,931.8	3	1.29	5,369.2	2.32	0.000433
30	8,503.0	1	1.31	6,493.2	0.76	0.000118
31	10,001.5	2	1.33	7,519.6	1.50	0.000200
32	11,480.5	8	1.35	8,487.7	5.91	0.000697
33	12,911.0	3	1.38	9,375.7	2.18	0.000232
34	14,073.0	5	1.40	10,028.5	3.56	0.000355
35	15,136.3	4	1.43	10,577.1	2.80	0.000264
36	16,015.0	11	1.46	10,968.9	7.53	0.000687
37	16,711.5	12	1.49	11,216.6	8.05	0.000718
38	17,129.5	15	1.52	11,268.2	9.87	0.000876
39	17,366.3	10	1.55	11,201.4	6.45	0.000576
40	17,503.0	17	1.58	11,078.0	10.76	0.000971
41	17,600.8	13	1.61	10,943.0	8.08	0.000739
42	17,496.5	23	1.64	10,700.6	14.07	0.001315
43	17,321.3	23	1.66	10,437.9	13.86	0.001328
44	17,006.3	20	1.68	10,117.0	11.90	0.001176

Table 2.14. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
45	16,706.0	18	1.70	9,832.3	10.59	0.001077
46	16,551.0	27	1.71	9,659.6	15.76	0.001631
47	16,424.8	25	1.72	9,529.3	14.50	0.001522
48	16,299.5	32	1.73	9,425.1	18.50	0.001963
49	16,248.5	47	1.73	9,388.9	27.16	0.002893
50	16,268.3	36	1.73	9,418.6	20.84	0.002213
51	16,249.0	33	1.72	9,450.4	19.19	0.002031
52	16,865.5	57	1.71	9,878.8	33.39	0.003380
53	16,988.5	41	1.69	10,045.8	24.24	0.002413
54	16,296.3	85	1.67	9,750.5	50.86	0.005216
55	15,428.0	49	1.65	9,359.2	29.73	0.003176
56	14,242.3	76	1.62	8,775.7	46.83	0.005336
57	13,058.5	73	1.60	8,185.4	45.76	0.005590
58	11,964.0	79	1.57	7,638.4	50.44	0.006603
59	10,806.3	73	1.54	7,033.8	47.52	0.006755
60	9,060.8	61	1.51	6,016.3	40.50	0.006732
61	7,560.0	67	1.48	5,122.3	45.40	0.008862
62	7,004.5	74	1.45	4,842.7	51.16	0.010565
63	6,362.8	83	1.42	4,487.3	58.54	0.013045
64	5,681.3	67	1.39	4,084.7	48.17	0.011793
65	4,981.0	74	1.37	3,647.9	54.20	0.014856
66	4,372.5	67	1.34	3,258.6	49.93	0.015323
67	3,940.3	80	1.32	2,984.5	60.60	0.020303
68	3,586.3	61	1.30	2,757.3	46.90	0.017009
69	3,260.5	63	1.28	2,541.1	49.10	0.019322
70	2,817.5	63	1.27	2,222.8	49.70	0.022360
71	2,525.3	71	1.25	2,013.9	56.62	0.028115
72	2,225.8	64	1.24	1,791.9	51.52	0.028754
73	1,959.3	79	1.23	1,590.3	64.12	0.040321
74	1,680.8	65	1.22	1,373.9	53.13	0.038672
75	1,407.8	74	1.22	1,157.6	60.85	0.052564
76	1,130.0	62	1.21	933.8	51.23	0.054867
77	964.5	51	1.21	800.3	42.32	0.052877
78	801.5	52	1.20	667.3	43.29	0.064878
79	668.5	47	1.20	558.1	39.24	0.070307
80	513.0	29	1.20	429.2	24.26	0.056530
81	388.0	30	1.19	325.2	25.15	0.077320
82	289.0	17	1.19	242.6	14.27	0.058824

Table 2.14. (Continued).

Age x	R_x	A_x	Variance Ratio	Adjusted R_x	Adjusted A_x	Crude $\mu_x=A_x/R_x$
83	205.5	20	1.19	172.7	16.80	0.097324
84	162.5	16	1.19	136.7	13.45	0.098462
85	150.5	14	1.19	126.6	11.78	0.093023
86	134.0	17	1.19	112.8	14.31	0.126866
87	107.0	14	1.19	90.1	11.79	0.130841
88	82.0	12	1.19	69.1	10.11	0.146341
89	55.0	11	1.19	46.3	9.27	0.200000
90	40.0	3	1.19	33.7	2.53	0.075000
91	29.5	3	1.19	24.9	2.53	0.101695
92	25.5	3	1.19	21.5	2.53	0.117647
93	23.5	5	1.19	19.8	4.21	0.212766
94	16.0	4	1.19	13.5	3.37	0.250000
95	13.0	1	1.19	11.0	0.84	0.076923
96	10.5	2	1.19	8.9	1.69	0.190476
97	5.5	1	1.19	4.6	0.84	0.181818
98	2.5	0	1.19	2.1	0.00	0.000000
99	2.0	1	1.19	1.7	0.84	0.500000
100	0.5	0	1.19	0.4	0.00	0.000000
Totals	555,409.2	2,450		361,974.0	1,752.82	

Table 2.15. Assured lives, males, ultimate durations (2+ for Permanents and 5+ for Temporaries): unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
17	0.000457	0.000362	0.000679	0.000457	0.000362	0.000679
18	0.000459	0.000364	0.000680	0.000459	0.000364	0.000680
19	0.000461	0.000367	0.000683	0.000461	0.000367	0.000683
20	0.000463	0.000370	0.000685	0.000463	0.000370	0.000685
21	0.000466	0.000373	0.000689	0.000466	0.000373	0.000689
22	0.000469	0.000377	0.000692	0.000469	0.000377	0.000692
23	0.000473	0.000382	0.000697	0.000473	0.000382	0.000697
24	0.000477	0.000387	0.000703	0.000477	0.000387	0.000703
25	0.000483	0.000393	0.000709	0.000483	0.000393	0.000709
26	0.000489	0.000400	0.000717	0.000489	0.000400	0.000717
27	0.000496	0.000407	0.000727	0.000496	0.000407	0.000727
28	0.000504	0.000416	0.000738	0.000504	0.000416	0.000738
29	0.000513	0.000426	0.000751	0.000513	0.000426	0.000751
30	0.000525	0.000437	0.000767	0.000525	0.000437	0.000767
31	0.000537	0.000449	0.000786	0.000537	0.000449	0.000786
32	0.000552	0.000464	0.000808	0.000552	0.000464	0.000808
33	0.000570	0.000480	0.000834	0.000570	0.000480	0.000834
34	0.000590	0.000498	0.000864	0.000590	0.000498	0.000864
35	0.000613	0.000519	0.000900	0.000613	0.000519	0.000900
36	0.000640	0.000543	0.000942	0.000640	0.000543	0.000942
37	0.000670	0.000570	0.000992	0.000670	0.000570	0.000992
38	0.000706	0.000600	0.001049	0.000706	0.000600	0.001049
39	0.000747	0.000635	0.001116	0.000747	0.000635	0.001116
40	0.000794	0.000675	0.001195	0.000794	0.000675	0.001195
41	0.000848	0.000719	0.001285	0.000848	0.000719	0.001285
42	0.000910	0.000770	0.001391	0.000910	0.000770	0.001391
43	0.000981	0.000828	0.001513	0.000981	0.000828	0.001513
44	0.001063	0.000893	0.001654	0.001063	0.000893	0.001654
45	0.001156	0.000968	0.001817	0.001156	0.000968	0.001817
46	0.001263	0.001052	0.002005	0.001263	0.001052	0.002005
47	0.001385	0.001148	0.002221	0.001385	0.001148	0.002221
48	0.001525	0.001256	0.002470	0.001525	0.001256	0.002470
49	0.001683	0.001379	0.002754	0.001683	0.001379	0.002754
50	0.001865	0.001519	0.003079	0.001865	0.001519	0.003079

Table 2.15. (Continued.)

Age x	Unadjusted μ_x			Adjusted μ_x		
	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
51	0.002071	0.001677	0.003451	0.002071	0.001677	0.003451
52	0.002305	0.001857	0.003875	0.002305	0.001857	0.003875
53	0.002571	0.002061	0.004358	0.002571	0.002061	0.004358
54	0.002873	0.002292	0.004906	0.002873	0.002292	0.004906
55	0.003216	0.002555	0.005527	0.003216	0.002555	0.005527
56	0.003604	0.002852	0.006231	0.003604	0.002852	0.006231
57	0.004043	0.003190	0.007026	0.004043	0.003190	0.007026
58	0.004539	0.003572	0.007923	0.004539	0.003572	0.007923
59	0.005100	0.004006	0.008934	0.005100	0.004006	0.008934
60	0.005733	0.004498	0.010069	0.005733	0.004498	0.010069
61	0.006446	0.005056	0.011343	0.006446	0.005056	0.011343
62	0.007249	0.005689	0.012770	0.007249	0.005689	0.012770
63	0.008152	0.006406	0.014366	0.008152	0.006406	0.014366
64	0.009167	0.007219	0.016146	0.009167	0.007219	0.016146
65	0.010307	0.008140	0.018129	0.010307	0.008140	0.018129
66	0.011586	0.009185	0.020334	0.011586	0.009185	0.020334
67	0.013019	0.010369	0.022782	0.013019	0.010369	0.022782
68	0.014624	0.011711	0.025493	0.014624	0.011711	0.025493
69	0.016418	0.013232	0.028491	0.016418	0.013232	0.028491
70	0.018423	0.014955	0.031800	0.018423	0.014955	0.031800
71	0.020661	0.016909	0.035446	0.020661	0.016909	0.035446
72	0.023157	0.019122	0.039456	0.023157	0.019122	0.039456
73	0.025938	0.021630	0.043857	0.025938	0.021630	0.043857
74	0.029032	0.024472	0.048678	0.029032	0.024472	0.048678
75	0.032473	0.027692	0.053951	0.032473	0.027692	0.053951
76	0.036295	0.031340	0.059706	0.036295	0.031340	0.059706
77	0.040536	0.035472	0.065975	0.040536	0.035472	0.065975
78	0.045237	0.040154	0.072793	0.045237	0.040154	0.072793
79	0.050444	0.045456	0.080191	0.050444	0.045456	0.080191
80	0.056205	0.051463	0.088205	0.056205	0.051463	0.088205
81	0.062572	0.058266	0.096870	0.062572	0.058266	0.096870
82	0.069603	0.065970	0.106219	0.069603	0.065970	0.106219
83	0.077358	0.074696	0.116286	0.077358	0.074696	0.116286
84	0.085904	0.084577	0.127108	0.085904	0.084577	0.127108
85	0.095313	0.095767	0.138715	0.095313	**0.095313**	0.138715

Table 2.15. (Continued.)

Age x	Unadjusted μ_x			Adjusted μ_x		
	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
86	0.105660	0.108437	0.151142	0.105660	**0.105660**	0.151142
87	0.117029	0.122782	0.164420	0.117029	**0.117029**	0.164420
88	0.129507	0.139025	0.178577	0.129507	**0.129507**	0.178577
89	0.143189	0.157413	0.193642	0.143189	**0.143189**	0.193642
90	0.158176	0.178230	0.209641	0.158176	**0.158176**	0.209641
91	0.174576	0.201796	0.226595	0.174576	**0.174576**	0.226595
92	0.192504	0.228470	0.244526	0.192504	**0.192504**	0.244526
93	0.212084	0.258664	0.263450	0.212084	**0.212084**	0.263450
94	0.233444	0.292837	0.283378	0.233444	**0.233444**	0.283378
95	0.256725	0.331514	0.304321	0.256725	**0.256725**	0.304321
96	0.282071	0.375285	0.326281	0.282071	**0.282071**	0.326281
97	0.309640	0.424819	0.349259	0.309640	**0.309640**	0.349259
98	0.339595	0.480871	0.373247	0.339595	**0.339595**	0.373247
99	0.372110	0.544295	0.398235	0.372110	**0.372110**	0.398235
100	0.407367	0.616057	0.424205	0.407367	**0.407367**	0.424205
101	0.445558	0.697250	0.451133	**0.444172**	**0.444172**	**0.459964**
102	0.486885	0.789107	0.478989	**0.480496**	**0.480496**	**0.495256**
103	0.531560	0.893024	0.507738	**0.516318**	**0.516318**	**0.530061**
104	0.579804	1.010577	0.537334	**0.551618**	**0.551618**	**0.564357**
105	0.631848	1.143550	0.567730	**0.586369**	**0.586369**	**0.598122**
106	0.687933	1.293955	0.598867	**0.620546**	**0.620546**	**0.631328**
107	0.748312	1.464070	0.630681	**0.654118**	**0.654118**	**0.663945**
108	0.813244	1.656467	0.663102	**0.687050**	**0.687050**	**0.695941**
109	0.883000	1.874053	0.696051	**0.719302**	**0.719302**	**0.727277**
110	0.957861	2.120113	0.729446	**0.750828**	**0.750828**	**0.757908**
111	1.038115	2.398357	0.763195	**0.781575**	**0.781575**	**0.787781**
112	1.124061	2.712978	0.797202	**0.811478**	**0.811478**	**0.816835**
113	1.216004	3.068714	0.831365	**0.840459**	**0.840459**	**0.844992**
114	1.314261	3.470915	0.865576	**0.868421**	**0.868421**	**0.872159**
115	1.419153	3.925626	0.899722	**0.895236**	**0.895236**	**0.898213**
116	1.531008	4.439675	0.933688	**0.920736**	**0.920736**	**0.922988**
117	1.650162	5.020774	0.967354	**0.944678**	**0.944678**	**0.946250**
118	1.776955	5.677634	1.000596	**0.966674**	**0.966674**	**0.967621**
119	1.911732	6.420092	1.033289	**0.985988**	**0.985988**	**0.986386**
120	2.054839	7.259257	1.065306	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 2.16. Assured lives, females, ultimate durations (2+ for Permanents and 5+ for Temporaries): unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
17	0.000178	0.000240	0.000248	0.000178	**0.000178**	0.000248
18	0.000182	0.000243	0.000251	0.000182	**0.000182**	0.000251
19	0.000186	0.000246	0.000254	0.000186	**0.000186**	0.000254
20	0.000191	0.000249	0.000258	0.000191	**0.000191**	0.000258
21	0.000196	0.000252	0.000262	0.000196	**0.000196**	0.000262
22	0.000203	0.000256	0.000267	0.000203	**0.000203**	0.000267
23	0.000209	0.000261	0.000273	0.000209	**0.000209**	0.000273
24	0.000217	0.000266	0.000280	0.000217	**0.000217**	0.000280
25	0.000226	0.000271	0.000288	0.000226	**0.000226**	0.000288
26	0.000235	0.000278	0.000298	0.000235	**0.000235**	0.000298
27	0.000246	0.000285	0.000309	0.000246	**0.000246**	0.000309
28	0.000258	0.000293	0.000322	0.000258	**0.000258**	0.000322
29	0.000272	0.000302	0.000336	0.000272	**0.000272**	0.000336
30	0.000287	0.000312	0.000354	0.000287	**0.000287**	0.000354
31	0.000304	0.000323	0.000374	0.000304	**0.000304**	0.000374
32	0.000322	0.000336	0.000398	0.000322	**0.000322**	0.000398
33	0.000343	0.000350	0.000425	0.000343	**0.000343**	0.000425
34	0.000367	0.000366	0.000456	0.000367	0.000366	0.000456
35	0.000393	0.000384	0.000492	0.000393	0.000384	0.000492
36	0.000423	0.000405	0.000534	0.000423	0.000405	0.000534
37	0.000456	0.000427	0.000583	0.000456	0.000427	0.000583
38	0.000492	0.000453	0.000638	0.000492	0.000453	0.000638
39	0.000533	0.000482	0.000702	0.000533	0.000482	0.000702
40	0.000579	0.000515	0.000775	0.000579	0.000515	0.000775
41	0.000631	0.000551	0.000859	0.000631	0.000551	0.000859
42	0.000688	0.000592	0.000956	0.000688	0.000592	0.000956
43	0.000753	0.000638	0.001066	0.000753	0.000638	0.001066
44	0.000825	0.000690	0.001192	0.000825	0.000690	0.001192
45	0.000905	0.000748	0.001335	0.000905	0.000748	0.001335
46	0.000995	0.000814	0.001499	0.000995	0.000814	0.001499
47	0.001095	0.000887	0.001685	0.001095	0.000887	0.001685
48	0.001208	0.000970	0.001897	0.001208	0.000970	0.001897
49	0.001333	0.001063	0.002138	0.001333	0.001063	0.002138
50	0.001474	0.001168	0.002410	0.001474	0.001168	0.002410

Table 2.16. (Continued.)

Age x	Unadjusted μ_x			Adjusted μ_x		
	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
51	0.001631	0.001285	0.002719	0.001631	0.001285	0.002719
52	0.001807	0.001418	0.003069	0.001807	0.001418	0.003069
53	0.002003	0.001566	0.003463	0.002003	0.001566	0.003463
54	0.002223	0.001733	0.003908	0.002223	0.001733	0.003908
55	0.002468	0.001921	0.004410	0.002468	0.001921	0.004410
56	0.002743	0.002132	0.004975	0.002743	0.002132	0.004975
57	0.003050	0.002369	0.005609	0.003050	0.002369	0.005609
58	0.003394	0.002636	0.006322	0.003394	0.002636	0.006322
59	0.003777	0.002936	0.007120	0.003777	0.002936	0.007120
60	0.004207	0.003273	0.008014	0.004207	0.003273	0.008014
61	0.004687	0.003652	0.009015	0.004687	0.003652	0.009015
62	0.005224	0.004078	0.010132	0.005224	0.004078	0.010132
63	0.005824	0.004557	0.011378	0.005824	0.004557	0.011378
64	0.006495	0.005095	0.012766	0.006495	0.005095	0.012766
65	0.007245	0.005700	0.014310	0.007245	0.005700	0.014310
66	0.008084	0.006380	0.016026	0.008084	0.006380	0.016026
67	0.009023	0.007145	0.017930	0.009023	0.007145	0.017930
68	0.010072	0.008005	0.020041	0.010072	0.008005	0.020041
69	0.011245	0.008971	0.022378	0.011245	0.008971	0.022378
70	0.012557	0.010057	0.024961	0.012557	0.010057	0.024961
71	0.014023	0.011278	0.027812	0.014023	0.011278	0.027812
72	0.015663	0.012651	0.030957	0.015663	0.012651	0.030957
73	0.017497	0.014194	0.034420	0.017497	0.014194	0.034420
74	0.019547	0.015928	0.038228	0.019547	0.015928	0.038228
75	0.021840	0.017878	0.042410	0.021840	0.017878	0.042410
76	0.024404	0.020070	0.046999	0.024404	0.020070	0.046999
77	0.027270	0.022534	0.052025	0.027270	0.022534	0.052025
78	0.030476	0.025304	0.057524	0.030476	0.025304	0.057524
79	0.034060	0.028417	0.063532	0.034060	0.028417	0.063532
80	0.038067	0.031917	0.070088	0.038067	0.031917	0.070088
81	0.042548	0.035852	0.077232	0.042548	0.035852	0.077232
82	0.047559	0.040275	0.085007	0.047559	0.040275	0.085007
83	0.053161	0.045247	0.093458	0.053161	0.045247	0.093458
84	0.059426	0.050836	0.102630	0.059426	0.050836	0.102630
85	0.066431	0.057119	0.112572	0.066431	0.057119	0.112572

Table 2.16. (Continued.)

Age x	Unadjusted μ_x			Adjusted μ_x		
	Combined	Non-smoker	Smoker	Combined	Non-smoker	Smoker
86	0.074264	0.064182	0.123334	0.074264	0.064182	0.123334
87	0.083022	0.072122	0.134969	0.083022	0.072122	0.134969
88	0.092815	0.081048	0.147530	0.092815	0.081048	0.147530
89	0.103765	0.091081	0.161072	0.103765	0.091081	0.161072
90	0.116009	0.102360	0.175652	0.116009	0.102360	0.175652
91	0.129700	0.115038	0.191330	0.129700	0.115038	0.191330
92	0.145009	0.129291	0.208163	0.145009	0.129291	0.208163
93	0.162126	0.145313	0.226213	0.162126	0.145313	0.226213
94	0.181267	0.163324	0.245541	0.181267	0.163324	0.245541
95	0.202669	0.183570	0.266208	0.202669	0.183570	0.266208
96	0.226599	0.206330	0.288278	0.226599	0.206330	0.288278
97	0.253358	0.231915	0.311811	0.253358	0.231915	0.311811
98	0.283278	0.260675	0.336870	0.283278	0.260675	0.336870
99	0.316734	0.293006	0.363517	0.316734	0.293006	0.363517
100	0.354144	0.329351	0.391812	0.354144	0.329351	0.391812
101	0.395973	0.370207	0.421814	**0.394254**	**0.371001**	**0.429583**
102	0.442745	0.416134	0.453580	**0.433840**	**0.412107**	**0.466860**
103	0.495044	0.467762	0.487166	**0.472880**	**0.452645**	**0.503623**
104	0.553523	0.525800	0.522625	**0.511349**	**0.492591**	**0.539849**
105	0.618912	0.591041	0.560006	**0.549222**	**0.531918**	**0.575513**
106	0.692027	0.664381	0.599357	**0.586469**	**0.570594**	**0.610587**
107	0.773782	0.746826	0.640719	**0.623055**	**0.608585**	**0.645040**
108	0.865197	0.839504	0.684130	**0.658944**	**0.645852**	**0.678836**
109	0.967414	0.943686	0.729625	**0.694093**	**0.682350**	**0.711935**
110	1.081709	1.060801	0.777230	**0.728451**	**0.718027**	**0.744288**
111	1.209510	1.192454	0.826969	**0.761959**	**0.752821**	**0.775842**
112	1.352411	1.340449	0.878856	**0.794548**	**0.786661**	**0.806530**
113	1.512199	1.506816	0.932900	**0.826131**	**0.819457**	**0.836272**
114	1.690868	1.693833	0.989104	**0.856604**	**0.851099**	**0.864967**
115	1.890648	1.904066	1.047461	**0.885828**	**0.881445**	**0.892487**
116	2.114035	2.140396	1.107956	**0.913618**	**0.910302**	**0.918656**
117	2.363818	2.406061	1.170567	**0.939709**	**0.937395**	**0.943226**
118	2.643117	2.704705	1.235261	**0.963681**	**0.962287**	**0.965799**
119	2.955417	3.040420	1.301998	**0.984730**	**0.984143**	**0.985620**
120	3.304621	3.417808	1.370727	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 2.17. Details of graduations for male assured lives, combined, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	1,138.0	0.84	0.000457	0.52	0.32			
18	1,409.0	0.84	0.000459	0.65	0.19			
19	2,497.3	2.50	0.000461	1.15	1.35			
20	4,084.3	4.99	0.000463	1.89	3.10			
21	6,198.0	4.97	0.000466	2.89	2.08			
17-21	15,326.6	14.13		7.10	7.04	2.66	2.64	199.1
22	8,924.8	2.47	0.000469	4.19	–1.71			
23	12,345.4	4.92	0.000473	5.84	–0.92			
22-23	21,270.3	7.39		10.03	–2.63	3.17	–0.83	73.8
24	16,732.7	16.30	0.000477	7.98	8.32	2.83	2.94	204.2
25	22,369.6	12.94	0.000483	10.80	2.13	3.29	0.65	119.8
26	29,005.4	15.23	0.000489	14.18	1.05	3.77	0.28	107.4
27	36,154.0	22.22	0.000496	17.93	4.29	4.23	1.01	123.9
28	44,624.9	20.40	0.000504	22.49	–2.09	4.74	–0.44	90.7
29	54,332.6	24.79	0.000513	27.87	–3.09	5.28	–0.58	88.9
30	64,160.0	26.73	0.000525	33.68	–6.96	5.80	–1.20	79.3
31	73,850.6	30.83	0.000537	39.66	–8.83	6.30	–1.40	77.7
32	83,335.5	45.84	0.000552	46.00	–0.16	6.78	–0.02	99.6
33	92,805.0	45.75	0.000570	52.90	–7.15	7.27	–0.98	86.5
34	101,802.5	65.56	0.000590	60.06	5.50	7.75	0.71	109.2
35	110,589.5	62.19	0.000613	67.79	–5.60	8.23	–0.68	91.7
36	117,681.1	81.50	0.000640	75.32	6.19	8.68	0.71	108.2
37	123,055.3	70.48	0.000670	82.45	–11.97	9.08	–1.32	85.5
38	127,338.2	81.57	0.000706	89.90	–8.33	9.48	–0.88	90.7
39	129,958.6	100.62	0.000747	97.08	3.54	9.85	0.36	103.6
40	132,478.8	95.57	0.000794	105.19	–9.62	10.26	–0.94	90.9
41	135,445.1	123.10	0.000848	114.86	8.25	10.72	0.77	107.2
42	138,435.9	132.71	0.000910	125.98	6.74	11.22	0.60	105.3
43	142,412.3	130.76	0.000981	139.71	–8.94	11.82	–0.76	93.6
44	147,269.8	164.79	0.001063	156.55	8.24	12.51	0.66	105.3
45	153,002.0	182.45	0.001156	176.87	5.58	13.30	0.42	103.2
46	159,532.0	214.77	0.001263	201.49	13.29	14.19	0.94	106.6
47	166,937.9	244.84	0.001385	231.21	13.63	15.21	0.90	105.9
48	175,408.3	273.51	0.001525	267.50	6.01	16.36	0.37	102.2
49	184,823.9	312.61	0.001683	311.06	1.55	17.64	0.09	100.5
50	194,406.9	345.64	0.001865	362.57	–16.93	19.04	–0.89	95.3

Table 2.17. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
51	208,435.1	436.20	0.002071	431.67	4.53	20.78	0.22	101.0
52	228,367.6	545.32	0.002305	526.39	18.94	22.94	0.83	103.6
53	240,495.9	606.71	0.002571	618.31	–11.61	24.87	–0.47	98.1
54	239,794.2	680.29	0.002873	688.93	–8.64	26.25	–0.33	98.7
55	231,358.0	726.75	0.003216	744.05	–17.30	27.28	–0.63	97.7
56	217,885.5	785.62	0.003604	785.26	0.36	28.02	0.01	100.0
57	206,958.2	862.51	0.004043	836.73	25.78	28.93	0.89	103.1
58	197,458.0	946.82	0.004539	896.26	50.56	29.94	1.69	105.6
59	184,928.2	976.35	0.005100	943.13	33.22	30.71	1.08	103.5
60	158,476.2	897.72	0.005733	908.54	–10.82	30.14	–0.36	98.8
61	142,564.6	912.66	0.006446	918.97	–6.31	30.31	–0.21	99.3
62	139,924.9	1,028.07	0.007249	1,014.32	13.75	31.85	0.43	101.4
63	137,737.1	1,081.14	0.008152	1,122.83	–41.69	33.51	–1.24	96.3
64	129,030.4	1,205.00	0.009167	1,182.82	22.18	34.39	0.64	101.9
65	86,047.5	781.43	0.010307	886.89	–105.46	29.78	–3.54	88.1
66	58,347.8	658.05	0.011586	676.02	–17.97	26.00	–0.69	97.3
67	51,312.7	616.56	0.013019	668.04	–51.48	25.85	–1.99	92.3
68	47,290.2	697.34	0.014624	691.57	5.77	26.30	0.22	100.8
69	43,854.3	704.54	0.016418	720.00	–15.46	26.83	–0.58	97.9
70	40,177.9	722.64	0.018423	740.20	–17.56	27.21	–0.65	97.6
71	36,569.4	819.81	0.020661	755.56	64.25	27.49	2.34	108.5
72	33,744.3	745.49	0.023157	781.42	–35.93	27.95	–1.29	95.4
73	31,181.7	797.08	0.025938	808.79	–11.71	28.44	–0.41	98.6
74	28,686.8	872.98	0.029032	832.83	40.15	28.86	1.39	104.8
75	25,402.6	784.45	0.032473	824.90	–40.45	28.72	–1.41	95.1
76	22,749.5	836.29	0.036295	825.69	10.59	28.73	0.37	101.3
77	20,868.1	904.46	0.040536	845.91	58.55	29.08	2.01	106.9
78	19,209.9	851.74	0.045237	869.00	–17.26	29.48	–0.59	98.0
79	17,561.2	898.32	0.050444	885.86	12.47	29.76	0.42	101.4
80	14,997.3	849.26	0.056205	842.92	6.34	29.03	0.22	100.8
81	12,596.0	797.10	0.062572	788.16	8.95	28.07	0.32	101.1
82	10,400.9	747.84	0.069603	723.93	23.91	26.91	0.89	103.3
83	8,567.2	704.95	0.077358	662.75	42.21	25.74	1.64	106.4
84	7,306.7	664.33	0.085904	627.67	36.66	25.05	1.46	105.8
85	6,381.1	630.25	0.095313	608.20	22.06	24.66	0.89	103.6
86	5,628.5	604.46	0.105660	594.71	9.75	24.39	0.40	101.6
87	4,867.6	545.73	0.117029	569.65	–23.92	23.87	–1.00	95.8
88	4,148.0	545.03	0.129507	537.19	7.84	23.18	0.34	101.5
89	3,436.8	442.35	0.143189	492.11	–49.77	22.18	–2.24	89.9
90	2,811.9	401.96	0.158176	444.77	–42.81	21.09	–2.03	90.4
Totals	6,302,105.0	33,280.84		33,279.15	1.68			100.0

Table 2.18. Details of graduations for male assured lives, non-smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	306.1	0.00	0.000362	0.11	–0.11			
18	468.1	0.00	0.000364	0.17	–0.17			
19	1,109.0	1.67	0.000367	0.41	1.26			
20	1,841.4	2.49	0.000370	0.68	1.81			
21	2,877.0	0.83	0.000373	1.07	–0.24			
22	4,379.2	0.82	0.000377	1.65	–0.83			
23	6,225.8	2.46	0.000382	2.38	0.08			
17-23	17,206.7	8.27		6.47	1.80	2.54	0.71	127.9
24	8,519.1	6.52	0.000387	3.30	3.22			
25	11,441.2	4.85	0.000393	4.50	0.36			
24-25	19,960.2	11.37		7.79	3.58	2.79	1.28	145.9
26	14,531.9	6.41	0.000400	5.81	0.60	2.41	0.25	110.3
27	17,340.8	11.11	0.000407	7.06	4.05	2.66	1.53	157.4
28	20,974.4	7.06	0.000416	8.73	–1.66	2.95	–0.56	80.9
29	25,189.4	11.62	0.000426	10.73	0.89	3.28	0.27	108.3
30	29,545.4	10.69	0.000437	12.91	–2.22	3.59	–0.62	82.8
31	33,921.9	9.77	0.000449	15.23	–5.46	3.90	–1.40	64.2
32	38,128.0	17.00	0.000464	17.69	–0.69	4.21	–0.16	96.1
33	42,258.3	18.15	0.000480	20.28	–2.13	4.50	–0.47	89.5
34	45,938.0	26.37	0.000498	22.88	3.49	4.78	0.73	115.3
35	49,211.0	28.65	0.000519	25.54	3.11	5.05	0.62	112.2
36	51,183.6	28.77	0.000543	27.79	0.97	5.27	0.18	103.5
37	52,002.2	29.53	0.000570	29.64	–0.11	5.44	–0.02	99.6
38	52,132.0	24.34	0.000600	31.28	–6.94	5.59	–1.24	77.8
39	51,474.2	30.96	0.000635	32.69	–1.73	5.72	–0.30	94.7
40	50,531.1	36.08	0.000675	34.11	1.97	5.84	0.34	105.8
41	49,410.8	42.90	0.000719	35.53	7.37	5.96	1.24	120.8
42	47,963.0	41.59	0.000770	36.93	4.66	6.08	0.77	112.6
43	46,825.5	25.31	0.000828	38.77	–13.46	6.23	–2.16	65.3
44	45,615.5	40.45	0.000893	40.73	–0.28	6.38	–0.04	99.3
45	44,312.0	42.38	0.000968	42.89	–0.52	6.55	–0.08	98.8
46	43,154.2	42.60	0.001052	45.40	–2.79	6.74	–0.41	93.8
47	42,282.5	52.80	0.001148	48.54	4.26	6.97	0.61	108.8
48	41,808.2	53.20	0.001256	52.51	0.69	7.25	0.09	101.3
49	41,801.3	58.36	0.001379	57.64	0.72	7.59	0.09	101.2
50	42,079.4	52.68	0.001519	63.92	–11.23	7.99	–1.41	82.4

Table 2.18. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
51	43,434.6	73.86	0.001677	72.84	1.02	8.53	0.12	101.4
52	45,596.2	77.32	0.001857	84.67	–7.35	9.20	–0.80	91.3
53	46,201.6	108.21	0.002061	95.22	12.99	9.76	1.33	113.6
54	44,536.5	92.14	0.002292	102.08	–9.94	10.10	–0.98	90.3
55	42,272.5	97.67	0.002555	108.01	–10.34	10.39	–0.99	90.4
56	38,937.6	107.83	0.002852	111.05	–3.22	10.54	–0.31	97.1
57	35,852.5	104.68	0.003190	114.37	–9.69	10.69	–0.91	91.5
58	33,350.0	143.01	0.003572	119.13	23.89	10.91	2.19	120.1
59	30,566.8	145.15	0.004006	122.45	22.70	11.07	2.05	118.5
60	26,947.2	128.15	0.004498	121.21	6.94	11.01	0.63	105.7
61	24,134.8	134.16	0.005056	122.03	12.13	11.05	1.10	109.9
62	23,198.3	120.99	0.005689	131.97	–10.98	11.49	–0.96	91.7
63	22,354.8	161.50	0.006406	143.20	18.30	11.97	1.53	112.8
64	20,686.0	156.02	0.007219	149.33	6.69	12.22	0.55	104.5
65	16,738.6	145.01	0.008140	136.25	8.76	11.67	0.75	106.4
66	13,081.6	108.06	0.009185	120.15	–12.09	10.96	–1.10	89.9
67	11,826.2	107.56	0.010369	122.63	–15.07	11.07	–1.36	87.7
68	11,102.1	129.93	0.011711	130.02	–0.08	11.40	–0.01	99.9
69	10,421.0	123.92	0.013232	137.89	–13.97	11.74	–1.19	89.9
70	9,494.5	148.32	0.014955	141.99	6.32	11.92	0.53	104.5
71	8,592.3	152.32	0.016909	145.29	7.03	12.05	0.58	104.8
72	8,016.6	122.37	0.019122	153.29	–30.92	12.38	–2.50	79.8
73	7,464.1	139.61	0.021630	161.45	–21.84	12.71	–1.72	86.5
74	6,740.5	179.01	0.024472	164.95	14.06	12.84	1.09	108.5
75	5,423.7	148.01	0.027692	150.19	–2.18	12.26	–0.18	98.5
76	4,553.5	147.92	0.031340	142.71	5.21	11.95	0.44	103.7
77	4,046.3	166.79	0.035472	143.53	23.26	11.98	1.94	116.2
78	3,643.8	127.39	0.040154	146.31	–18.93	12.10	–1.56	87.1
79	3,176.3	131.91	0.045456	144.38	–12.47	12.02	–1.04	91.4
80	2,536.7	140.57	0.051463	130.55	10.02	11.43	0.88	107.7
81	1,990.2	119.86	0.058266	115.96	3.90	10.77	0.36	103.4
82	1,485.6	96.52	0.065970	98.01	–1.48	9.90	–0.15	98.5
83	1,094.0	90.74	0.074696	81.72	9.03	9.04	1.00	111.0
84	816.5	65.59	0.084577	69.06	–3.47	8.31	–0.42	95.0
85	621.0	63.95	0.095313	59.19	4.76	7.69	0.62	108.0
86	504.3	56.41	0.105660	53.28	3.12	7.30	0.43	105.9
87	399.6	48.00	0.117029	46.77	1.24	6.84	0.18	102.6
88	313.4	35.38	0.129507	40.58	–5.20	6.37	–0.82	87.2
89	243.9	42.97	0.143189	34.93	8.04	5.91	1.36	123.0
90	180.8	34.55	0.158176	28.59	5.96	5.35	1.11	120.8
Totals	1,669,357.8	5,291.79		5,276.74	15.05			100.3

Table 2.19. Details of graduations for male assured lives, smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	69.5	0.00	0.000679	0.05	–0.05			
18	73.6	0.00	0.000680	0.05	–0.05			
19	115.9	0.00	0.000683	0.08	–0.08			
20	215.3	0.00	0.000685	0.15	–0.15			
21	370.2	1.66	0.000689	0.26	1.40			
22	565.2	0.00	0.000692	0.39	–0.39			
23	901.7	0.82	0.000697	0.63	0.19			
24	1,301.6	3.26	0.000703	0.91	2.34			
25	1,799.6	1.62	0.000709	1.28	0.34			
26	2,494.3	2.40	0.000717	1.79	0.62			
17-26	7,907.0	9.76		5.58	4.18	2.36	1.77	174.9
27	3,354.4	2.38	0.000727	2.44	–0.06			
28	4,210.5	3.14	0.000738	3.11	0.03			
27-28	7,564.9	5.52		5.55	–0.03	2.35	–0.01	99.5
29	5,379.3	3.87	0.000751	4.04	–0.17			
30	6,679.8	3.82	0.000767	5.12	–1.31			
29-30	12,059.0	7.69		9.16	–1.47	3.03	–0.49	83.9
31	7,914.3	4.51	0.000786	6.22	–1.71	2.49	–0.69	72.5
32	9,228.1	7.39	0.000808	7.46	–0.06	2.73	–0.02	99.2
33	10,380.2	7.99	0.000834	8.66	–0.67	2.94	–0.23	92.3
34	11,365.4	12.83	0.000864	9.82	3.01	3.13	0.96	130.6
35	12,240.9	8.39	0.000900	11.02	–2.63	3.32	–0.79	76.1
36	12,715.1	15.75	0.000942	11.98	3.78	3.46	1.09	131.5
37	12,752.0	7.38	0.000992	12.65	–5.27	3.56	–1.48	58.4
38	12,730.8	10.53	0.001049	13.35	–2.83	3.65	–0.77	78.8
39	12,547.5	12.26	0.001116	14.00	–1.75	3.74	–0.47	87.5
40	12,472.4	13.92	0.001195	14.90	–0.98	3.86	–0.25	93.4
41	12,337.3	18.65	0.001285	15.85	2.80	3.98	0.70	117.7
42	12,008.9	12.23	0.001391	16.70	–4.47	4.09	–1.09	73.2
43	11,672.4	15.67	0.001513	17.66	–1.99	4.20	–0.47	88.7
44	11,480.2	19.63	0.001654	18.99	0.64	4.36	0.15	103.4
45	11,408.7	17.66	0.001817	20.73	–3.07	4.55	–0.67	85.2
46	11,327.6	31.52	0.002005	22.71	8.80	4.77	1.85	138.8
47	11,325.9	31.91	0.002221	25.15	6.76	5.02	1.35	126.9
48	11,392.4	37.59	0.002470	28.14	9.45	5.30	1.78	133.6
49	11,478.1	24.85	0.002754	31.61	–6.76	5.62	–1.20	78.6
50	11,649.5	30.68	0.003079	35.87	–5.18	5.99	–0.87	85.5

Table 2.19. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
51	12,018.5	35.48	0.003451	41.48	–6.00	6.44	–0.93	85.5
52	12,639.4	53.89	0.003875	48.98	4.91	7.00	0.70	110.0
53	13,088.1	59.72	0.004358	57.04	2.69	7.55	0.36	104.7
54	12,964.2	69.41	0.004906	63.60	5.80	7.98	0.73	109.1
55	12,678.3	70.98	0.005527	70.07	0.90	8.37	0.11	101.3
56	11,935.6	71.48	0.006231	74.37	–2.89	8.62	–0.34	96.1
57	11,262.3	88.38	0.007026	79.13	9.25	8.90	1.04	111.7
58	10,681.5	100.88	0.007923	84.63	16.25	9.20	1.77	119.2
59	10,037.7	87.22	0.008934	89.68	–2.46	9.47	–0.26	97.3
60	8,847.3	83.00	0.010069	89.08	–6.08	9.44	–0.64	93.2
61	7,957.2	102.99	0.011343	90.26	12.73	9.50	1.34	114.1
62	7,599.2	90.57	0.012770	97.04	–6.47	9.85	–0.66	93.3
63	7,275.0	84.63	0.014366	104.51	–19.88	10.22	–1.94	81.0
64	6,605.8	87.00	0.016146	106.66	–19.66	10.33	–1.90	81.6
65	4,929.0	76.17	0.018129	89.36	–13.19	9.45	–1.40	85.2
66	3,734.2	67.07	0.020334	75.93	–8.86	8.71	–1.02	88.3
67	3,325.5	75.74	0.022782	75.76	–0.02	8.70	–0.00	100.0
68	3,171.9	89.95	0.025493	80.86	9.09	8.99	1.01	111.2
69	2,926.9	85.73	0.028491	83.39	2.34	9.13	0.26	102.8
70	2,649.0	78.10	0.031800	84.24	–6.14	9.18	–0.67	92.7
71	2,367.3	90.91	0.035446	83.91	7.00	9.16	0.76	108.3
72	2,121.3	82.12	0.039456	83.70	–1.58	9.15	–0.17	98.1
73	1,889.9	88.47	0.043857	82.88	5.59	9.10	0.61	106.7
74	1,676.9	80.11	0.048678	81.63	–1.52	9.03	–0.17	98.1
75	1,316.0	73.18	0.053951	71.00	2.18	8.43	0.26	103.1
76	1,051.6	62.80	0.059706	62.78	0.02	7.92	0.00	100.0
77	867.5	67.21	0.065975	57.24	9.98	7.57	1.32	117.4
78	716.0	56.62	0.072793	52.12	4.49	7.22	0.62	108.6
79	582.3	50.93	0.080191	46.70	4.23	6.83	0.62	109.1
80	461.4	41.00	0.088205	40.70	0.30	6.38	0.05	100.7
81	356.6	37.72	0.096870	34.55	3.17	5.88	0.54	109.2
82	271.9	36.09	0.106219	28.89	7.21	5.37	1.34	124.9
83	195.8	13.44	0.116286	22.77	–9.32	4.77	–1.95	59.1
84	143.4	25.23	0.127108	18.22	7.00	4.27	1.64	138.4
85	114.4	19.35	0.138715	15.87	3.48	3.98	0.87	121.9
86	95.6	13.47	0.151142	14.44	–0.97	3.80	–0.26	93.3
87	80.8	14.32	0.164420	13.29	1.02	3.65	0.28	107.7
88	73.3	5.90	0.178577	13.09	–7.19	3.62	–1.99	45.1
89	58.6	9.27	0.193642	11.34	–2.07	3.37	–0.62	81.7
90	44.7	3.37	0.209641	9.36	–5.99	3.06	–1.96	36.0
Totals	438,770.6	2,794.18		2,794.32	–0.15			100.0

Table 2.20. Details of graduations for female assured lives, combined, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	1,462.4	0.00	0.000178	0.26	–0.26			
18	1,625.2	0.00	0.000182	0.30	–0.30			
19	2,225.4	0.00	0.000186	0.41	–0.41			
20	3,218.5	2.49	0.000191	0.61	1.88			
21	4,872.8	0.00	0.000196	0.96	–0.96			
22	7,200.8	2.47	0.000203	1.46	1.01			
23	9,836.8	0.00	0.000209	2.06	–2.06			
17-23	30,441.9	4.97		6.06	–1.09	2.46	–0.44	82.0
24	13,166.0	2.44	0.000217	2.86	–0.41			
25	17,803.7	1.62	0.000226	4.02	–2.41			
24-25	30,969.7	4.06		6.88	–2.82	2.62	–1.07	59.0
26	23,694.2	8.02	0.000235	5.57	2.45	2.36	1.04	144.0
27	30,598.3	6.35	0.000246	7.53	–1.18	2.74	–0.43	84.3
28	38,801.5	9.41	0.000258	10.01	–0.60	3.16	–0.19	94.0
29	47,213.9	15.49	0.000272	12.84	2.65	3.58	0.74	120.6
30	55,112.5	12.22	0.000287	15.82	–3.60	3.98	–0.90	77.2
31	63,434.4	19.55	0.000304	19.28	0.26	4.39	0.06	101.4
32	71,804.5	18.48	0.000322	23.12	–4.64	4.81	–0.96	79.9
33	79,920.1	21.79	0.000343	27.41	–5.63	5.24	–1.07	79.5
34	87,445.8	29.93	0.000367	32.09	–2.16	5.67	–0.38	93.3
35	94,051.3	31.45	0.000393	36.96	–5.52	6.08	–0.91	85.1
36	99,711.9	46.57	0.000423	42.18	4.40	6.49	0.68	110.4
37	103,835.2	46.31	0.000456	47.35	–1.04	6.88	–0.15	97.8
38	106,525.5	38.15	0.000492	52.41	–14.26	7.24	–1.97	72.8
39	107,726.6	59.34	0.000533	57.42	1.92	7.58	0.25	103.3
40	107,835.3	60.76	0.000579	62.44	–1.68	7.90	–0.21	97.3
41	107,630.0	74.61	0.000631	67.91	6.69	8.24	0.81	109.9
42	106,946.2	79.51	0.000688	73.58	5.93	8.58	0.69	108.1
43	106,122.9	87.38	0.000753	79.91	7.47	8.94	0.84	109.3
44	104,781.3	85.67	0.000825	86.44	–0.78	9.30	–0.08	99.1
45	103,481.7	101.23	0.000905	93.65	7.58	9.68	0.78	108.1
46	102,724.9	95.71	0.000995	102.21	–6.50	10.11	–0.64	93.6
47	101,951.1	123.58	0.001095	111.64	11.94	10.57	1.13	110.7
48	101,003.4	152.66	0.001208	122.01	30.64	11.05	2.77	125.1
49	100,096.3	156.59	0.001333	133.43	23.16	11.55	2.01	117.4
50	99,217.1	143.00	0.001474	146.25	–3.24	12.09	–0.27	97.8

Table 2.20. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
51	99,643.3	156.45	0.001631	162.52	–6.07	12.75	–0.48	96.3
52	102,766.9	220.82	0.001807	185.70	35.12	13.63	2.58	118.9
53	102,575.1	192.18	0.002003	205.46	–13.27	14.33	–0.93	93.5
54	97,953.8	260.87	0.002223	217.75	43.12	14.76	2.92	119.8
55	91,776.9	210.50	0.002468	226.51	–16.00	15.05	–1.06	92.9
56	83,843.4	236.61	0.002743	229.98	6.63	15.17	0.44	102.9
57	77,286.7	248.85	0.003050	235.72	13.12	15.35	0.85	105.6
58	72,360.9	237.50	0.003394	245.59	–8.09	15.67	–0.52	96.7
59	66,509.3	249.95	0.003777	251.21	–1.26	15.85	–0.08	99.5
60	56,658.1	219.12	0.004207	238.36	–19.24	15.44	–1.25	91.9
61	49,141.1	222.24	0.004687	230.32	–8.09	15.18	–0.53	96.5
62	46,480.3	229.54	0.005224	242.81	–13.28	15.58	–0.85	94.5
63	43,881.5	232.73	0.005824	255.57	–22.83	15.99	–1.43	91.1
64	40,674.0	222.88	0.006495	264.18	–41.29	16.25	–2.54	84.4
65	34,216.3	220.44	0.007245	247.90	–27.46	15.74	–1.74	88.9
66	29,736.0	224.32	0.008084	240.39	–16.07	15.50	–1.04	93.3
67	27,620.6	258.29	0.009023	249.22	9.07	15.79	0.57	103.6
68	26,163.6	243.72	0.010072	263.52	–19.80	16.23	–1.22	92.5
69	24,533.7	247.84	0.011245	275.88	–28.05	16.61	–1.69	89.8
70	22,266.5	259.55	0.012557	279.60	–20.05	16.72	–1.20	92.8
71	20,150.4	319.79	0.014023	282.57	37.22	16.81	2.21	113.2
72	18,493.7	282.58	0.015663	289.67	–7.09	17.02	–0.42	97.6
73	16,805.2	306.01	0.017497	294.04	11.96	17.15	0.70	104.1
74	15,258.5	302.44	0.019547	298.26	4.18	17.27	0.24	101.4
75	13,750.9	306.71	0.021840	300.32	6.39	17.33	0.37	102.1
76	12,398.9	315.67	0.024404	302.58	13.09	17.39	0.75	104.3
77	11,163.2	302.87	0.027270	304.42	–1.55	17.45	–0.09	99.5
78	9,955.3	324.71	0.030476	303.40	21.31	17.42	1.22	107.0
79	8,879.6	283.86	0.034060	302.44	–18.58	17.39	–1.07	93.9
80	7,500.6	275.28	0.038067	285.53	–10.25	16.90	–0.61	96.4
81	6,167.2	248.94	0.042548	262.40	–13.46	16.20	–0.83	94.9
82	4,966.7	239.21	0.047559	236.21	3.00	15.37	0.19	101.3
83	3,996.2	217.62	0.053161	212.44	5.18	14.58	0.36	102.4
84	3,410.6	216.12	0.059426	202.68	13.44	14.24	0.94	106.6
85	2,991.5	198.58	0.066431	198.73	–0.14	14.10	–0.01	99.9
86	2,645.6	216.36	0.074264	196.47	19.89	14.02	1.42	110.1
87	2,265.7	203.81	0.083022	188.10	15.70	13.72	1.14	108.3
88	1,892.9	186.17	0.092815	175.69	10.48	13.25	0.79	106.0
89	1,481.6	167.67	0.103765	153.74	13.93	12.40	1.12	109.1
90	1,143.1	110.39	0.116009	132.61	–22.22	11.52	–1.93	83.2
Totals	3,574,483.0	11,151.95		11,152.89	–0.93			100.0

Table 2.21. Details of graduations for female assured lives, non-smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	662.9	0.00	0.000178	0.12	–0.12			
18	723.1	0.00	0.000182	0.13	–0.13			
19	1,089.9	0.00	0.000186	0.20	–0.20			
20	1,571.3	2.49	0.000191	0.30	2.19			
21	2,409.4	0.00	0.000196	0.47	–0.47			
22	3,738.1	0.82	0.000203	0.76	0.07			
23	5,312.5	0.00	0.000209	1.11	–1.11			
24	7,188.0	1.63	0.000217	1.56	0.07			
25	9,708.9	1.62	0.000226	2.19	–0.58			
17-25	32,404.0	6.57		6.85	–0.28	2.62	–0.11	95.9
26	12,593.4	5.61	0.000235	2.96	2.65			
27	15,782.1	3.17	0.000246	3.88	–0.71			
26-27	28,375.5	8.79		6.84	1.94	2.62	0.74	128.4
28	19,728.3	3.92	0.000258	5.09	–1.17	2.26	–0.52	77.1
29	23,913.3	10.07	0.000272	6.50	3.57	2.55	1.40	154.8
30	27,820.1	6.87	0.000287	7.98	–1.11	2.83	–0.39	86.1
31	32,124.5	11.28	0.000304	9.77	1.51	3.13	0.48	115.5
32	36,472.9	5.18	0.000322	11.74	–6.57	3.43	–1.92	44.1
33	40,658.0	12.35	0.000343	13.95	–1.60	3.73	–0.43	88.5
34	44,581.9	14.25	0.000366	16.32	–2.06	4.04	–0.51	87.3
35	47,736.5	16.07	0.000384	18.33	–2.26	4.28	–0.53	87.7
36	50,189.8	24.66	0.000405	20.33	4.33	4.51	0.96	121.3
37	51,574.7	20.81	0.000427	22.02	–1.22	4.69	–0.26	94.5
38	52,418.7	16.45	0.000453	23.75	–7.30	4.87	–1.50	69.3
39	52,379.8	23.22	0.000482	25.25	–2.03	5.02	–0.40	92.0
40	51,693.8	22.79	0.000515	26.62	–3.84	5.16	–0.74	85.6
41	50,649.6	27.98	0.000551	27.91	0.07	5.28	0.01	100.3
42	49,242.3	31.80	0.000592	29.15	2.65	5.40	0.49	109.1
43	47,509.9	31.34	0.000638	30.31	1.02	5.51	0.19	103.4
44	45,457.7	36.29	0.000690	31.37	4.92	5.60	0.88	115.7
45	43,538.1	40.02	0.000748	32.57	7.45	5.71	1.31	122.9
46	42,008.7	30.35	0.000814	34.20	–3.85	5.85	–0.66	88.8
47	40,647.9	41.19	0.000887	36.05	5.14	6.00	0.86	114.3
48	39,448.6	61.29	0.000970	38.27	23.03	6.19	3.72	160.2
49	38,410.8	50.27	0.001063	40.83	9.44	6.39	1.48	123.1
50	37,623.0	42.84	0.001168	43.94	–1.10	6.63	–0.17	97.5

Table 2.21. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
51	37,629.9	47.69	0.001285	48.35	–0.66	6.95	–0.10	98.6
52	38,709.1	66.77	0.001418	54.89	11.88	7.41	1.60	121.7
53	38,457.0	57.36	0.001566	60.22	–2.86	7.76	–0.37	95.2
54	36,346.5	75.99	0.001733	62.99	13.00	7.94	1.64	120.6
55	34,037.1	61.27	0.001921	65.39	–4.12	8.09	–0.51	93.7
56	30,932.1	67.78	0.002132	65.95	1.83	8.12	0.23	102.8
57	28,292.7	69.58	0.002369	67.03	2.55	8.19	0.31	103.8
58	26,399.2	78.53	0.002636	69.59	8.94	8.34	1.07	112.8
59	24,173.4	71.60	0.002936	70.97	0.63	8.42	0.07	100.9
60	21,029.0	63.08	0.003273	68.83	–5.75	8.30	–0.69	91.6
61	18,747.2	74.53	0.003652	68.46	6.07	8.27	0.73	108.9
62	17,763.4	72.59	0.004078	72.44	0.15	8.51	0.02	100.2
63	16,750.3	69.82	0.004557	76.33	–6.51	8.74	–0.75	91.5
64	15,620.0	56.08	0.005095	79.58	–23.50	8.92	–2.63	70.5
65	13,976.7	65.91	0.005700	79.67	–13.75	8.93	–1.54	82.7
66	12,606.7	63.35	0.006380	80.43	–17.09	8.97	–1.91	78.8
67	11,799.7	90.89	0.007145	84.31	6.58	9.18	0.72	107.8
68	11,215.2	76.12	0.008005	89.78	–13.66	9.48	–1.44	84.8
69	10,528.2	81.05	0.008971	94.45	–13.40	9.72	–1.38	85.8
70	9,399.3	84.41	0.010057	94.53	–10.12	9.72	–1.04	89.3
71	8,407.4	104.47	0.011278	94.82	9.65	9.74	0.99	110.2
72	7,657.2	101.44	0.012651	96.87	4.57	9.84	0.46	104.7
73	6,835.6	99.84	0.014194	97.02	2.81	9.85	0.29	102.9
74	6,133.0	96.45	0.015928	97.69	–1.23	9.88	–0.12	98.7
75	5,380.8	89.63	0.017878	96.20	–6.57	9.81	–0.67	93.2
76	4,725.0	97.51	0.020070	94.83	2.68	9.74	0.28	102.8
77	4,201.6	90.45	0.022534	94.68	–4.23	9.73	–0.43	95.5
78	3,726.2	97.41	0.025304	94.29	3.12	9.71	0.32	103.3
79	3,288.6	78.48	0.028417	93.45	–14.97	9.67	–1.55	84.0
80	2,722.7	87.02	0.031917	86.90	0.12	9.32	0.01	100.1
81	2,145.7	63.70	0.035852	76.93	–13.23	8.77	–1.51	82.8
82	1,684.1	73.02	0.040275	67.83	5.19	8.24	0.63	107.7
83	1,316.6	62.18	0.045247	59.57	2.60	7.72	0.34	104.4
84	1,107.9	61.39	0.050836	56.32	5.07	7.50	0.67	109.0
85	994.6	61.43	0.057119	56.81	4.62	7.54	0.61	108.1
86	895.3	61.46	0.064182	57.46	3.99	7.58	0.53	106.9
87	792.1	71.58	0.072122	57.13	14.46	7.56	1.91	125.3
88	647.8	64.02	0.081048	52.50	11.52	7.25	1.59	121.9
89	500.9	55.61	0.091081	45.62	9.99	6.75	1.48	121.9
90	372.9	32.86	0.102360	38.17	–5.30	6.18	–0.86	86.1
Totals	1,544,556.8	3,540.98		3,535.21	5.77			100.2

Table 2.22. Details of graduations for female assured lives, smokers, ultimate durations (2+ for Permanents and 5+ for Temporaries): exposed to risk and actual deaths adjusted by variance ratios.

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
17	64.5	0.00	0.000248	0.02	–0.02			
18	74.4	0.00	0.000251	0.02	–0.02			
19	103.4	0.00	0.000254	0.03	–0.03			
20	158.0	0.00	0.000258	0.04	–0.04			
21	261.7	0.00	0.000262	0.07	–0.07			
22	432.5	0.00	0.000267	0.12	–0.12			
23	636.8	0.00	0.000273	0.17	–0.17			
24	950.1	0.00	0.000280	0.27	–0.27			
25	1,424.8	0.00	0.000288	0.41	–0.41			
26	2,148.8	0.00	0.000298	0.64	–0.64			
27	3,067.5	0.00	0.000309	0.95	–0.95			
28	4,207.5	0.78	0.000322	1.35	–0.57			
29	5,369.2	2.32	0.000336	1.80	0.52			
17-29	18,899.3	3.11		5.88	–2.77	2.43	–1.14	52.8
30	6,493.2	0.76	0.000354	2.30	–1.53			
31	7,519.6	1.50	0.000374	2.81	–1.31			
30-31	14,012.8	2.27		5.11	–2.84	2.26	–1.26	44.4
32	8,487.7	5.91	0.000398	3.38	2.54			
33	9,375.7	2.18	0.000425	3.98	–1.81			
32-33	17,863.4	8.09		7.36	0.73	2.71	0.27	109.9
34	10,028.5	3.56	0.000456	4.57	–1.01			
35	10,577.1	2.80	0.000492	5.20	–2.41			
34-35	20,605.6	6.36		9.78	–3.42	3.13	–1.09	65.0
36	10,968.9	7.53	0.000534	5.86	1.68	2.42	0.69	128.6
37	11,216.6	8.05	0.000583	6.54	1.52	2.56	0.59	123.2
38	11,268.2	9.87	0.000638	7.19	2.68	2.68	1.00	137.3
39	11,201.4	6.45	0.000702	7.86	–1.41	2.80	–0.50	82.0
40	11,078.0	10.76	0.000775	8.59	2.17	2.93	0.74	125.3
41	10,943.0	8.08	0.000859	9.40	–1.32	3.07	–0.43	86.0
42	10,700.6	14.07	0.000956	10.23	3.84	3.20	1.20	137.5
43	10,437.9	13.86	0.001066	11.13	2.73	3.34	0.82	124.6
44	10,117.0	11.90	0.001192	12.06	–0.16	3.47	–0.05	98.7
45	9,832.3	10.59	0.001335	13.13	–2.53	3.62	–0.70	80.7
46	9,659.6	15.76	0.001499	14.48	1.28	3.81	0.34	108.8
47	9,529.3	14.50	0.001685	16.06	–1.55	4.01	–0.39	90.3
48	9,425.1	18.50	0.001897	17.88	0.62	4.23	0.15	103.5
49	9,388.9	27.16	0.002138	20.07	7.08	4.48	1.58	135.3
50	9,418.6	20.84	0.002410	22.70	–1.86	4.76	–0.39	91.8

Table 2.22. (Continued.)

Age x	Adjusted R_x	Adjusted A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
51	9,450.4	19.19	0.002719	25.70	–6.50	5.07	–1.28	74.7
52	9,878.8	33.39	0.003069	30.32	3.07	5.51	0.56	110.1
53	10,045.8	24.24	0.003463	34.79	–10.54	5.90	–1.79	69.7
54	9,750.5	50.86	0.003908	38.10	12.75	6.17	2.07	133.5
55	9,359.2	29.73	0.004410	41.27	–11.55	6.42	–1.80	72.0
56	8,775.7	46.83	0.004975	43.66	3.17	6.61	0.48	107.3
57	8,185.4	45.76	0.005609	45.91	–0.15	6.78	–0.02	99.7
58	7,638.4	50.44	0.006322	48.29	2.15	6.95	0.31	104.4
59	7,033.8	47.52	0.007120	50.08	–2.57	7.08	–0.36	94.9
60	6,016.3	40.50	0.008014	48.21	–7.71	6.94	–1.11	84.0
61	5,122.3	45.40	0.009015	46.18	–0.78	6.80	–0.12	98.3
62	4,842.7	51.16	0.010132	49.07	2.10	7.00	0.30	104.3
63	4,487.3	58.54	0.011378	51.06	7.48	7.15	1.05	114.6
64	4,084.7	48.17	0.012766	52.15	–3.97	7.22	–0.55	92.4
65	3,647.9	54.20	0.014310	52.20	1.99	7.23	0.28	103.8
66	3,258.6	49.93	0.016026	52.22	–2.29	7.23	–0.32	95.6
67	2,984.5	60.60	0.017930	53.51	7.08	7.32	0.97	113.2
68	2,757.3	46.90	0.020041	55.26	–8.36	7.43	–1.12	84.9
69	2,541.1	49.10	0.022378	56.86	–7.77	7.54	–1.03	86.3
70	2,222.8	49.70	0.024961	55.48	–5.78	7.45	–0.78	89.6
71	2,013.9	56.62	0.027812	56.01	0.61	7.48	0.08	101.1
72	1,791.9	51.52	0.030957	55.47	–3.95	7.45	–0.53	92.9
73	1,590.3	64.12	0.034420	54.74	9.38	7.40	1.27	117.1
74	1,373.9	53.13	0.038228	52.52	0.61	7.25	0.08	101.2
75	1,157.6	60.85	0.042410	49.09	11.75	7.01	1.68	123.9
76	933.8	51.23	0.046999	43.89	7.35	6.62	1.11	116.7
77	800.3	42.32	0.052025	41.64	0.68	6.45	0.11	101.6
78	667.3	43.29	0.057524	38.39	4.91	6.20	0.79	112.8
79	558.1	39.24	0.063532	35.46	3.78	5.95	0.63	110.7
80	429.2	24.26	0.070088	30.08	–5.82	5.48	–1.06	80.7
81	325.2	25.15	0.077232	25.12	0.03	5.01	0.01	100.1
82	242.6	14.27	0.085007	20.62	–6.35	4.54	–1.40	69.2
83	172.7	16.80	0.093458	16.14	0.67	4.02	0.17	104.1
84	136.7	13.45	0.102630	14.02	–0.57	3.74	–0.15	95.9
85	126.6	11.78	0.112572	14.26	–2.48	3.78	–0.66	82.6
86	112.8	14.31	0.123334	13.91	0.40	3.73	0.11	102.9
87	90.1	11.79	0.134969	12.16	–0.37	3.49	–0.11	96.9
88	69.1	10.11	0.147530	10.19	–0.08	3.19	–0.03	99.2
89	46.3	9.27	0.161072	7.46	1.80	2.73	0.66	124.2
90	33.7	2.53	0.175652	5.92	–3.39	2.43	–1.39	42.7
Totals	361,322.3	1,735.96		1,738.72	–2.76			99.8

3. IMMEDIATE ANNUITANTS

3.1 *The data*

3.1.1 This investigation 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 will reduce over time and it is possible that this will be the last time that tables on this experience will be produced.

3.1.2 Total numbers of exposed to risk and of deaths are shown in Table 3.1. The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Table 3.2.

3.1.3 In terms of lives, the 1999-2002 data have 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 about 5% of the total male exposure below age 60. For females, the equivalent figures are three deaths and about 3½% of the female exposure.

3.1.4 By contrast, the volume of data by amounts has increased since 1991-1994 (for durations 1 and over). However, this is a consequence of significantly higher average amounts per life, and this is shown in Table 3.3.

3.2 *Ultimate graduations*

3.2.1 Tables have been produced for the lives experience only as there appeared to be little difference between the lives and amounts experiences, with neither being clearly heavier than the other. Ultimate rates were produced for males at durations 0 and over (i.e. no select rates were produced), and for females at durations 1 and over. Furthermore, a decision was taken that no rates below age 60 would be produced, since the results would not be supported by the data.

3.2.2 The key statistics from the resulting unadjusted ultimate graduations are shown in Table 3.4. This table also shows the '–Log likelihood' value calculated from the adjusted ultimate graduations.

3.3 *Adjustments*

3.3.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages, with a "run-in" age of 100 and a "curvature" parameter of 1.25. No other adjustments were made. Calculated values of μ_x, both pre- and post-adjustments, are shown in Table 3.5. Adjusted values that differ from unadjusted values are highlighted in bold.

3.3.2 Details of the ultimate rates graduations, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in Tables 3.6 and 3.7.

3.4 *Select rates*

3.4.1 For males there were only 49 deaths at duration 0. No attempt was made to graduate this experience; instead, the mortality rates generated from a trial graduation of the durations 1 and over experience were applied to the duration 0 experience, resulting in an all age 100A/E of 98. It was therefore decided that the male experience should have no select period, and the graduation be based on all durations combined.

3.4.2 For females, there were 78 deaths at duration 0. A similar approach to the males experience was taken, and this resulted in a duration 0 100A/E of 84. As this was considered sufficiently different from the durations 1 and over experience, it was decided that a select period of 1 should be adopted for females, with the select duration 0 values of μ being calculated as:

$$\mu_{\{x\}} = 0.84 \times \mu_x.$$

3.4.3 These select rates of μ are for exact age x but an average over the year of duration 0 to 1, so the notation $\mu_{\{x\}}$ has been used to differentiate this from the standard notation $\mu_{[x]}$ which may be assumed to relate to exact duration 0. Values of $q_{[x]}$ were then derived from the resulting values of $\mu_{\{x\}}$ using the method described in Section 1 above, but substituting $\mu_{\{x+k\}}$ for μ_{x+k}. Theoretically, the integration should vary by both age and duration, but the MGWP believes that the method adopted of varying by age only will be sufficiently accurate.

3.4.4 As with the "92" Series tables, select rates have been assumed to cease at age 100.

Table 3.1. Immediate annuitants, males and females, lives and amounts: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982, durations 0 and 1+.

	1999-2002	1991-1994	1979-1982
Males			
Lives			
Duration 0			
Central exposed	1,107.0	2,933.8	2,933.5
Deaths	49	104	122
Durations 1+			
Central exposed	33,833.5	35,689.5	61,503.5
Deaths	2,542	2,886	4,771
Amounts			
Duration 0			
Central exposed	4,541,789	8,590,467	3,463,312
Deaths	225,246	451,992	174,875
Durations 1+			
Central exposed	94,189,027	52,612,321	45,392,288
Deaths	6,830,657	4,181,932	3,857,585
Females			
Lives			
Duration 0			
Central exposed	1,905.0	4,033.3	3,967.0
Deaths	78	146	154
Durations 1+			
Central exposed	48,974.5	66,470.3	142,137.5
Deaths	4,262	5,863	9,789
Amounts			
Duration 0			
Central exposed	7,947,891	13,099,689	4,567,483
Deaths	434,445	715,195	201,549
Durations 1+			
Central exposed	134,871,502	97,571,462	79,089,613
Deaths	13,522,282	8,150,260	5,342,282

Table 3.2. Immediate annuitants, males and females, lives: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Duration 0	12-96	no ages	no ages
Durations 1+	10-108	54-97	71-101[†]
Females			
Duration 0	14-103	single ages	86
Durations 1+	10-108	54-101	74-103

[†] Some other single ages outside the range given meet the criterion.

Table 3.3. Immediate annuitants, males and females: average amounts per life by exposed to risk for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Males			
Duration 0	£4,102.79	£2,928.10	£1,180.61
Durations 1+	£2,783.90	£1,474.17	£738.04
Females			
Duration 0	£4,172.12	£3,247.88	£1,151.37
Durations 1+	£2,753.91	£1,467.90	£556.43

Table 3.4. Unadjusted graduations of the immediate annuitant ultimate experience: key statistics.

Sex	Males	Females
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
T-ratio	1.8	2.0
b_1	–6.069074	–8.233861
T-ratio	–5.6	–9.3
b_2	8.266671	10.673350
T-ratio	6.3	9.7
b_3	–1.514280	–2.908070
T-ratio	–1.8	–4.4
–Log likelihood	8,021.8	12,632.6
–Log likelihood (adj.)*	8,021.8	12,632.6
Sign test: +/–	17 / 20	15 / 19
Sign test: *p*(pos)	0.3714	0.3038
Runs test: *p*(runs)	0.7604	0.9798
K-S test: *p*(*KS*)	1.0000	0.9771
Serial correlation test:		
T-ratio 1	–0.92	–0.78
T-ratio 2	–1.99	–1.25
T-ratio 3	–2.03	–0.83
χ^2 test:		
χ^2	55.80	56.47
Degrees of freedom	33	30
$p(\chi^2)$	0.0078	0.0024

* Calculated from adjusted ultimate graduations.

Table 3.5. Immediate annuitants, males and females, ultimate durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x		Adjusted μ_x	
Age x	Males	Females	Males	Females
60	0.006733	0.003210	0.006733	0.003210
61	0.007103	0.003344	0.007103	0.003344
62	0.007543	0.003513	0.007543	0.003513
63	0.008065	0.003728	0.008065	0.003728
64	0.008683	0.003996	0.008683	0.003996
65	0.009414	0.004332	0.009414	0.004332
66	0.010274	0.004749	0.010274	0.004749
67	0.011285	0.005264	0.011285	0.005264
68	0.012469	0.005898	0.012469	0.005898
69	0.013853	0.006674	0.013853	0.006674
70	0.015466	0.007618	0.015466	0.007618
71	0.017342	0.008762	0.017342	0.008762
72	0.019517	0.010140	0.019517	0.010140
73	0.022032	0.011792	0.022032	0.011792
74	0.024933	0.013761	0.024933	0.013761
75	0.028271	0.016099	0.028271	0.016099
76	0.032099	0.018857	0.032099	0.018857
77	0.036480	0.022095	0.036480	0.022095
78	0.041478	0.025876	0.041478	0.025876
79	0.047167	0.030268	0.047167	0.030268
80	0.053624	0.035343	0.053624	0.035343
81	0.060933	0.041174	0.060933	0.041174
82	0.069183	0.047839	0.069183	0.047839
83	0.078470	0.055414	0.078470	0.055414
84	0.088897	0.063976	0.088897	0.063976
85	0.100571	0.073600	0.100571	0.073600
86	0.113604	0.084356	0.113604	0.084356
87	0.128115	0.096309	0.128115	0.096309
88	0.144226	0.109515	0.144226	0.109515
89	0.162064	0.124020	0.162064	0.124020
90	0.181757	0.139855	0.181757	0.139855

Table 3.5. (Continued.)

	Unadjusted μ_x		Adjusted μ_x	
Age x	Males	Females	Males	Females
91	0.203437	0.157039	0.203437	0.157039
92	0.227236	0.175571	0.227236	0.175571
93	0.253287	0.195430	0.253287	0.195430
94	0.281719	0.216573	0.281719	0.216573
95	0.312659	0.238936	0.312659	0.238936
96	0.346231	0.262426	0.346231	0.262426
97	0.382550	0.286928	0.382550	0.286928
98	0.421722	0.312297	0.421722	0.312297
99	0.463845	0.338366	0.463845	0.338366
100	0.509003	0.364942	0.509003	0.364942
101	0.557265	0.391807	**0.539496**	**0.404382**
102	0.608683	0.418725	**0.569591**	**0.443306**
103	0.663291	0.445441	**0.599270**	**0.481693**
104	0.721101	0.471686	**0.628515**	**0.519519**
105	0.782102	0.497181	**0.657307**	**0.556759**
106	0.846259	0.521642	**0.685623**	**0.593382**
107	0.913507	0.544786	**0.713437**	**0.629357**
108	0.983757	0.566333	**0.740721**	**0.664647**
109	1.056887	0.586016	**0.767442**	**0.699208**
110	1.132745	0.603585	**0.793561**	**0.732991**
111	1.211147	0.618810	**0.819035**	**0.765939**
112	1.291877	0.631489	**0.843810**	**0.797983**
113	1.374689	0.641449	**0.867821**	**0.829038**
114	1.459301	0.648556	**0.890987**	**0.859001**
115	1.545402	0.652710	**0.913203**	**0.887737**
116	1.632653	0.653855	**0.934330**	**0.915062**
117	1.720684	0.651974	**0.954165**	**0.940717**
118	1.809099	0.647093	**0.972389**	**0.964288**
119	1.897480	0.639280	**0.988391**	**0.984985**
120	1.985386	0.628643	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 3.6. Details of graduations for male immediate annuitants, ultimate durations: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
60	191.0	3.0	0.006733	1.29	1.71			
61	260.0	1.0	0.007103	1.85	–0.85			
62	319.0	4.0	0.007543	2.41	1.59			
60-62	770.0	8.0		5.54	2.46	2.35	1.05	144.4
63	375.5	2.0	0.008065	3.03	–1.03			
64	427.5	1.0	0.008683	3.71	–2.71			
63-64	803.0	3.0		6.74	–3.74	2.60	–1.44	44.5
65	529.5	2.0	0.009414	4.98	–2.98			
66	665.5	6.0	0.010274	6.84	–0.84			
65-66	1,195.0	8.0		11.82	–3.82	3.44	–1.11	67.7
67	742.5	9.0	0.011285	8.38	0.62	2.89	0.21	107.4
68	819.0	13.0	0.012469	10.21	2.79	3.20	0.87	127.3
69	928.0	21.0	0.013853	12.86	8.14	3.59	2.27	163.4
70	1,022.0	10.0	0.015466	15.81	–5.81	3.98	–1.46	63.3
71	1,042.0	21.0	0.017342	18.07	2.93	4.25	0.69	116.2
72	1,050.5	18.0	0.019517	20.50	–2.50	4.53	–0.55	87.8
73	1,039.5	24.0	0.022032	22.90	1.10	4.79	0.23	104.8
74	1,130.0	28.0	0.024933	28.17	–0.17	5.31	–0.03	99.4
75	1,238.5	41.0	0.028271	35.01	5.99	5.92	1.01	117.1
76	1,240.5	31.0	0.032099	39.82	–8.82	6.31	–1.40	77.9
77	1,238.5	46.0	0.036480	45.18	0.82	6.72	0.12	101.8
78	1,293.0	48.0	0.041478	53.63	–5.63	7.32	–0.77	89.5
79	1,361.0	52.0	0.047167	64.19	–12.19	8.01	–1.52	81.0
80	1,405.5	94.0	0.053624	75.37	18.63	8.68	2.15	124.7
81	1,356.0	92.0	0.060933	82.62	9.38	9.09	1.03	111.3
82	1,293.5	84.0	0.069183	89.49	–5.49	9.46	–0.58	93.9
83	1,199.5	80.0	0.078470	94.13	–14.13	9.70	–1.46	85.0
84	1,199.0	104.0	0.088897	106.59	–2.59	10.32	–0.25	97.6
85	1,274.5	138.0	0.100571	128.18	9.82	11.32	0.87	107.7
86	1,273.0	168.0	0.113604	144.62	23.38	12.03	1.94	116.2
87	1,207.5	135.0	0.128115	154.70	–19.70	12.44	–1.58	87.3
88	1,104.5	151.0	0.144226	159.30	–8.30	12.62	–0.66	94.8
89	995.0	167.0	0.162064	161.25	5.75	12.70	0.45	103.6
90	843.5	183.0	0.181757	153.31	29.69	12.38	2.40	119.4

Table 3.6. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	738.5	121.0	0.203437	150.24	–29.24	12.26	–2.39	80.5
92	619.0	132.0	0.227236	140.66	–8.66	11.86	–0.73	93.8
93	495.0	115.0	0.253287	125.38	–10.38	11.20	–0.93	91.7
94	389.0	129.0	0.281719	109.59	19.41	10.47	1.85	117.7
95	278.0	90.0	0.312659	86.92	3.08	9.32	0.33	103.5
96	197.0	63.0	0.346231	68.21	–5.21	8.26	–0.63	92.4
97	141.0	52.0	0.382550	53.94	–1.94	7.34	–0.26	96.4
98	80.0	43.0	0.421722	33.74	9.26	5.81	1.59	127.5
99	52.0	24.0	0.463845	24.12	–0.12	4.91	–0.02	99.5
100	35.0	13.0	0.509003	17.82	–4.82	4.22	–1.14	73.0
Totals	33,089.0	2,559.0		2,559.0	0.00			100.0

Table 3.7. Details of graduations for female immediate annuitants, ultimate durations: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
60	171.5	1.0	0.003210	0.55	0.45			
61	228.0	1.0	0.003344	0.76	0.24			
62	317.5	1.0	0.003513	1.12	–0.12			
63	369.0	1.0	0.003728	1.38	–0.38			
64	420.0	2.0	0.003996	1.68	0.32			
60-64	1,506.0	6.0		5.48	0.52	2.34	0.22	109.4
65	459.0	3.0	0.004332	1.99	1.01			
66	478.5	2.0	0.004749	2.27	–0.27			
67	520.5	2.0	0.005264	2.74	–0.74			
65-67	1,458.0	7.0		7.00	–0.00	2.65	–0.00	100.0
68	564.0	1.0	0.005898	3.33	–2.33			
69	629.0	3.0	0.006674	4.20	–1.20			
68-69	1,193.0	4.0		7.52	–3.52	2.74	–1.28	53.2
70	710.0	9.0	0.007618	5.41	3.59	2.33	1.54	166.4
71	754.5	4.0	0.008762	6.61	–2.61	2.57	–1.02	60.5
72	821.5	7.0	0.010140	8.33	–1.33	2.89	–0.46	84.0
73	866.0	6.0	0.011792	10.21	–4.21	3.20	–1.32	58.8
74	930.0	17.0	0.013761	12.80	4.20	3.58	1.17	132.8
75	1,009.5	19.0	0.016099	16.25	2.75	4.03	0.68	116.9
76	1,121.5	14.0	0.018857	21.15	–7.15	4.60	–1.55	66.2
77	1,280.5	33.0	0.022095	28.29	4.71	5.32	0.89	116.6
78	1,424.0	57.0	0.025876	36.85	20.15	6.07	3.32	154.7
79	1,604.5	46.0	0.030268	48.57	–2.57	6.97	–0.37	94.7
80	1,743.5	63.0	0.035343	61.62	1.38	7.85	0.18	102.2
81	1,782.0	66.0	0.041174	73.37	–7.37	8.57	–0.86	90.0
82	1,791.0	98.0	0.047839	85.68	12.32	9.26	1.33	114.4
83	1,803.0	94.0	0.055414	99.91	–5.91	10.00	–0.59	94.1
84	1,957.0	138.0	0.063976	125.20	12.80	11.19	1.14	110.2
85	2,132.0	133.0	0.073600	156.92	–23.92	12.53	–1.91	84.8
86	2,273.0	153.0	0.084356	191.74	–38.74	13.85	–2.80	79.8
87	2,362.0	219.0	0.096309	227.48	–8.48	15.08	–0.56	96.3
88	2,310.0	292.0	0.109515	252.98	39.02	15.91	2.45	115.4
89	2,205.0	262.0	0.124020	273.46	–11.46	16.54	–0.69	95.8
90	2,116.5	277.0	0.139855	296.00	–19.00	17.20	–1.10	93.6

Table 3.7. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	1,952.5	308.0	0.157039	306.62	1.38	17.51	0.08	100.5
92	1,762.0	350.0	0.175571	309.36	40.64	17.59	2.31	113.1
93	1,495.0	286.0	0.195430	292.17	–6.17	17.09	–0.36	97.9
94	1,252.0	291.0	0.216573	271.15	19.85	16.47	1.21	107.3
95	1,014.5	226.0	0.238936	242.40	–16.40	15.57	–1.05	93.2
96	773.5	210.0	0.262426	202.99	7.01	14.25	0.49	103.5
97	593.5	167.0	0.286928	170.29	–3.29	13.05	–0.25	98.1
98	414.5	129.0	0.312297	129.45	–0.45	11.38	–0.04	99.7
99	283.0	97.0	0.338366	95.76	1.24	9.79	0.13	101.3
100	194.5	62.0	0.364942	70.98	–8.98	8.43	–1.07	87.3
Totals	51,046.0	4,167.0		4,170.0	–3.01			99.9

4. RETIREMENT ANNUITANTS

4.1 *The data*

4.1.1 This investigation covers the mortality experience of retirement annuities effected under Section 620 of ICTA 1988, that is those self-employed who have purchased retirement annuities. Data are gathered for both males and females, and is subdivided into two sections, deferred and vested, which together form the combined section. Only lives data are collected for this investigation, and there is no subdivision by duration.

4.1.2 Total numbers of exposed to risk and of deaths are shown in Table 4.1. While data volumes for the deferred section have fallen in total since the graduation of the "92" Series, the vested section has grown in that time. It is also the case that the experience for males remains much larger than that for females.

4.1.3 The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Table 4.2. As would be expected, there is very little vested data below age 50, and very little deferred data above age 75.

4.2 *Ultimate graduations*

4.2.1 For the "92" Series, graduations were carried out for each of the deferred, vested and combined sections. However, only the vested section was designated as "standard". For the "00" Series, the MGWP decided to produce base tables for all three sections, separately for males and females (i.e. six tables in all). The age ranges of the tables are 17-75 for the deferred sections, 50-120 for the vested sections and 17-120 for the combined sections.

4.2.2 The key statistics from the resulting unadjusted ultimate graduations are shown in Tables 4.3 and 4.4. These tables also show the '–Log likelihood' value calculated from the adjusted ultimate graduations.

4.2.3 As the data were not split by duration, it was not possible to produce any select rates.

4.3 *Adjustments*

4.3.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages for the vested sections, with a "run-in" age of 100 and a "curvature" parameter of 1.25.

4.3.2 In addition, the combined sections were set equal to the vested sections (males or females as appropriate) above certain ages and equal to the deferred sections (males or females as appropriate) below certain ages.

4.3.3 The reasoning behind this approach is that at the younger ages (below about age 50) the combined section should be comprised virtually exclusively of deferred data, and at higher ages (above about age 75) it should be comprised virtually exclusively of vested data, and so this adjustment is designed to avoid spurious anomalies in these relationships that would be caused by the graduation formulae.

4.3.4 These ages are summarised in the table below (to the nearest 0.01), and represent the points at which the graduated curves would cross. The original combined section graduation is used, unadjusted, between these ages.

Sex	Lower age up to which Combined = Deferred	Upper age from which Combined = Vested
Male	53.46	86.62
Female	58.65	74.35

4.3.5 The effect of the adjustments can be seen in Tables 4.5 and 4.6, which show the calculated values of μ_x both pre- and post-adjustments. Adjusted values that differ from unadjusted values are highlighted in bold.

4.3.6 Details of the ultimate rates graduations, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in Tables 4.7 to 4.12.

Table 4.1. Retirement annuitants, males and females, deferred and vested, all durations: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Males			
Deferred			
Central exposed	3,873,251.0	5,335,263.0	2,997,376.5
Deaths	13,329	17,256	12,328
Vested			
Central exposed	878,142.2	630,827.0	221,898.0
Deaths	29,654	20,200	8,811
Combined			
Central exposed	4,751,393.2	5,966,090.0	3,219,274.5
Deaths	42,983	37,456	21,139
Females			
Deferred			
Central exposed	678,178.1	963,447.2	338,758.0
Deaths	1,644	1,958	860
Vested			
Central exposed	288,287.5	149,663.1	35,006.0
Deaths	4,716	2,695	692
Combined			
Central exposed	966,465.6	1,113,110.3	473,764.0
Deaths	6,360	4,653	1,552

Table 4.2. Retirement annuitants, males and females: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Deferred	11-94	27-79	34-75
Vested	10-108	42-97	52-98†
Combined	10-108	27-97	34-98†
Females			
Deferred	23-100	29-75	44-74†
Vested	10-108	48-96	58-98†
Combined	10-108	29-96	44-98†

† Some other single ages outside the range given meet the criterion.

Table 4.3. Unadjusted graduations of the male retirement annuitants ultimate experience: key statistics.

Section	Deferred	Vested	Combined
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
T-ratio	5.1	–4.3	6.8
$100\times a_2$		–6.446652	
T-ratio		–6.6	
b_1	–5.954870	–3.260284	–4.289179
T-ratio	–15.0	–29.0	–59.8
b_2	3.983058	4.292047	5.834998
T-ratio	16.3	21.1	129.3
b_3	–1.616713		–0.286044
T-ratio	–4.3		–3.9
–Log likelihood	85,239.8	121,161.3	206,997.7
–Log likelihood (adj.)*	85,239.8	121,161.3	206,995.0
Sign test: +/–	20 / 24	31 / 17	35 / 29
Sign test: *p*(pos)	0.3258	0.9703	0.7388
Runs test: *p*(runs)	0.3417	0.2137	0.4779
K-S test: *p*(*KS*)	0.9907	0.6256	0.7164
Serial correlation test:			
T-ratio 1	0.62	0.55	0.40
T-ratio 2	–0.75	1.31	1.74
T-ratio 3	–0.18	–0.56	–0.48
χ^2 test:			
χ^2	66.42	136.29	139.71
Degrees of freedom	40	44	60
$p(\chi^2)$	0.0054	0.0000	0.0000

* Calculated from adjusted ultimate graduations.

Table 4.4. Unadjusted graduations of the female retirement annuitants ultimate experience: key statistics.

Section	Deferred	Vested	Combined
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
T-ratio		–2.2	–0.1
$100\times a_2$		–2.807680	
T-ratio		–3.6	
b_1	–4.787615	–4.152614	–3.512802
T-ratio	–95.7	–23.8	–9.5
b_2	4.035249	5.410052	5.364421
T-ratio	24.1	14.6	16.4
b_3			1.068144
T-ratio			3.2
–Log likelihood	11,180.2	21,669.5	32,926.5
–Log likelihood (adj.)*	11,180.2	21,669.5	32,922.8
Sign test: +/–	20 / 20	25 / 19	26 / 35
Sign test: *p*(pos)	0.5000	0.7743	0.1528
Runs test: *p*(runs)	0.4381	0.7229	0.4637
K-S test: *p*(*KS*)	0.9261	1.0000	0.7171
Serial correlation test:			
T-ratio 1	0.02	0.17	1.05
T-ratio 2	–2.15	–0.69	–0.67
T-ratio 3	0.25	–1.38	1.26
χ^2 test:			
χ^2	79.44	53.08	98.07
Degrees of freedom	38	40	57
$p(\chi^2)$	0.0001	0.0806	0.0006

* Calculated from adjusted ultimate graduations.

Table 4.5. Retirement annuitants, males, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
17	0.000418		0.000398	0.000418		**0.000418**
18	0.000419		0.000401	0.000419		**0.000419**
19	0.000420		0.000405	0.000420		**0.000420**
20	0.000422		0.000409	0.000422		**0.000422**
21	0.000424		0.000413	0.000424		**0.000424**
22	0.000427		0.000418	0.000427		**0.000427**
23	0.000430		0.000424	0.000430		**0.000430**
24	0.000434		0.000431	0.000434		**0.000434**
25	0.000439		0.000439	0.000439		**0.000439**
26	0.000445		0.000448	0.000445		**0.000445**
27	0.000451		0.000458	0.000451		**0.000451**
28	0.000459		0.000469	0.000459		**0.000459**
29	0.000469		0.000483	0.000469		**0.000469**
30	0.000481		0.000498	0.000481		**0.000481**
31	0.000494		0.000515	0.000494		**0.000494**
32	0.000510		0.000534	0.000510		**0.000510**
33	0.000529		0.000557	0.000529		**0.000529**
34	0.000551		0.000582	0.000551		**0.000551**
35	0.000577		0.000611	0.000577		**0.000577**
36	0.000608		0.000644	0.000608		**0.000608**
37	0.000643		0.000681	0.000643		**0.000643**
38	0.000684		0.000724	0.000684		**0.000684**
39	0.000731		0.000772	0.000731		**0.000731**
40	0.000786		0.000827	0.000786		**0.000786**
41	0.000849		0.000889	0.000849		**0.000849**
42	0.000922		0.000960	0.000922		**0.000922**
43	0.001005		0.001040	0.001005		**0.001005**
44	0.001099		0.001131	0.001099		**0.001099**
45	0.001207		0.001234	0.001207		**0.001207**
46	0.001329		0.001351	0.001329		**0.001329**
47	0.001467		0.001483	0.001467		**0.001467**
48	0.001623		0.001633	0.001623		**0.001623**
49	0.001798		0.001802	0.001798		**0.001798**
50	0.001995	0.013866	0.001993	0.001995	0.013866	**0.001995**

Table 4.5. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
51	0.002215	0.013194	0.002209	0.002215	0.013194	**0.002215**
52	0.002460	0.012578	0.002454	0.002460	0.012578	**0.002460**
53	0.002732	0.012023	0.002729	0.002732	0.012023	**0.002732**
54	0.003034	0.011533	0.003040	0.003034	0.011533	0.003040
55	0.003368	0.011114	0.003391	0.003368	0.011114	0.003391
56	0.003735	0.010774	0.003786	0.003735	0.010774	0.003786
57	0.004139	0.010519	0.004232	0.004139	0.010519	0.004232
58	0.004580	0.010357	0.004733	0.004580	0.010357	0.004733
59	0.005062	0.010295	0.005298	0.005062	0.010295	0.005298
60	0.005586	0.010344	0.005934	0.005586	0.010344	0.005934
61	0.006155	0.010513	0.006649	0.006155	0.010513	0.006649
62	0.006769	0.010812	0.007452	0.006769	0.010812	0.007452
63	0.007431	0.011254	0.008355	0.007431	0.011254	0.008355
64	0.008142	0.011851	0.009369	0.008142	0.011851	0.009369
65	0.008903	0.012617	0.010508	0.008903	0.012617	0.010508
66	0.009715	0.013567	0.011785	0.009715	0.013567	0.011785
67	0.010578	0.014718	0.013217	0.010578	0.014718	0.013217
68	0.011492	0.016087	0.014823	0.011492	0.016087	0.014823
69	0.012457	0.017695	0.016622	0.012457	0.017695	0.016622
70	0.013473	0.019563	0.018637	0.013473	0.019563	0.018637
71	0.014538	0.021713	0.020892	0.014538	0.021713	0.020892
72	0.015650	0.024172	0.023416	0.015650	0.024172	0.023416
73	0.016807	0.026967	0.026238	0.016807	0.026967	0.026238
74	0.018006	0.030128	0.029392	0.018006	0.030128	0.029392
75	0.019245	0.033688	0.032916	0.019245	0.033688	0.032916
76		0.037682	0.036852		0.037682	0.036852
77		0.042150	0.041245		0.042150	0.041245
78		0.047134	0.046146		0.047134	0.046146
79		0.052681	0.051612		0.052681	0.051612
80		0.058840	0.057704		0.058840	0.057704
81		0.065667	0.064491		0.065667	0.064491
82		0.073221	0.072048		0.073221	0.072048
83		0.081568	0.080460		0.081568	0.080460
84		0.090778	0.089819		0.090778	0.089819
85		0.100930	0.100225		0.100930	0.100225

Table 4.5. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
86		0.112107	0.111791		0.112107	0.111791
87		0.124402	0.124640		0.124402	**0.124402**
88		0.137914	0.138907		0.137914	**0.137914**
89		0.152753	0.154742		0.152753	**0.152753**
90		0.169038	0.172308		0.169038	**0.169038**
91		0.186898	0.191786		0.186898	**0.186898**
92		0.206474	0.213373		0.206474	**0.206474**
93		0.227920	0.237285		0.227920	**0.227920**
94		0.251405	0.263762		0.251405	**0.251405**
95		0.277110	0.293064		0.277110	**0.277110**
96		0.305234	0.325477		0.305234	**0.305234**
97		0.335995	0.361314		0.335995	**0.335995**
98		0.369629	0.400918		0.369629	**0.369629**
99		0.406393	0.444665		0.406393	**0.406393**
100		0.446567	0.492964		0.446567	**0.446567**
101		0.490459	0.546264		**0.480938**	**0.480938**
102		0.538399	0.605054		**0.514859**	**0.514859**
103		0.590753	0.669870		**0.548312**	**0.548312**
104		0.647915	0.741293		**0.581277**	**0.581277**
105		0.710316	0.819962		**0.613730**	**0.613730**
106		0.778425	0.906568		**0.645646**	**0.645646**
107		0.852756	1.001868		**0.676997**	**0.676997**
108		0.933864	1.106684		**0.707750**	**0.707750**
109		1.022357	1.221910		**0.737869**	**0.737869**
110		1.118898	1.348520		**0.767310**	**0.767310**
111		1.224208	1.487573		**0.796023**	**0.796023**
112		1.339073	1.640218		**0.823948**	**0.823948**
113		1.464349	1.807702		**0.851012**	**0.851012**
114		1.600970	1.991381		**0.877124**	**0.877124**
115		1.749952	2.192724		**0.902166**	**0.902166**
116		1.912403	2.413323		**0.925979**	**0.925979**
117		2.089530	2.654905		**0.948337**	**0.948337**
118		2.282650	2.919337		**0.968878**	**0.968878**
119		2.493195	3.208642		**0.986915**	**0.986915**
120		2.722727	3.525007		**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 4.6. Retirement annuitants, females, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
17	0.000116		0.000333	0.000116		**0.000116**
18	0.000125		0.000339	0.000125		**0.000125**
19	0.000136		0.000347	0.000136		**0.000136**
20	0.000147		0.000356	0.000147		**0.000147**
21	0.000160		0.000365	0.000160		**0.000160**
22	0.000173		0.000375	0.000173		**0.000173**
23	0.000188		0.000386	0.000188		**0.000188**
24	0.000203		0.000399	0.000203		**0.000203**
25	0.000221		0.000412	0.000221		**0.000221**
26	0.000239		0.000427	0.000239		**0.000239**
27	0.000259		0.000443	0.000259		**0.000259**
28	0.000281		0.000460	0.000281		**0.000281**
29	0.000305		0.000479	0.000305		**0.000305**
30	0.000330		0.000500	0.000330		**0.000330**
31	0.000358		0.000522	0.000358		**0.000358**
32	0.000388		0.000546	0.000388		**0.000388**
33	0.000421		0.000573	0.000421		**0.000421**
34	0.000456		0.000601	0.000456		**0.000456**
35	0.000494		0.000632	0.000494		**0.000494**
36	0.000536		0.000666	0.000536		**0.000536**
37	0.000581		0.000703	0.000581		**0.000581**
38	0.000630		0.000743	0.000630		**0.000630**
39	0.000683		0.000786	0.000683		**0.000683**
40	0.000740		0.000834	0.000740		**0.000740**
41	0.000802		0.000886	0.000802		**0.000802**
42	0.000870		0.000942	0.000870		**0.000870**
43	0.000943		0.001004	0.000943		**0.000943**
44	0.001022		0.001071	0.001022		**0.001022**
45	0.001108		0.001145	0.001108		**0.001108**
46	0.001201		0.001226	0.001201		**0.001201**
47	0.001302		0.001315	0.001302		**0.001302**
48	0.001411		0.001412	0.001411		**0.001411**
49	0.001530		0.001519	0.001530		**0.001530**
50	0.001659	0.006862	0.001636	0.001659	0.006862	**0.001659**

Table 4.6. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
51	0.001798	0.006507	0.001766	0.001798	0.006507	**0.001798**
52	0.001949	0.006175	0.001909	0.001949	0.006175	**0.001949**
53	0.002113	0.005870	0.002066	0.002113	0.005870	**0.002113**
54	0.002291	0.005594	0.002240	0.002291	0.005594	**0.002291**
55	0.002483	0.005350	0.002433	0.002483	0.005350	**0.002483**
56	0.002692	0.005143	0.002647	0.002692	0.005143	**0.002692**
57	0.002918	0.004977	0.002884	0.002918	0.004977	**0.002918**
58	0.003164	0.004855	0.003147	0.003164	0.004855	**0.003164**
59	0.003429	0.004784	0.003440	0.003429	0.004784	0.003440
60	0.003718	0.004769	0.003766	0.003718	0.004769	0.003766
61	0.004030	0.004817	0.004130	0.004030	0.004817	0.004130
62	0.004369	0.004934	0.004536	0.004369	0.004934	0.004536
63	0.004736	0.005128	0.004991	0.004736	0.005128	0.004991
64	0.005134	0.005409	0.005500	0.005134	0.005409	0.005500
65	0.005566	0.005786	0.006071	0.005566	0.005786	0.006071
66	0.006033	0.006271	0.006712	0.006033	0.006271	0.006712
67	0.006541	0.006875	0.007432	0.006541	0.006875	0.007432
68	0.007090	0.007612	0.008244	0.007090	0.007612	0.008244
69	0.007686	0.008497	0.009160	0.007686	0.008497	0.009160
70	0.008332	0.009548	0.010195	0.008332	0.009548	0.010195
71	0.009033	0.010784	0.011365	0.009033	0.010784	0.011365
72	0.009792	0.012224	0.012690	0.009792	0.012224	0.012690
73	0.010615	0.013893	0.014194	0.010615	0.013893	0.014194
74	0.011507	0.015818	0.015902	0.011507	0.015818	0.015902
75	0.012474	0.018026	0.017846	0.012474	0.018026	**0.018026**
76		0.020551	0.020061		0.020551	**0.020551**
77		0.023428	0.022589		0.023428	**0.023428**
78		0.026698	0.025478		0.026698	**0.026698**
79		0.030407	0.028785		0.030407	**0.030407**
80		0.034603	0.032577		0.034603	**0.034603**
81		0.039343	0.036930		0.039343	**0.039343**
82		0.044689	0.041935		0.044689	**0.044689**
83		0.050709	0.047699		0.050709	**0.050709**
84		0.057482	0.054348		0.057482	**0.057482**
85		0.065093	0.062028		0.065093	**0.065093**

Table 4.6. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
86		0.073638	0.070914		0.073638	**0.073638**
87		0.083224	0.081211		0.083224	**0.083224**
88		0.093969	0.093160		0.093969	**0.093969**
89		0.106006	0.107050		0.106006	**0.106006**
90		0.119482	0.123220		0.119482	**0.119482**
91		0.134563	0.142075		0.134563	**0.134563**
92		0.151432	0.164093		0.151432	**0.151432**
93		0.170292	0.189846		0.170292	**0.170292**
94		0.191371	0.220016		0.191371	**0.191371**
95		0.214923	0.255416		0.214923	**0.214923**
96		0.241231	0.297017		0.241231	**0.241231**
97		0.270610	0.345984		0.270610	**0.270610**
98		0.303409	0.403711		0.303409	**0.303409**
99		0.340021	0.471875		0.340021	**0.340021**
100		0.380881	0.552489		0.380881	**0.380881**
101		0.426474	0.647981		**0.419331**	**0.419331**
102		0.477341	0.761276		**0.457278**	**0.457278**
103		0.534085	0.895908		**0.494702**	**0.494702**
104		0.597378	1.056152		**0.531579**	**0.531579**
105		0.667967	1.247185		**0.567884**	**0.567884**
106		0.746687	1.475290		**0.603588**	**0.603588**
107		0.834466	1.748097		**0.638660**	**0.638660**
108		0.932340	2.074893		**0.673064**	**0.673064**
109		1.041463	2.466992		**0.706757**	**0.706757**
110		1.163119	2.938202		**0.739693**	**0.739693**
111		1.298742	3.505401		**0.771814**	**0.771814**
112		1.449926	4.189244		**0.803053**	**0.803053**
113		1.618451	5.015056		**0.833329**	**0.833329**
114		1.806298	6.013924		**0.862540**	**0.862540**
115		2.015674	7.224075		**0.890554**	**0.890554**
116		2.249040	8.692579		**0.917194**	**0.917194**
117		2.509137	10.477488		**0.942205**	**0.942205**
118		2.799021	12.650506		**0.965184**	**0.965184**
119		3.122094	15.300328		**0.985362**	**0.985362**
120		3.482149	18.536843		**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 4.7. Details of graduations for male retirement annuitants, deferred: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
30	2,062.0	2	0.000481	0.99	1.01			
31	4,090.5	2	0.000494	2.02	–0.02			
32	7,189.0	5	0.000510	3.67	1.33			
30-32	13,341.5	9		6.68	2.32	2.58	0.90	134.7
33	11,570.0	4	0.000529	6.12	–2.12	2.47	–0.86	65.3
34	17,360.5	15	0.000551	9.57	5.43	3.09	1.76	156.7
35	24,437.5	12	0.000577	14.11	–2.11	3.76	–0.56	85.1
36	32,583.0	26	0.000608	19.80	6.20	4.45	1.39	131.3
37	41,787.5	26	0.000643	26.86	–0.86	5.18	–0.17	96.8
38	51,450.5	34	0.000684	35.19	–1.19	5.93	–0.20	96.6
39	60,844.3	41	0.000731	44.50	–3.50	6.67	–0.52	92.1
40	70,150.0	67	0.000786	55.15	11.85	7.43	1.60	121.5
41	79,578.5	74	0.000849	67.58	6.42	8.22	0.78	109.5
42	89,563.9	70	0.000922	82.55	–12.55	9.09	–1.38	84.8
43	98,854.1	85	0.001005	99.30	–14.30	9.96	–1.44	85.6
44	106,622.3	107	0.001099	117.19	–10.19	10.83	–0.94	91.3
45	113,311.3	120	0.001207	136.74	–16.74	11.69	–1.43	87.8
46	120,036.2	152	0.001329	159.51	–7.51	12.63	–0.59	95.3
47	127,159.6	208	0.001467	186.55	21.45	13.66	1.57	111.5
48	135,525.8	215	0.001623	219.95	–4.95	14.83	–0.33	97.7
49	145,106.1	258	0.001798	260.95	–2.95	16.15	–0.18	98.9
50	155,794.1	330	0.001995	310.81	19.19	17.63	1.09	106.2
51	167,850.0	378	0.002215	371.76	6.24	19.28	0.32	101.7
52	184,418.0	435	0.002460	453.67	–18.67	21.30	–0.88	95.9
53	195,821.7	559	0.002732	535.07	23.93	23.13	1.03	104.5
54	197,816.1	619	0.003034	600.25	18.75	24.50	0.77	103.1
55	195,281.9	641	0.003368	657.70	–16.70	25.65	–0.65	97.5
56	186,756.9	695	0.003735	697.60	–2.60	26.41	–0.10	99.6
57	176,799.3	744	0.004139	731.73	12.27	27.05	0.45	101.7
58	166,726.4	745	0.004580	763.67	–18.67	27.63	–0.68	97.6
59	154,739.2	770	0.005062	783.33	–13.33	27.99	–0.48	98.3
60	137,460.6	789	0.005586	767.92	21.08	27.71	0.76	102.7
61	117,465.8	784	0.006155	722.99	61.01	26.89	2.27	108.4
62	111,129.5	697	0.006769	752.27	–55.27	27.43	–2.02	92.7
63	103,919.3	758	0.007431	772.25	–14.25	27.79	–0.51	98.2
64	94,091.4	783	0.008142	766.11	16.89	27.68	0.61	102.2
65	61,007.8	600	0.008903	543.15	56.85	23.31	2.44	110.5

Table 4.7. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
66	29,343.9	271	0.009715	285.07	–14.07	16.88	–0.83	95.1
67	23,017.2	204	0.010578	243.47	–39.47	15.60	–2.53	83.8
68	18,877.2	191	0.011492	216.94	–25.94	14.73	–1.76	88.0
69	15,953.6	194	0.012457	198.74	–4.74	14.10	–0.34	97.6
70	12,148.1	133	0.013473	163.67	–30.67	12.79	–2.40	81.3
71	7,643.8	119	0.014538	111.12	7.88	10.54	0.75	107.1
72	6,043.1	98	0.015650	94.57	3.43	9.72	0.35	103.6
73	4,914.9	85	0.016807	82.60	2.40	9.09	0.26	102.9
74	3,962.1	92	0.018006	71.34	20.66	8.45	2.45	129.0
75	2,177.4	51	0.019245	41.90	9.10	6.47	1.41	121.7
Totals	3,870,441.9	13,288		13,288.01	–0.01			100.0

Table 4.8. Details of graduations for male retirement annuitants, vested: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	497.5	9	0.013866	6.90	2.10	2.63	0.80	130.5
51	1,130.3	8	0.013194	14.91	–6.91	3.86	–1.79	53.6
52	1,483.0	12	0.012578	18.65	–6.65	4.32	–1.54	64.3
53	1,953.0	27	0.012023	23.48	3.52	4.85	0.73	115.0
54	2,396.3	28	0.011533	27.64	0.36	5.26	0.07	101.3
55	2,871.3	37	0.011114	31.91	5.09	5.65	0.90	115.9
56	3,122.0	37	0.010774	33.64	3.36	5.80	0.58	110.0
57	3,326.8	45	0.010519	35.00	10.00	5.92	1.69	128.6
58	3,557.8	40	0.010357	36.85	3.15	6.07	0.52	108.6
59	3,642.5	58	0.010295	37.50	20.50	6.12	3.35	154.7
60	7,669.3	76	0.010344	79.33	–3.33	8.91	–0.37	95.8
61	14,368.5	123	0.010513	151.05	–28.05	12.29	–2.28	81.4
62	16,739.8	185	0.010812	180.99	4.01	13.45	0.30	102.2
63	19,300.3	220	0.011254	217.20	2.80	14.74	0.19	101.3
64	22,045.8	271	0.011851	261.26	9.74	16.16	0.60	103.7
65	34,593.5	414	0.012617	436.45	–22.45	20.89	–1.07	94.9
66	47,108.3	575	0.013567	639.10	–64.10	25.28	–2.54	90.0
67	47,701.3	679	0.014718	702.04	–23.04	26.50	–0.87	96.7
68	48,761.8	733	0.016087	784.44	–51.44	28.01	–1.84	93.4
69	49,848.5	916	0.017695	882.07	33.93	29.70	1.14	103.8
70	50,763.3	1,075	0.019563	993.06	81.94	31.51	2.60	108.3
71	50,510.0	1,149	0.021713	1,096.73	52.27	33.12	1.58	104.8
72	48,417.5	1,204	0.024172	1,170.35	33.65	34.21	0.98	102.9
73	46,092.5	1,281	0.026967	1,242.97	38.03	35.26	1.08	103.1
74	43,565.8	1,297	0.030128	1,312.54	–15.54	36.23	–0.43	98.8
75	41,100.8	1,423	0.033688	1,384.59	38.41	37.21	1.03	102.8
76	38,601.0	1,497	0.037682	1,454.57	42.43	38.14	1.11	102.9
77	35,197.5	1,491	0.042150	1,483.58	7.42	38.52	0.19	100.5
78	32,092.5	1,496	0.047134	1,512.66	–16.66	38.89	–0.43	98.9
79	29,465.3	1,404	0.052681	1,552.25	–148.25	39.40	–3.76	90.4
80	25,406.8	1,513	0.058840	1,494.93	18.07	38.66	0.47	101.2
81	20,736.3	1,259	0.065667	1,361.68	–102.68	36.90	–2.78	92.5
82	16,568.0	1,257	0.073221	1,213.12	43.88	34.83	1.26	103.6
83	13,042.5	913	0.081568	1,063.85	–150.85	32.62	–4.62	85.8
84	10,904.3	1,008	0.090778	989.87	18.13	31.46	0.58	101.8
85	9,594.0	950	0.100930	968.32	–18.32	31.12	–0.59	98.1

Table 4.8. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
86	8,139.0	971	0.112107	912.44	58.56	30.21	1.94	106.4
87	6,421.8	899	0.124402	798.89	100.11	28.26	3.54	112.5
88	4,993.3	690	0.137914	688.65	1.35	26.24	0.05	100.2
89	3,759.3	639	0.152753	574.25	64.75	23.96	2.70	111.3
90	2,741.0	479	0.169038	463.33	15.67	21.53	0.73	103.4
91	1,985.0	329	0.186898	370.99	–41.99	19.26	–2.18	88.7
92	1,419.3	299	0.206474	293.05	5.95	17.12	0.35	102.0
93	957.8	232	0.227920	218.30	13.70	14.78	0.93	106.3
94	613.0	135	0.251405	154.11	–19.11	12.41	–1.54	87.6
95	395.5	93	0.277110	109.60	–16.60	10.47	–1.59	84.9
96	239.3	74	0.305234	73.04	0.96	8.55	0.11	101.3
97	148.0	40	0.335995	49.73	–9.73	7.05	–1.38	80.4
98	94.8	14	0.369629	35.04	–21.04	5.92	–3.55	40.0
99	65.0	7	0.406393	26.42	–19.42	5.14	–3.78	26.5
100	45.5	13	0.446567	20.32	–7.32	4.51	–1.62	64.0
Totals	876,193.3	29,624		29,683.64	–59.64			99.8

Table 4.9. Details of graduations for male retirement annuitants, combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
30	2,064.0	2	0.000481	0.99	1.01			
31	4,092.0	2	0.000494	2.02	–0.02			
32	7,191.5	5	0.000510	3.67	1.33			
30-32	13,347.5	9		6.68	2.32	2.59	0.90	134.7
33	11,574.5	4	0.000529	6.12	–2.12	2.47	–0.86	65.3
34	17,368.5	15	0.000551	9.57	5.43	3.09	1.75	156.7
35	24,450.0	12	0.000577	14.11	–2.11	3.76	–0.56	85.0
36	32,603.0	26	0.000608	19.81	6.19	4.45	1.39	131.3
37	41,813.3	26	0.000643	26.88	–0.88	5.18	–0.17	96.7
38	51,487.8	34	0.000684	35.21	–1.21	5.93	–0.20	96.6
39	60,893.1	43	0.000731	44.53	–1.53	6.67	–0.23	96.6
40	70,216.0	68	0.000786	55.20	12.80	7.43	1.72	123.2
41	79,669.5	74	0.000849	67.66	6.34	8.23	0.77	109.4
42	89,671.4	73	0.000922	82.64	–9.64	9.09	–1.06	88.3
43	98,977.4	86	0.001005	99.42	–13.42	9.97	–1.35	86.5
44	106,766.1	107	0.001099	117.35	–10.35	10.83	–0.96	91.2
45	113,475.3	122	0.001207	136.94	–14.94	11.70	–1.28	89.1
46	120,236.2	157	0.001329	159.78	–2.78	12.64	–0.22	98.3
47	127,389.4	210	0.001467	186.89	23.11	13.67	1.69	112.4
48	135,774.6	222	0.001623	220.36	1.64	14.84	0.11	100.7
49	145,381.9	263	0.001798	261.44	1.56	16.17	0.10	100.6
50	156,291.6	339	0.001995	311.80	27.20	17.66	1.54	108.7
51	168,980.3	386	0.002215	374.27	11.73	19.35	0.61	103.1
52	185,901.0	447	0.002460	457.32	–10.32	21.38	–0.48	97.7
53	197,774.7	586	0.002732	540.41	45.59	23.25	1.96	108.4
54	200,212.4	647	0.003040	608.66	38.34	24.67	1.55	106.3
55	198,153.2	678	0.003391	671.90	6.10	25.92	0.24	100.9
56	189,878.9	732	0.003786	718.92	13.08	26.81	0.49	101.8
57	180,126.1	789	0.004232	762.24	26.76	27.61	0.97	103.5
58	170,284.2	785	0.004733	806.03	–21.03	28.39	–0.74	97.4
59	158,381.7	828	0.005298	839.16	–11.16	28.97	–0.39	98.7
60	145,129.9	865	0.005934	861.19	3.81	29.35	0.13	100.4
61	131,834.3	907	0.006649	876.54	30.46	29.61	1.03	103.5
62	127,869.3	882	0.007452	952.93	–70.93	30.87	–2.30	92.6
63	123,219.6	978	0.008355	1,029.53	–51.53	32.09	–1.61	95.0
64	116,137.2	1,054	0.009369	1,088.13	–34.13	32.99	–1.03	96.9
65	95,601.3	1,014	0.010508	1,004.55	9.45	31.69	0.30	100.9

Table 4.9. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
66	76,452.2	846	0.011785	900.98	–54.98	30.02	–1.83	93.9
67	70,718.5	883	0.013217	934.71	–51.71	30.57	–1.69	94.5
68	67,639.0	924	0.014823	1,002.62	–78.62	31.66	–2.48	92.2
69	65,802.1	1,110	0.016622	1,093.77	16.23	33.07	0.49	101.5
70	62,911.4	1,208	0.018637	1,172.48	35.52	34.24	1.04	103.0
71	58,153.8	1,268	0.020892	1,214.97	53.03	34.86	1.52	104.4
72	54,460.6	1,302	0.023416	1,275.24	26.76	35.71	0.75	102.1
73	51,007.4	1,366	0.026238	1,338.32	27.68	36.58	0.76	102.1
74	47,527.9	1,389	0.029392	1,396.95	–7.95	37.38	–0.21	99.4
75	43,278.2	1,474	0.032916	1,424.56	49.44	37.74	1.31	103.5
76	39,059.0	1,506	0.036852	1,439.40	66.60	37.94	1.76	104.6
77	35,453.7	1,498	0.041245	1,462.29	35.71	38.24	0.93	102.4
78	32,268.3	1,502	0.046146	1,489.06	12.94	38.59	0.34	100.9
79	29,599.2	1,407	0.051612	1,527.67	–120.67	39.09	–3.09	92.1
80	25,503.0	1,513	0.057704	1,471.62	41.38	38.36	1.08	102.8
81	20,798.3	1,261	0.064491	1,341.30	–80.30	36.62	–2.19	94.0
82	16,610.8	1,261	0.072048	1,196.78	64.22	34.59	1.86	105.4
83	13,082.7	914	0.080460	1,052.64	–138.64	32.44	–4.27	86.8
84	10,941.4	1,010	0.089819	982.74	27.26	31.35	0.87	102.8
85	9,631.4	952	0.100225	965.31	–13.31	31.07	–0.43	98.6
86	8,164.5	971	0.111791	912.72	58.28	30.21	1.93	106.4
87	6,443.1	900	0.124402	801.54	98.46	28.31	3.48	112.3
88	5,009.5	690	0.137914	690.88	–0.88	26.28	–0.03	99.9
89	3,771.8	641	0.152753	576.16	64.84	24.00	2.70	111.3
90	2,754.0	480	0.169038	465.53	14.47	21.58	0.67	103.1
91	1,996.5	329	0.186898	373.14	–44.14	19.32	–2.29	88.2
92	1,425.8	299	0.206474	294.39	4.61	17.16	0.27	101.6
93	961.3	232	0.227920	219.10	12.90	14.80	0.87	105.9
94	614.0	136	0.251405	154.36	–18.36	12.42	–1.48	88.1
95	395.5	93	0.277110	109.60	–16.60	10.47	–1.59	84.9
96	239.3	74	0.305234	73.04	0.96	8.55	0.11	101.3
97	148.0	40	0.335995	49.73	–9.73	7.05	–1.38	80.4
98	94.8	14	0.369629	35.04	–21.04	5.92	–3.55	40.0
99	65.0	7	0.406393	26.42	–19.42	5.14	–3.78	26.5
100	45.5	13	0.446567	20.32	–7.32	4.51	–1.62	64.0
Totals	4,749,898.7	42,981		42,939.54	41.46			100.1

Table 4.10. Details of graduations for female retirement annuitants, deferred: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
30	521.0	0	0.000330	0.17	–0.17			
31	980.5	0	0.000358	0.35	–0.35			
32	1,658.5	0	0.000388	0.64	–0.64			
33	2,602.0	1	0.000421	1.09	–0.09			
34	3,767.0	1	0.000456	1.72	–0.72			
35	5,130.0	3	0.000494	2.54	0.46			
30-35	14,659.0	5		6.51	–1.51	2.55	–0.59	76.7
36	6,661.5	1	0.000536	3.57	–2.57			
37	8,258.5	8	0.000581	4.80	3.20			
36-37	14,920.0	9		8.37	0.63	2.89	0.22	107.6
38	9,893.0	13	0.000630	6.23	6.77	2.50	2.71	208.7
39	11,476.0	6	0.000683	7.83	–1.83	2.80	–0.66	76.6
40	12,914.0	11	0.000740	9.56	1.44	3.09	0.47	115.1
41	14,237.5	11	0.000802	11.42	–0.42	3.38	–0.12	96.3
42	15,493.5	12	0.000870	13.47	–1.47	3.67	–0.40	89.1
43	16,664.0	8	0.000943	15.71	–7.71	3.96	–1.95	50.9
44	17,770.0	21	0.001022	18.16	2.84	4.26	0.67	115.6
45	18,827.8	24	0.001108	20.86	3.14	4.57	0.69	115.1
46	19,877.8	18	0.001201	23.87	–5.87	4.89	–1.20	75.4
47	21,020.3	23	0.001302	27.37	–4.37	5.23	–0.84	84.0
48	22,516.4	36	0.001411	31.78	4.22	5.64	0.75	113.3
49	24,373.3	39	0.001530	37.29	1.71	6.11	0.28	104.6
50	26,412.3	37	0.001659	43.81	–6.81	6.62	–1.03	84.5
51	28,839.3	50	0.001798	51.86	–1.86	7.20	–0.26	96.4
52	32,114.1	63	0.001949	62.60	0.40	7.91	0.05	100.6
53	34,461.7	78	0.002113	72.82	5.18	8.53	0.61	107.1
54	35,355.4	117	0.002291	80.99	36.01	9.00	4.00	144.5
55	35,609.6	83	0.002483	88.43	–5.43	9.40	–0.58	93.9
56	34,938.8	83	0.002692	94.05	–11.05	9.70	–1.14	88.2
57	34,174.1	117	0.002918	99.73	17.27	9.99	1.73	117.3
58	33,171.6	86	0.003164	104.94	–18.94	10.24	–1.85	82.0
59	31,479.4	84	0.003429	107.96	–23.96	10.39	–2.31	77.8
60	25,661.7	109	0.003718	95.40	13.60	9.77	1.39	114.3
61	17,301.3	81	0.004030	69.73	11.27	8.35	1.35	116.2
62	15,323.7	67	0.004369	66.95	0.05	8.18	0.01	100.1
63	13,627.1	45	0.004736	64.54	–19.54	8.03	–2.43	69.7
64	11,863.3	61	0.005134	60.91	0.09	7.80	0.01	100.2
65	8,194.8	55	0.005566	45.61	9.39	6.75	1.39	120.6

Table 4.10. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
66	5,320.5	36	0.006033	32.10	3.90	5.67	0.69	112.1
67	4,418.6	16	0.006541	28.90	–12.90	5.38	–2.40	55.4
68	3,716.7	22	0.007090	26.35	–4.35	5.13	–0.85	83.5
69	3,236.1	23	0.007686	24.87	–1.87	4.99	–0.38	92.5
70	2,459.3	20	0.008332	20.49	–0.49	4.53	–0.11	97.6
71	1,587.0	13	0.009033	14.33	–1.33	3.79	–0.35	90.7
72	1,298.7	14	0.009792	12.72	1.28	3.57	0.36	110.1
73	1,073.7	11	0.010615	11.40	–0.40	3.38	–0.12	96.5
74	846.7	21	0.011507	9.74	11.26	3.12	3.61	215.5
75	427.1	7	0.012474	5.33	1.67	2.31	0.72	131.4
Totals	677,555.2	1,635		1,635.00	–0.00			100.0

Table 4.11. Details of graduations for female retirement annuitants, vested: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	231.5	3	0.006862	1.59	1.41			
51	445.5	2	0.006507	2.90	–0.90			
52	597.5	3	0.006175	3.69	–0.69			
50-52	1,274.5	8		8.18	–0.18	2.86	–0.06	97.8
53	764.3	5	0.005870	4.49	0.51			
54	988.3	3	0.005594	5.53	–2.53			
53-54	1,752.6	8		10.01	–2.01	3.16	–0.64	79.9
55	1,282.0	8	0.005350	6.86	1.14	2.62	0.44	116.6
56	1,582.0	10	0.005143	8.14	1.86	2.85	0.65	122.9
57	1,729.5	9	0.004977	8.61	0.39	2.93	0.13	104.6
58	1,929.3	19	0.004855	9.37	9.63	3.06	3.15	202.8
59	2,133.8	13	0.004784	10.21	2.79	3.20	0.87	127.3
60	6,331.0	31	0.004769	30.19	0.81	5.49	0.15	102.7
61	12,916.5	48	0.004817	62.22	–14.22	7.89	–1.80	77.2
62	13,149.5	57	0.004934	64.88	–7.88	8.05	–0.98	87.9
63	13,672.0	70	0.005128	70.11	–0.11	8.37	–0.01	99.8
64	14,081.8	81	0.005409	76.17	4.83	8.73	0.55	106.3
65	15,149.8	86	0.005786	87.66	–1.66	9.36	–0.18	98.1
66	16,026.8	95	0.006271	100.50	–5.50	10.02	–0.55	94.5
67	15,481.3	113	0.006875	106.43	6.57	10.32	0.64	106.2
68	14,901.8	114	0.007612	113.43	0.57	10.65	0.05	100.5
69	14,393.8	125	0.008497	122.31	2.69	11.06	0.24	102.2
70	14,161.3	138	0.009548	135.22	2.78	11.63	0.24	102.1
71	13,773.5	154	0.010784	148.53	5.47	12.19	0.45	103.7
72	13,028.0	158	0.012224	159.26	–1.26	12.62	–0.10	99.2
73	12,218.3	177	0.013893	169.75	7.25	13.03	0.56	104.3
74	11,275.5	160	0.015818	178.35	–18.35	13.35	–1.37	89.7
75	10,399.5	191	0.018026	187.46	3.54	13.69	0.26	101.9
76	9,531.0	182	0.020551	195.87	–13.87	14.00	–0.99	92.9
77	8,402.5	208	0.023428	196.85	11.15	14.03	0.79	105.7
78	7,545.8	234	0.026698	201.46	32.54	14.19	2.29	116.2
79	6,849.8	196	0.030407	208.28	–12.28	14.43	–0.85	94.1
80	6,081.8	222	0.034603	210.45	11.55	14.51	0.80	105.5
81	5,076.0	186	0.039343	199.70	–13.70	14.13	–0.97	93.1
82	4,048.8	183	0.044689	180.93	2.07	13.45	0.15	101.1
83	3,177.5	143	0.050709	161.13	–18.13	12.69	–1.43	88.7
84	2,631.5	166	0.057482	151.26	14.74	12.30	1.20	109.7
85	2,309.3	152	0.065093	150.32	1.68	12.26	0.14	101.1

Table 4.11. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
86	2,022.5	138	0.073638	148.93	–10.93	12.20	–0.90	92.7
87	1,684.8	125	0.083224	140.21	–15.21	11.84	–1.28	89.1
88	1,319.8	137	0.093969	124.02	12.98	11.14	1.17	110.5
89	1,053.8	107	0.106006	111.71	–4.71	10.57	–0.45	95.8
90	849.8	76	0.119482	101.54	–25.54	10.08	–2.53	74.9
91	630.3	79	0.134563	84.82	–5.82	9.21	–0.63	93.1
92	471.0	85	0.151432	71.32	13.68	8.45	1.62	119.2
93	328.5	72	0.170292	55.94	16.06	7.48	2.15	128.7
94	221.0	39	0.191371	42.29	–3.29	6.50	–0.51	92.2
95	162.5	43	0.214923	34.93	8.07	5.91	1.37	123.1
96	100.5	24	0.241231	24.24	–0.24	4.92	–0.05	99.0
97	60.0	14	0.270610	16.24	–2.24	4.03	–0.56	86.2
98	40.5	11	0.303409	12.29	–1.29	3.51	–0.37	89.5
99	29.5	6	0.340021	10.03	–4.03	3.17	–1.27	59.8
100	16.5	8	0.380881	6.28	1.72	2.51	0.68	127.3
Totals	287,289.1	4,709		4,714.90	–5.90			99.9

Table 4.12. Details of graduations for female retirement annuitants, combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
30	526.0	0	0.000330	0.17	–0.17			
31	987.5	0	0.000358	0.35	–0.35			
32	1,667.8	0	0.000388	0.65	–0.65			
33	2,612.8	1	0.000421	1.10	–0.10			
34	3,777.0	1	0.000456	1.72	–0.72			
35	5,142.3	3	0.000494	2.54	0.46			
30-35	14,713.4	5		6.54	–1.54	2.56	–0.60	76.5
36	6,676.5	1	0.000536	3.58	–2.58			
37	8,273.8	8	0.000581	4.81	3.19			
36-37	14,950.3	9		8.38	0.62	2.90	0.21	107.3
38	9,918.0	13	0.000630	6.25	6.75	2.50	2.70	208.1
39	11,508.3	6	0.000683	7.86	–1.86	2.80	–0.66	76.4
40	12,956.0	11	0.000740	9.59	1.41	3.10	0.46	114.7
41	14,289.3	11	0.000802	11.46	–0.46	3.39	–0.14	96.0
42	15,548.0	13	0.000870	13.52	–0.52	3.68	–0.14	96.1
43	16,724.0	8	0.000943	15.77	–7.77	3.97	–1.96	50.7
44	17,841.8	22	0.001022	18.24	3.76	4.27	0.88	120.6
45	18,903.8	24	0.001108	20.94	3.06	4.58	0.67	114.6
46	19,961.3	20	0.001201	23.98	–3.98	4.90	–0.81	83.4
47	21,118.1	23	0.001302	27.50	–4.50	5.24	–0.86	83.6
48	22,636.4	37	0.001411	31.95	5.05	5.65	0.89	115.8
49	24,525.8	40	0.001530	37.53	2.47	6.13	0.40	106.6
50	26,643.8	40	0.001659	44.19	–4.19	6.65	–0.63	90.5
51	29,284.8	52	0.001798	52.66	–0.66	7.26	–0.09	98.8
52	32,711.6	66	0.001949	63.76	2.24	7.99	0.28	103.5
53	35,226.0	83	0.002113	74.44	8.56	8.63	0.99	111.5
54	36,343.7	120	0.002291	83.25	36.75	9.12	4.03	144.1
55	36,891.6	91	0.002483	91.61	–0.61	9.57	–0.06	99.3
56	36,520.8	93	0.002692	98.31	–5.31	9.92	–0.54	94.6
57	35,903.6	126	0.002918	104.77	21.23	10.24	2.07	120.3
58	35,100.9	105	0.003164	111.04	–6.04	10.54	–0.57	94.6
59	33,613.2	97	0.003440	115.63	–18.63	10.75	–1.73	83.9
60	31,992.7	140	0.003766	120.49	19.51	10.98	1.78	116.2
61	30,217.8	129	0.004130	124.80	4.20	11.17	0.38	103.4
62	28,473.2	124	0.004536	129.16	–5.16	11.37	–0.45	96.0
63	27,299.1	115	0.004991	136.24	–21.24	11.67	–1.82	84.4
64	25,945.1	142	0.005500	142.69	–0.69	11.95	–0.06	99.5
65	23,344.6	141	0.006071	141.71	–0.71	11.90	–0.06	99.5

Table 4.12. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
66	21,347.3	131	0.006712	143.27	–12.27	11.97	–1.03	91.4
67	19,899.9	129	0.007432	147.91	–18.91	12.16	–1.55	87.2
68	18,618.5	136	0.008244	153.50	–17.50	12.39	–1.41	88.6
69	17,629.9	148	0.009160	161.49	–13.49	12.71	–1.06	91.6
70	16,620.6	158	0.010195	169.44	–11.44	13.02	–0.88	93.2
71	15,360.5	167	0.011365	174.57	–7.57	13.21	–0.57	95.7
72	14,326.7	172	0.012690	181.81	–9.81	13.48	–0.73	94.6
73	13,292.0	188	0.014194	188.67	–0.67	13.74	–0.05	99.6
74	12,122.2	181	0.015902	192.77	–11.77	13.88	–0.85	93.9
75	10,826.6	198	0.018026	195.16	2.84	13.97	0.20	101.5
76	9,616.9	183	0.020551	197.63	–14.63	14.06	–1.04	92.6
77	8,447.0	210	0.023428	197.90	12.10	14.07	0.86	106.1
78	7,568.8	234	0.026698	202.07	31.93	14.22	2.25	115.8
79	6,867.3	197	0.030407	208.81	–11.81	14.45	–0.82	94.3
80	6,099.3	222	0.034603	211.05	10.95	14.53	0.75	105.2
81	5,092.0	186	0.039343	200.33	–14.33	14.15	–1.01	92.8
82	4,055.8	184	0.044689	181.25	2.75	13.46	0.20	101.5
83	3,184.0	143	0.050709	161.46	–18.46	12.71	–1.45	88.6
84	2,644.0	166	0.057482	151.98	14.02	12.33	1.14	109.2
85	2,314.8	152	0.065093	150.68	1.32	12.28	0.11	100.9
86	2,026.0	139	0.073638	149.19	–10.19	12.21	–0.83	93.2
87	1,688.8	125	0.083224	140.55	–15.55	11.86	–1.31	88.9
88	1,324.8	137	0.093969	124.49	12.51	11.16	1.12	110.0
89	1,058.3	107	0.106006	112.19	–5.19	10.59	–0.49	95.4
90	852.3	77	0.119482	101.83	–24.83	10.09	–2.46	75.6
91	631.8	79	0.134563	85.02	–6.02	9.22	–0.65	92.9
92	472.0	85	0.151432	71.48	13.52	8.45	1.60	118.9
93	329.5	72	0.170292	56.11	15.89	7.49	2.12	128.3
94	221.5	40	0.191371	42.39	–2.39	6.51	–0.37	94.4
95	162.5	43	0.214923	34.93	8.07	5.91	1.37	123.1
96	101.0	24	0.241231	24.36	–0.36	4.94	–0.07	98.5
97	61.5	14	0.270610	16.64	–2.64	4.08	–0.65	84.1
98	41.5	12	0.303409	12.59	–0.59	3.55	–0.17	95.3
99	30.5	6	0.340021	10.37	–4.37	3.22	–1.36	57.9
100	17.0	8	0.380881	6.47	1.53	2.54	0.60	123.6
Totals	966,060.1	6,359.00		6,434.63	–75.63			98.8

5. PERSONAL PENSIONERS

5.1 *The data*

5.1.1 This investigation covers the mortality experience of holders of personal pension policies effected under Chapter IV of Part XIV of ICTA 1988. Data are gathered for both males and females, and is subdivided into two sections, deferred and vested, which together form the combined section. Only lives data are collected for this investigation, and there is no subdivision by duration.

5.1.2 Total numbers of exposed to risk and of deaths are shown in Table 5.1. Personal pensions only came into existence in 1988, and so there is no 1979-1982 comparison. Volumes have increased significantly since 1991-1994, and this now forms one of the larger of the life office mortality investigations. It is also the case that the experience for males is much larger than that for females, though not to the same extent as for the retirement annuities.

5.1.3 The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Table 5.2. As would be expected, there is very little deferred data above age 75, but there is a fair amount of vested data below age 50 (with a total of 81 deaths for males and 31 deaths for females) though this is insufficient to graduate.

5.2 *Ultimate graduations*

5.2.1 No graduations of the personal pensioner experience were carried out as part of the "92" Series. However, given the significant volumes of data available, the MGWP felt it appropriate to do so for the "00" Series. As with the retirement annuitants, tables have been produced for each of the deferred, vested and combined sections, separately for males and females (i.e. six tables in all). The age ranges of the tables are 17-75 for the deferred sections, 50-120 for the vested sections and 17-120 for the combined sections.

5.2.2 The key statistics from the resulting unadjusted ultimate graduations are shown in Tables 5.3 and 5.4. These tables also show the '–Log likelihood' value calculated from the adjusted ultimate graduations.

5.2.3 As the data were not split by duration, it was not possible to produce any select rates.

5.3 *Adjustments*

5.3.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages for the vested sections, with a "run-in" age of 100 and a "curvature" parameter of 1.25.

5.3.2 In addition, as with the retirement annuitants, the combined sections were set equal to the vested sections (males or females as appropriate) above certain ages and equal to the deferred sections (males or females as appropriate) below certain ages.

5.3.3 These ages are summarised in the table below (to the nearest 0.01), and represent the points at which the graduated curves would cross. The original combined section graduation is used, unadjusted, between these ages.

Sex	Lower age up to which Combined = Deferred	Upper age from which Combined = Vested
Male	39.99	71.67
Female	49.52	73.93

5.3.4 The effect of the adjustments can be seen in Tables 5.5 and 5.6, which show the calculated values of μ_x both pre- and post-adjustments. Adjusted values that differ from unadjusted values are highlighted in bold.

5.3.5 Details of the ultimate rates graduations, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in Tables 5.7 to 5.12.

Table 5.1. Personal pensioners, males and females, deferred and vested, all durations: comparison of (central) exposed to risk and deaths for 1999-2002 and 1991-1994.

	1999-2002	1991-1994
Males		
Deferred		
Central exposed	8,554,555.8	3,827,960.3
Deaths	16,544	5,827
Vested		
Central exposed	687,358.8	49,938.9
Deaths	9,775	564
Combined		
Central exposed	9,241,914.6	3,877,899.2
Deaths	26,319	6,391
Females		
Deferred		
Central exposed	4,324,288.9	1,882,410.6
Deaths	4,507	1,251
Vested		
Central exposed	292,631.4	19,740.1
Deaths	1,835	110
Combined		
Central exposed	4,616,920.3	1,902,150.7
Deaths	6,342	1,361

Table 5.2. Personal pensioners, males and females: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Deferred	10-81	17-75†	22-75
Vested	10-108	35-88	49-87†
Combined	10-108	17-88†	22-87†
Females			
Deferred	10-79	17-75†	27-70†
Vested	10-108	33-85	51-84
Combined	10-108	17-85†	27-84

† Some other single ages outside the range given meet the criterion.

Table 5.3. Unadjusted graduations of the male personal pensioners ultimate experience: key statistics.

Section	Deferred	Vested	Combined
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
T-ratio	15.3		16.1
b_1	–5.894375	–1.805621	–4.527817
T-ratio	–23.1	–12.5	–34.5
b_2	3.659673	1.817239	6.335509
T-ratio	16.1	22.2	76.5
b_3	–1.542952	2.323129	–0.359870
T-ratio	–6.6	15.6	–2.8
b_4		–0.750000†	0.600000†
T-ratio		0.0	0.0
–Log likelihood	113,501.6	49,863.9	159,443.0
–Log likelihood (adj.)*	113,501.6	49,863.9	159,442.7
Sign test: +/–	27 / 28	21 / 23	27 / 24
Sign test: *p*(pos)	0.5000	0.4402	0.6101
Runs test: *p*(runs)	0.5000	0.3273	0.8089
K-S test: *p*(*KS*)	0.9871	0.9431	1.0000
Serial correlation test:			
T-ratio 1	–0.60	0.93	–1.04
T-ratio 2	1.13	–0.06	0.29
T-ratio 3	–1.30	–0.51	–0.72
χ^2 test:			
χ^2	98.21	99.06	93.30
Degrees of freedom	51	40	46
$p(\chi^2)$	0.0001	0.0000	0.0000

† Fixed parameter.

* Calculated from adjusted ultimate graduations.

Table 5.4. Unadjusted graduations of the female personal pensioners ultimate experience: key statistics.

Section	Deferred	Vested	Combined
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†
T-ratio		17.4	0.0
b_1	–5.619389	–6.745098	–4.845442
T-ratio	–24.9	–58.6	–39.7
b_2	3.099457	9.343251	4.792242
T-ratio	10.1	13.9	32.8
b_3	–0.684653	–1.200000†	–0.107757
T-ratio	–4.0	0.0	–1.0
b_4			0.250000†
T-ratio			0.0
–Log likelihood	33,674.4	10,852.5	44,599.7
–Log likelihood (adj.)*	33,674.4	10,852.5	44,590.1
Sign test: +/–	26 / 24	18 / 23	33 / 27
Sign test: p(pos)	0.5561	0.2664	0.7405
Runs test: p(runs)	0.4466	0.5376	0.1349
K-S test: $p(KS)$	1.0000	0.9130	0.6695
Serial correlation test:			
T-ratio 1	0.22	0.05	2.45
T-ratio 2	–1.05	0.21	1.20
T-ratio 3	–1.04	–2.13	–0.90
χ^2 test:			
χ^2	66.32	63.31	115.54
Degrees of freedom	47	37	55
$p(\chi^2)$	0.0331	0.0045	0.0000

† Fixed parameter.

* Calculated from adjusted ultimate graduations.

Table 5.5. Personal pensioners, males, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
17	0.000429		0.000428	0.000429		**0.000429**
18	0.000430		0.000429	0.000430		**0.000430**
19	0.000433		0.000430	0.000433		**0.000433**
20	0.000435		0.000432	0.000435		**0.000435**
21	0.000439		0.000434	0.000439		**0.000439**
22	0.000443		0.000437	0.000443		**0.000443**
23	0.000447		0.000440	0.000447		**0.000447**
24	0.000453		0.000444	0.000453		**0.000453**
25	0.000460		0.000450	0.000460		**0.000460**
26	0.000467		0.000456	0.000467		**0.000467**
27	0.000477		0.000464	0.000477		**0.000477**
28	0.000488		0.000474	0.000488		**0.000488**
29	0.000501		0.000486	0.000501		**0.000501**
30	0.000516		0.000500	0.000516		**0.000516**
31	0.000534		0.000517	0.000534		**0.000534**
32	0.000555		0.000538	0.000555		**0.000555**
33	0.000579		0.000562	0.000579		**0.000579**
34	0.000607		0.000590	0.000607		**0.000607**
35	0.000639		0.000624	0.000639		**0.000639**
36	0.000677		0.000663	0.000677		**0.000677**
37	0.000720		0.000709	0.000720		**0.000720**
38	0.000770		0.000762	0.000770		**0.000770**
39	0.000827		0.000822	0.000827		**0.000827**
40	0.000892		0.000892	0.000892		0.000892
41	0.000967		0.000972	0.000967		0.000972
42	0.001051		0.001064	0.001051		0.001064
43	0.001147		0.001167	0.001147		0.001167
44	0.001255		0.001284	0.001255		0.001284
45	0.001376		0.001416	0.001376		0.001416
46	0.001513		0.001565	0.001513		0.001565
47	0.001666		0.001731	0.001666		0.001731
48	0.001837		0.001917	0.001837		0.001917
49	0.002028		0.002123	0.002028		0.002123
50	0.002240	0.008065	0.002353	0.002240	0.008065	0.002353

Table 5.5. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
51	0.002475	0.007917	0.002607	0.002475	0.007917	0.002607
52	0.002734	0.007822	0.002888	0.002734	0.007822	0.002888
53	0.003020	0.007777	0.003198	0.003020	0.007777	0.003198
54	0.003333	0.007780	0.003539	0.003333	0.007780	0.003539
55	0.003677	0.007830	0.003913	0.003677	0.007830	0.003913
56	0.004052	0.007927	0.004323	0.004052	0.007927	0.004323
57	0.004460	0.008071	0.004772	0.004460	0.008071	0.004772
58	0.004903	0.008264	0.005263	0.004903	0.008264	0.005263
59	0.005382	0.008508	0.005798	0.005382	0.008508	0.005798
60	0.005899	0.008806	0.006382	0.005899	0.008806	0.006382
61	0.006455	0.009161	0.007018	0.006455	0.009161	0.007018
62	0.007051	0.009578	0.007710	0.007051	0.009578	0.007710
63	0.007688	0.010063	0.008462	0.007688	0.010063	0.008462
64	0.008367	0.010623	0.009280	0.008367	0.010623	0.009280
65	0.009087	0.011265	0.010168	0.009087	0.011265	0.010168
66	0.009849	0.012000	0.011134	0.009849	0.012000	0.011134
67	0.010653	0.012837	0.012183	0.010653	0.012837	0.012183
68	0.011499	0.013790	0.013322	0.011499	0.013790	0.013322
69	0.012384	0.014873	0.014561	0.012384	0.014873	0.014561
70	0.013309	0.016103	0.015908	0.013309	0.016103	0.015908
71	0.014270	0.017500	0.017374	0.014270	0.017500	0.017374
72	0.015267	0.019086	0.018970	0.015267	0.019086	**0.019086**
73	0.016296	0.020887	0.020709	0.016296	0.020887	**0.020887**
74	0.017355	0.022933	0.022606	0.017355	0.022933	**0.022933**
75	0.018439	0.025259	0.024678	0.018439	0.025259	**0.025259**
76		0.027905	0.026943		0.027905	**0.027905**
77		0.030915	0.029423		0.030915	**0.030915**
78		0.034344	0.032143		0.034344	**0.034344**
79		0.038250	0.035129		0.038250	**0.038250**
80		0.042704	0.038414		0.042704	**0.042704**
81		0.047786	0.042034		0.047786	**0.047786**
82		0.053586	0.046031		0.053586	**0.053586**
83		0.060210	0.050452		0.060210	**0.060210**
84		0.067778	0.055351		0.067778	**0.067778**
85		0.076427	0.060794		0.076427	**0.076427**

Table 5.5. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
86		0.086314	0.066852		0.086314	**0.086314**
87		0.097618	0.073611		0.097618	**0.097618**
88		0.110542	0.081169		0.110542	**0.110542**
89		0.125319	0.089641		0.125319	**0.125319**
90		0.142210	0.099161		0.142210	**0.142210**
91		0.161512	0.109886		0.161512	**0.161512**
92		0.183562	0.121999		0.183562	**0.183562**
93		0.208737	0.135719		0.208737	**0.208737**
94		0.237461	0.151298		0.237461	**0.237461**
95		0.270207	0.169041		0.270207	**0.270207**
96		0.307506	0.189305		0.307506	**0.307506**
97		0.349943	0.212516		0.349943	**0.349943**
98		0.398169	0.239185		0.398169	**0.398169**
99		0.452899	0.269920		0.452899	**0.452899**
100		0.514915	0.305453		0.514915	**0.514915**
101		0.585070	0.346668		**0.545041**	**0.545041**
102		0.664286	0.394630		**0.574773**	**0.574773**
103		0.753557	0.450635		**0.604094**	**0.604094**
104		0.853940	0.516257		**0.632988**	**0.632988**
105		0.966556	0.593423		**0.661433**	**0.661433**
106		1.092576	0.684492		**0.689408**	**0.689408**
107		1.233216	0.792370		**0.716887**	**0.716887**
108		1.389720	0.920647		**0.743843**	**0.743843**
109		1.563339	1.073775		**0.770242**	**0.770242**
110		1.755311	1.257297		**0.796047**	**0.796047**
111		1.966835	1.478144		**0.821214**	**0.821214**
112		2.199035	1.745018		**0.845690**	**0.845690**
113		2.452922	2.068886		**0.869412**	**0.869412**
114		2.729358	2.463638		**0.892299**	**0.892299**
115		3.029005	2.946935		**0.914248**	**0.914248**
116		3.352273	3.541337		**0.935121**	**0.935121**
117		3.699273	4.275795		**0.954717**	**0.954717**
118		4.069755	5.187633		**0.972722**	**0.972722**
119		4.463059	6.325198		**0.988531**	**0.988531**
120		4.878057	7.751425		**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 5.6. Personal pensioners, females, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
17	0.000058		0.000129	0.000058		**0.000058**
18	0.000065		0.000134	0.000065		**0.000065**
19	0.000073		0.000139	0.000073		**0.000073**
20	0.000082		0.000146	0.000082		**0.000082**
21	0.000093		0.000153	0.000093		**0.000093**
22	0.000104		0.000161	0.000104		**0.000104**
23	0.000116		0.000171	0.000116		**0.000116**
24	0.000130		0.000181	0.000130		**0.000130**
25	0.000146		0.000193	0.000146		**0.000146**
26	0.000163		0.000207	0.000163		**0.000163**
27	0.000182		0.000222	0.000182		**0.000182**
28	0.000203		0.000239	0.000203		**0.000203**
29	0.000226		0.000259	0.000226		**0.000226**
30	0.000251		0.000280	0.000251		**0.000251**
31	0.000279		0.000304	0.000279		**0.000279**
32	0.000309		0.000331	0.000309		**0.000309**
33	0.000343		0.000361	0.000343		**0.000343**
34	0.000380		0.000394	0.000380		**0.000380**
35	0.000420		0.000430	0.000420		**0.000420**
36	0.000464		0.000471	0.000464		**0.000464**
37	0.000512		0.000515	0.000512		**0.000512**
38	0.000565		0.000564	0.000565		**0.000565**
39	0.000622		0.000618	0.000622		**0.000622**
40	0.000684		0.000678	0.000684		**0.000684**
41	0.000752		0.000743	0.000752		**0.000752**
42	0.000825		0.000814	0.000825		**0.000825**
43	0.000905		0.000892	0.000905		**0.000905**
44	0.000991		0.000977	0.000991		**0.000991**
45	0.001084		0.001071	0.001084		**0.001084**
46	0.001185		0.001172	0.001185		**0.001185**
47	0.001294		0.001283	0.001294		**0.001294**
48	0.001411		0.001403	0.001411		**0.001411**
49	0.001537		0.001534	0.001537		**0.001537**
50	0.001672	0.004167	0.001676	0.001672	0.004167	0.001676

Table 5.6. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
51	0.001818	0.004183	0.001830	0.001818	0.004183	0.001830
52	0.001973	0.004203	0.001997	0.001973	0.004203	0.001997
53	0.002140	0.004227	0.002178	0.002140	0.004227	0.002178
54	0.002319	0.004257	0.002374	0.002319	0.004257	0.002374
55	0.002509	0.004295	0.002587	0.002509	0.004295	0.002587
56	0.002712	0.004340	0.002817	0.002712	0.004340	0.002817
57	0.002929	0.004396	0.003065	0.002929	0.004396	0.003065
58	0.003159	0.004465	0.003334	0.003159	0.004465	0.003334
59	0.003404	0.004549	0.003624	0.003404	0.004549	0.003624
60	0.003663	0.004652	0.003938	0.003663	0.004652	0.003938
61	0.003938	0.004776	0.004277	0.003938	0.004776	0.004277
62	0.004229	0.004928	0.004644	0.004229	0.004928	0.004644
63	0.004537	0.005111	0.005039	0.004537	0.005111	0.005039
64	0.004862	0.005334	0.005466	0.004862	0.005334	0.005466
65	0.005204	0.005602	0.005928	0.005204	0.005602	0.005928
66	0.005564	0.005926	0.006427	0.005564	0.005926	0.006427
67	0.005942	0.006315	0.006966	0.005942	0.006315	0.006966
68	0.006340	0.006782	0.007548	0.006340	0.006782	0.007548
69	0.006756	0.007341	0.008178	0.006756	0.007341	0.008178
70	0.007192	0.008010	0.008859	0.007192	0.008010	0.008859
71	0.007648	0.008809	0.009596	0.007648	0.008809	0.009596
72	0.008124	0.009759	0.010393	0.008124	0.009759	0.010393
73	0.008620	0.010888	0.011257	0.008620	0.010888	0.011257
74	0.009136	0.012227	0.012192	0.009136	0.012227	**0.012227**
75	0.009672	0.013812	0.013207	0.009672	0.013812	**0.013812**
76		0.015684	0.014307		0.015684	**0.015684**
77		0.017890	0.015502		0.017890	**0.017890**
78		0.020485	0.016800		0.020485	**0.020485**
79		0.023531	0.018211		0.023531	**0.023531**
80		0.027100	0.019746		0.027100	**0.027100**
81		0.031271	0.021419		0.031271	**0.031271**
82		0.036138	0.023241		0.036138	**0.036138**
83		0.041804	0.025230		0.041804	**0.041804**
84		0.048387	0.027402		0.048387	**0.048387**
85		0.056020	0.029776		0.056020	**0.056020**

Table 5.6. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Deferred	Vested	Combined	Deferred	Vested	Combined
86		0.064852	0.032375		0.064852	**0.064852**
87		0.075050	0.035222		0.075050	**0.075050**
88		0.086801	0.038345		0.086801	**0.086801**
89		0.100314	0.041774		0.100314	**0.100314**
90		0.115820	0.045544		0.115820	**0.115820**
91		0.133576	0.049695		0.133576	**0.133576**
92		0.153866	0.054269		0.153866	**0.153866**
93		0.177004	0.059319		0.177004	**0.177004**
94		0.203333	0.064899		0.203333	**0.203333**
95		0.233232	0.071074		0.233232	**0.233232**
96		0.267113	0.077918		0.267113	**0.267113**
97		0.305424	0.085513		0.305424	**0.305424**
98		0.348653	0.093956		0.348653	**0.348653**
99		0.397329	0.103353		0.397329	**0.397329**
100		0.452021	0.113830		0.452021	**0.452021**
101		0.513340	0.125530		**0.486053**	**0.486053**
102		0.581944	0.138614		**0.519640**	**0.519640**
103		0.658533	0.153273		**0.552763**	**0.552763**
104		0.743851	0.169722		**0.585403**	**0.585403**
105		0.838687	0.188212		**0.617536**	**0.617536**
106		0.943876	0.209032		**0.649138**	**0.649138**
107		1.060293	0.232518		**0.680180**	**0.680180**
108		1.188855	0.259059		**0.710630**	**0.710630**
109		1.330516	0.289107		**0.740452**	**0.740452**
110		1.486267	0.323191		**0.769603**	**0.769603**
111		1.657130	0.361927		**0.798033**	**0.798033**
112		1.844154	0.406034		**0.825683**	**0.825683**
113		2.048409	0.456359		**0.852481**	**0.852481**
114		2.270980	0.513893		**0.878335**	**0.878335**
115		2.512962	0.579806		**0.903130**	**0.903130**
116		2.775449	0.655476		**0.926709**	**0.926709**
117		3.059526	0.742534		**0.948846**	**0.948846**
118		3.366262	0.842909		**0.969185**	**0.969185**
119		3.696693	0.958897		**0.987044**	**0.987044**
120		4.051821	1.093228		**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 5.7. Details of graduations for male personal pensioners, deferred: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	7,890.6	2	0.000435	3.44	–1.44			
21	12,856.1	4	0.000439	5.64	–1.64			
20-21	20,746.7	6		9.07	–3.07	3.01	–1.02	66.1
22	19,257.4	12	0.000443	8.52	3.48	2.92	1.19	140.8
23	26,953.5	16	0.000447	12.06	3.94	3.47	1.14	132.7
24	37,231.5	23	0.000453	16.86	6.14	4.11	1.50	136.4
25	51,799.1	30	0.000460	23.80	6.20	4.88	1.27	126.0
26	72,198.2	28	0.000467	33.75	–5.75	5.81	–0.99	83.0
27	98,734.5	57	0.000477	47.07	9.93	6.86	1.45	121.1
28	131,038.4	55	0.000488	63.91	–8.91	7.99	–1.11	86.1
29	164,992.0	99	0.000501	82.61	16.39	9.09	1.80	119.8
30	196,597.7	79	0.000516	101.43	–22.43	10.07	–2.23	77.9
31	224,143.3	122	0.000534	119.64	2.36	10.94	0.22	102.0
32	247,006.5	138	0.000555	136.98	1.02	11.70	0.09	100.7
33	266,254.5	139	0.000579	154.10	–15.10	12.41	–1.22	90.2
34	283,113.8	201	0.000607	171.82	29.18	13.11	2.23	117.0
35	296,588.9	190	0.000639	189.66	0.34	13.77	0.02	100.2
36	305,779.0	215	0.000677	207.04	7.96	14.39	0.55	103.8
37	310,897.1	215	0.000720	223.98	–8.98	14.97	–0.60	96.0
38	311,244.2	230	0.000770	239.72	–9.72	15.48	–0.63	95.9
39	306,668.3	214	0.000827	253.69	–39.69	15.93	–2.49	84.4
40	299,366.9	286	0.000892	267.15	18.85	16.34	1.15	107.1
41	292,061.6	277	0.000967	282.32	–5.32	16.80	–0.32	98.1
42	284,739.8	280	0.001051	299.26	–19.26	17.30	–1.11	93.6
43	275,899.9	321	0.001147	316.34	4.66	17.79	0.26	101.5
44	267,085.7	285	0.001255	335.07	–50.07	18.30	–2.74	85.1
45	258,068.0	351	0.001376	355.16	–4.16	18.85	–0.22	98.8
46	251,455.6	397	0.001513	380.44	16.56	19.50	0.85	104.4
47	245,140.4	447	0.001666	408.45	38.55	20.21	1.91	109.4
48	240,622.1	489	0.001837	442.11	46.89	21.03	2.23	110.6
49	237,762.1	471	0.002028	482.21	–11.21	21.96	–0.51	97.7
50	236,013.7	519	0.002240	528.67	–9.67	22.99	–0.42	98.2
51	236,877.1	560	0.002475	586.21	–26.21	24.21	–1.08	95.5
52	243,840.2	724	0.002734	666.68	57.32	25.82	2.22	108.6
53	242,473.9	724	0.003020	732.20	–8.20	27.06	–0.30	98.9
54	230,285.7	796	0.003333	767.63	28.37	27.71	1.02	103.7
55	213,096.4	799	0.003677	783.53	15.47	27.99	0.55	102.0

Table 5.7. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
56	189,582.5	772	0.004052	768.16	3.84	27.72	0.14	100.5
57	165,902.9	747	0.004460	739.94	7.06	27.20	0.26	101.0
58	144,594.6	621	0.004903	708.96	–87.96	26.63	–3.30	87.6
59	124,044.7	709	0.005382	667.66	41.34	25.84	1.60	106.2
60	102,349.9	600	0.005899	603.81	–3.81	24.57	–0.15	99.4
61	83,941.1	561	0.006455	541.87	19.13	23.28	0.82	103.5
62	74,947.2	507	0.007051	528.48	–21.48	22.99	–0.93	95.9
63	66,489.7	518	0.007688	511.19	6.81	22.61	0.30	101.3
64	57,664.1	475	0.008367	482.46	–7.46	21.96	–0.34	98.5
65	37,158.2	310	0.009087	337.66	–27.66	18.38	–1.51	91.8
66	16,769.4	152	0.009849	165.17	–13.17	12.85	–1.02	92.0
67	13,328.4	139	0.010653	141.99	–2.99	11.92	–0.25	97.9
68	10,990.9	125	0.011499	126.38	–1.38	11.24	–0.12	98.9
69	9,365.9	112	0.012384	115.99	–3.99	10.77	–0.37	96.6
70	7,427.3	89	0.013309	98.85	–9.85	9.94	–0.99	90.0
71	5,399.1	77	0.014270	77.05	–0.05	8.78	–0.01	99.9
72	4,322.5	63	0.015267	65.99	–2.99	8.12	–0.37	95.5
73	3,462.6	67	0.016296	56.43	10.57	7.51	1.41	118.7
74	2,743.6	74	0.017355	47.61	26.39	6.90	3.82	155.4
75	1,203.5	24	0.018439	22.19	1.81	4.71	0.38	108.1
Totals	8,547,721.8	16,537		16,537.01	–0.01			100.0

Table 5.8. Details of graduations for male personal pensioners, vested: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	2,282.0	26	0.008065	18.40	7.60	4.29	1.77	141.3
51	6,842.3	41	0.007917	54.17	–13.17	7.36	–1.79	75.7
52	9,249.3	60	0.007822	72.35	–12.35	8.51	–1.45	82.9
53	11,140.8	81	0.007777	86.64	–5.64	9.31	–0.61	93.5
54	12,622.8	77	0.007780	98.21	–21.21	9.91	–2.14	78.4
55	14,288.0	98	0.007830	111.88	–13.88	10.58	–1.31	87.6
56	15,660.8	122	0.007927	124.15	–2.15	11.14	–0.19	98.3
57	16,245.3	156	0.008071	131.12	24.88	11.45	2.17	119.0
58	16,857.8	128	0.008264	139.32	–11.32	11.80	–0.96	91.9
59	16,800.8	164	0.008508	142.95	21.05	11.96	1.76	114.7
60	21,124.0	183	0.008806	186.01	–3.01	13.64	–0.22	98.4
61	28,117.3	283	0.009161	257.58	25.42	16.05	1.58	109.9
62	30,007.8	302	0.009578	287.42	14.58	16.95	0.86	105.1
63	31,163.5	337	0.010063	313.61	23.39	17.71	1.32	107.5
64	31,346.8	352	0.010623	333.00	19.00	18.25	1.04	105.7
65	43,127.8	471	0.011265	485.86	–14.86	22.04	–0.67	96.9
66	56,005.5	679	0.012000	672.06	6.94	25.92	0.27	101.0
67	50,661.5	657	0.012837	650.35	6.65	25.50	0.26	101.0
68	44,613.3	559	0.013790	615.22	–56.22	24.80	–2.27	90.9
69	39,339.5	546	0.014873	585.09	–39.09	24.19	–1.62	93.3
70	35,329.8	547	0.016103	568.92	–21.92	23.85	–0.92	96.1
71	31,146.8	574	0.017500	545.06	28.94	23.35	1.24	105.3
72	26,275.0	552	0.019086	501.48	50.52	22.39	2.26	110.1
73	21,222.8	400	0.020887	443.28	–43.28	21.05	–2.06	90.2
74	16,678.8	389	0.022933	382.50	6.50	19.56	0.33	101.7
75	13,633.5	340	0.025259	344.37	–4.37	18.56	–0.24	98.7
76	10,866.8	281	0.027905	303.24	–22.24	17.41	–1.28	92.7
77	8,316.8	268	0.030915	257.12	10.88	16.03	0.68	104.2
78	6,310.8	229	0.034344	216.74	12.26	14.72	0.83	105.7
79	4,687.0	157	0.038250	179.28	–22.28	13.39	–1.66	87.6
80	3,361.3	134	0.042704	143.54	–9.54	11.98	–0.80	93.4
81	2,360.3	134	0.047786	112.79	21.21	10.62	2.00	118.8
82	1,617.5	97	0.053586	86.68	10.32	9.31	1.11	111.9
83	1,101.0	69	0.060210	66.29	2.71	8.14	0.33	104.1
84	762.5	56	0.067778	51.68	4.32	7.19	0.60	108.4
85	548.5	41	0.076427	41.92	–0.92	6.47	–0.14	97.8

Table 5.8. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
86	383.0	38	0.086314	33.06	4.94	5.75	0.86	114.9
87	216.0	32	0.097618	21.09	10.91	4.59	2.38	151.8
88	100.5	9	0.110542	11.11	–2.11	3.33	–0.63	81.0
89	38.5	13	0.125319	4.82	8.18			
90	17.0	6	0.142210	2.42	3.58			
89-90	55.5	19		7.24	11.76	2.69	4.37	262.3
Totals	682,471.1	9,688		9,682.74	5.26			100.1

Table 5.9. Details of graduations for male personal pensioners, combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	7,897.1	2	0.000435	3.44	–1.44			
21	12,862.6	4	0.000439	5.64	–1.64			
20-21	20,759.7	6		9.08	–3.08	3.01	–1.02	66.1
22	19,258.4	12	0.000443	8.52	3.48	2.92	1.19	140.8
23	26,954.0	16	0.000447	12.06	3.94	3.47	1.14	132.7
24	37,232.0	23	0.000453	16.86	6.14	4.11	1.50	136.4
25	51,799.6	30	0.000460	23.80	6.20	4.88	1.27	126.0
26	72,199.2	28	0.000467	33.75	–5.75	5.81	–0.99	83.0
27	98,736.3	57	0.000477	47.07	9.93	6.86	1.45	121.1
28	131,042.7	55	0.000488	63.92	–8.92	7.99	–1.12	86.1
29	165,003.0	99	0.000501	82.62	16.38	9.09	1.80	119.8
30	196,619.5	80	0.000516	101.44	–21.44	10.07	–2.13	78.9
31	224,169.3	123	0.000534	119.65	3.35	10.94	0.31	102.8
32	247,043.0	139	0.000555	137.00	2.00	11.70	0.17	101.5
33	266,306.0	139	0.000579	154.13	–15.13	12.41	–1.22	90.2
34	283,178.6	203	0.000607	171.86	31.14	13.11	2.38	118.1
35	296,689.4	192	0.000639	189.72	2.28	13.77	0.17	101.2
36	305,925.8	218	0.000677	207.14	10.86	14.39	0.75	105.2
37	311,064.4	217	0.000720	224.10	–7.10	14.97	–0.47	96.8
38	311,424.0	232	0.000770	239.86	–7.86	15.49	–0.51	96.7
39	306,856.6	216	0.000827	253.84	–37.84	15.93	–2.38	85.1
40	299,589.2	287	0.000892	267.36	19.64	16.35	1.20	107.3
41	292,328.6	283	0.000972	284.27	–1.27	16.86	–0.08	99.6
42	285,046.1	283	0.001064	303.19	–20.19	17.41	–1.16	93.3
43	276,234.4	325	0.001167	322.42	2.58	17.96	0.14	100.8
44	267,434.7	287	0.001284	343.48	–56.48	18.53	–3.05	83.6
45	258,430.5	357	0.001416	366.05	–9.05	19.13	–0.47	97.5
46	251,858.9	403	0.001565	394.12	8.88	19.85	0.45	102.3
47	245,596.7	454	0.001731	425.14	28.86	20.62	1.40	106.8
48	241,117.9	497	0.001917	462.15	34.85	21.50	1.62	107.5
49	238,324.4	493	0.002123	506.06	–13.06	22.50	–0.58	97.4
50	238,295.7	545	0.002353	560.71	–15.71	23.68	–0.66	97.2
51	243,719.4	601	0.002607	635.44	–34.44	25.21	–1.37	94.6
52	253,089.5	784	0.002888	730.98	53.02	27.04	1.96	107.3
53	253,614.7	805	0.003198	811.07	–6.07	28.48	–0.21	99.3
54	242,908.5	873	0.003539	859.62	13.38	29.32	0.46	101.6
55	227,384.4	897	0.003913	889.79	7.21	29.83	0.24	100.8

Table 5.9. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
56	205,243.3	894	0.004323	887.35	6.65	29.79	0.22	100.7
57	182,148.2	903	0.004772	869.28	33.72	29.48	1.14	103.9
58	161,452.4	749	0.005263	849.72	–100.72	29.15	–3.46	88.1
59	140,845.5	873	0.005798	816.69	56.31	28.58	1.97	106.9
60	123,473.9	783	0.006382	788.03	–5.03	28.07	–0.18	99.4
61	112,058.4	844	0.007018	786.41	57.59	28.04	2.05	107.3
62	104,955.0	809	0.007710	809.17	–0.17	28.45	–0.01	100.0
63	97,653.2	855	0.008462	826.34	28.66	28.75	1.00	103.5
64	89,010.9	827	0.009280	826.00	1.00	28.74	0.03	100.1
65	80,286.0	781	0.010168	816.38	–35.38	28.57	–1.24	95.7
66	72,774.9	831	0.011134	810.26	20.74	28.47	0.73	102.6
67	63,989.9	796	0.012183	779.57	16.43	27.92	0.59	102.1
68	55,604.2	684	0.013322	740.78	–56.78	27.22	–2.09	92.3
69	48,705.4	658	0.014561	709.21	–51.21	26.63	–1.92	92.8
70	42,757.1	636	0.015908	680.19	–44.19	26.08	–1.69	93.5
71	36,545.9	651	0.017374	634.95	16.05	25.20	0.64	102.5
72	30,597.5	615	0.019086	583.97	31.03	24.17	1.28	105.3
73	24,685.4	467	0.020887	515.60	–48.60	22.71	–2.14	90.6
74	19,422.4	463	0.022933	445.42	17.58	21.10	0.83	103.9
75	14,837.0	364	0.025259	374.77	–10.77	19.36	–0.56	97.1
76	10,897.8	281	0.027905	304.10	–23.10	17.44	–1.32	92.4
77	8,332.8	268	0.030915	257.61	10.39	16.05	0.65	104.0
78	6,319.8	230	0.034344	217.05	12.95	14.73	0.88	106.0
79	4,691.5	158	0.038250	179.45	–21.45	13.40	–1.60	88.0
80	3,363.3	134	0.042704	143.63	–9.63	11.98	–0.80	93.3
81	2,360.8	134	0.047786	112.81	21.19	10.62	1.99	118.8
82	1,617.5	97	0.053586	86.68	10.32	9.31	1.11	111.9
83	1,101.0	69	0.060210	66.29	2.71	8.14	0.33	104.1
84	762.5	56	0.067778	51.68	4.32	7.19	0.60	108.4
85	548.5	41	0.076427	41.92	–0.92	6.47	–0.14	97.8
86	383.0	38	0.086314	33.06	4.94	5.75	0.86	114.9
87	216.0	32	0.097618	21.09	10.91	4.59	2.38	151.8
88	100.5	9	0.110542	11.11	–2.11	3.33	–0.63	81.0
89	38.5	13	0.125319	4.82	8.18			
90	17.0	6	0.142210	2.42	3.58			
89-90	55.5	19		7.24	11.76	2.69	4.37	262.3
Totals	9,235,032.1	26,308		26,342.10	–34.10			99.9

Table 5.10. Details of graduations for female personal pensioners, deferred: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	4,721.3	0	0.000082	0.39	–0.39			
21	8,219.4	0	0.000093	0.76	–0.76			
22	12,740.3	6	0.000104	1.32	4.68			
23	18,564.8	2	0.000116	2.16	–0.16			
24	26,603.6	4	0.000130	3.47	0.53			
20-24	70,849.4	12		8.10	3.90	2.85	1.37	148.1
25	37,985.1	5	0.000146	5.54	–0.54	2.35	–0.23	90.3
26	54,195.4	9	0.000163	8.83	0.17	2.97	0.06	102.0
27	75,298.2	20	0.000182	13.68	6.32	3.70	1.71	146.2
28	100,140.2	31	0.000203	20.28	10.72	4.50	2.38	152.8
29	125,264.9	27	0.000226	28.25	–1.25	5.32	–0.24	95.6
30	146,628.8	34	0.000251	36.78	–2.78	6.06	–0.46	92.4
31	163,279.1	38	0.000279	45.50	–7.50	6.75	–1.11	83.5
32	173,867.3	48	0.000309	53.78	–5.78	7.33	–0.79	89.3
33	180,238.6	56	0.000343	61.80	–5.80	7.86	–0.74	90.6
34	183,296.6	77	0.000380	69.59	7.41	8.34	0.89	110.6
35	182,714.9	84	0.000420	76.74	7.26	8.76	0.83	109.5
36	178,740.9	66	0.000464	82.94	–16.94	9.11	–1.86	79.6
37	172,145.2	83	0.000512	88.17	–5.17	9.39	–0.55	94.1
38	163,829.6	79	0.000565	92.51	–13.51	9.62	–1.40	85.4
39	154,033.6	99	0.000622	95.79	3.21	9.79	0.33	103.4
40	144,736.3	114	0.000684	99.02	14.98	9.95	1.51	115.1
41	137,104.4	119	0.000752	103.07	15.93	10.15	1.57	115.5
42	130,749.2	87	0.000825	107.90	–20.90	10.39	–2.01	80.6
43	125,500.2	113	0.000905	113.56	–0.56	10.66	–0.05	99.5
44	120,933.1	121	0.000991	119.85	1.15	10.95	0.10	101.0
45	117,572.4	128	0.001084	127.49	0.51	11.29	0.05	100.4
46	114,903.3	138	0.001185	136.17	1.83	11.67	0.16	101.3
47	112,269.9	142	0.001294	145.25	–3.25	12.05	–0.27	97.8
48	110,382.6	156	0.001411	155.73	0.27	12.48	0.02	100.2
49	109,140.6	163	0.001537	167.73	–4.73	12.95	–0.37	97.2
50	107,138.2	210	0.001672	179.16	30.84	13.38	2.30	117.2
51	104,724.9	202	0.001818	190.34	11.66	13.80	0.84	106.1
52	103,536.6	210	0.001973	204.32	5.68	14.29	0.40	102.8
53	99,181.2	217	0.002140	212.27	4.73	14.57	0.32	102.2
54	90,754.9	193	0.002319	210.43	–17.43	14.51	–1.20	91.7
55	81,204.9	194	0.002509	203.76	–9.76	14.27	–0.68	95.2

Table 5.10. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
56	70,501.2	206	0.002712	191.22	14.78	13.83	1.07	107.7
57	60,934.8	185	0.002929	178.47	6.53	13.36	0.49	103.7
58	52,989.0	143	0.003159	167.40	–24.40	12.94	–1.89	85.4
59	45,017.2	159	0.003404	153.23	5.77	12.38	0.47	103.8
60	31,597.0	99	0.003663	115.75	–16.75	10.76	–1.56	85.5
61	18,637.4	84	0.003938	73.40	10.60	8.57	1.24	114.4
62	15,645.8	71	0.004229	66.17	4.83	8.13	0.59	107.3
63	13,136.9	56	0.004537	59.60	–3.60	7.72	–0.47	94.0
64	11,059.0	47	0.004862	53.76	–6.76	7.33	–0.92	87.4
65	7,868.1	41	0.005204	40.94	0.06	6.40	0.01	100.1
66	4,902.2	25	0.005564	27.28	–2.28	5.22	–0.44	91.7
67	3,902.7	20	0.005942	23.19	–3.19	4.82	–0.66	86.2
68	3,190.8	17	0.006340	20.23	–3.23	4.50	–0.72	84.0
69	2,664.4	19	0.006756	18.00	1.00	4.24	0.24	105.5
70	2,023.9	16	0.007192	14.56	1.44	3.82	0.38	109.9
71	1,381.3	9	0.007648	10.56	–1.56	3.25	–0.48	85.2
72	1,070.1	10	0.008124	8.69	1.31	2.95	0.44	115.0
73	807.5	18	0.008620	6.96	11.04	2.64	4.18	258.6
74	643.5	6	0.009136	5.88	0.12			
75	257.5	0	0.009672	2.49	–2.49			
74-75	901.0	6		8.37	–2.37	2.89	–0.82	71.7
Totals	4,320,570.8	4,506		4,502.11	3.89			100.1

Table 5.11. Details of graduations for female personal pensioners, vested: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	1,821.0	5	0.004167	7.59	–2.59	2.75	–0.94	65.9
51	3,541.5	15	0.004183	14.81	0.19	3.85	0.05	101.3
52	4,575.0	18	0.004203	19.23	–1.23	4.38	–0.28	93.6
53	5,518.5	20	0.004227	23.33	–3.33	4.83	–0.69	85.7
54	6,313.3	30	0.004257	26.88	3.12	5.18	0.60	111.6
55	7,247.8	29	0.004295	31.13	–2.13	5.58	–0.38	93.2
56	7,976.5	31	0.004340	34.62	–3.62	5.88	–0.62	89.5
57	8,305.0	46	0.004396	36.51	9.49	6.04	1.57	126.0
58	8,685.0	38	0.004465	38.78	–0.78	6.23	–0.13	98.0
59	8,934.5	54	0.004549	40.64	13.36	6.38	2.09	132.9
60	15,891.8	71	0.004652	73.92	–2.92	8.60	–0.34	96.0
61	25,120.5	115	0.004776	119.98	–4.98	10.95	–0.45	95.8
62	23,732.5	126	0.004928	116.95	9.05	10.81	0.84	107.7
63	21,584.0	116	0.005111	110.32	5.68	10.50	0.54	105.1
64	19,262.8	94	0.005334	102.74	–8.74	10.14	–0.86	91.5
65	18,240.0	72	0.005602	102.18	–30.18	10.11	–2.99	70.5
66	17,434.5	91	0.005926	103.31	–12.31	10.16	–1.21	88.1
67	14,815.3	109	0.006315	93.56	15.44	9.67	1.60	116.5
68	12,347.3	95	0.006782	83.74	11.26	9.15	1.23	113.4
69	10,189.5	95	0.007341	74.81	20.19	8.65	2.33	127.0
70	8,487.8	59	0.008010	67.99	–8.99	8.25	–1.09	86.8
71	7,129.3	79	0.008809	62.80	16.20	7.92	2.04	125.8
72	5,871.5	56	0.009759	57.30	–1.30	7.57	–0.17	97.7
73	4,753.8	50	0.010888	51.76	–1.76	7.19	–0.24	96.6
74	3,749.5	28	0.012227	45.85	–17.85	6.77	–2.64	61.1
75	3,141.5	33	0.013812	43.39	–10.39	6.59	–1.58	76.1
76	2,361.5	37	0.015684	37.04	–0.04	6.09	–0.01	99.9
77	1,750.3	34	0.017890	31.31	2.69	5.60	0.48	108.6
78	1,379.8	37	0.020485	28.27	8.73	5.32	1.64	130.9
79	1,085.5	26	0.023531	25.54	0.46	5.05	0.09	101.8
80	819.3	26	0.027100	22.20	3.80	4.71	0.81	117.1
81	595.3	12	0.031271	18.62	–6.62	4.31	–1.53	64.5
82	410.0	12	0.036138	14.82	–2.82	3.85	–0.73	81.0
83	276.0	12	0.041804	11.54	0.46	3.40	0.14	104.0
84	190.5	16	0.048387	9.22	6.78	3.04	2.23	173.6
85	128.0	2	0.056020	7.17	–5.17	2.68	–1.93	27.9

Table 5.11. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
86	82.0	8	0.064852	5.32	2.68	2.31	1.16	150.4
87	53.0	3	0.075050	3.98	–0.98			
88	29.0	2	0.086801	2.52	–0.52			
89	13.5	0	0.100314	1.35	–1.35			
90	6.0	1	0.115820	0.69	0.31			
87-90	101.5	6		8.54	–2.54	2.92	–0.87	70.2
Totals	283,849.4	1,803		1,803.69	–0.69			100.0

Table 5.12. Details of graduations for female personal pensioners, combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	4,724.8	0	0.000082	0.39	–0.39			
21	8,221.9	0	0.000093	0.76	–0.76			
22	12,740.8	6	0.000104	1.32	4.68			
23	18,564.8	2	0.000116	2.16	–0.16			
24	26,606.9	4	0.000130	3.47	0.53			
20-24	70,859.2	12		8.10	3.90	2.85	1.37	148.1
25	37,987.9	5	0.000146	5.54	–0.54	2.35	–0.23	90.3
26	54,199.4	9	0.000163	8.83	0.17	2.97	0.06	102.0
27	75,305.5	20	0.000182	13.69	6.31	3.70	1.71	146.1
28	100,153.5	31	0.000203	20.29	10.71	4.50	2.38	152.8
29	125,290.7	27	0.000226	28.26	–1.26	5.32	–0.24	95.5
30	146,677.6	34	0.000251	36.79	–2.79	6.07	–0.46	92.4
31	163,349.4	38	0.000279	45.52	–7.52	6.75	–1.12	83.5
32	173,949.6	49	0.000309	53.80	–4.80	7.33	–0.65	91.1
33	180,359.1	57	0.000343	61.84	–4.84	7.86	–0.62	92.2
34	183,460.9	77	0.000380	69.66	7.34	8.35	0.88	110.5
35	182,924.2	84	0.000420	76.82	7.18	8.76	0.82	109.3
36	178,971.4	67	0.000464	83.05	–16.05	9.11	–1.76	80.7
37	172,416.5	83	0.000512	88.31	–5.31	9.40	–0.56	94.0
38	164,136.1	80	0.000565	92.68	–12.68	9.63	–1.32	86.3
39	154,386.1	100	0.000622	96.01	3.99	9.80	0.41	104.2
40	145,153.8	114	0.000684	99.30	14.70	9.97	1.47	114.8
41	137,582.4	122	0.000752	103.43	18.57	10.17	1.83	118.0
42	131,295.2	88	0.000825	108.35	–20.35	10.41	–1.95	81.2
43	126,082.7	115	0.000905	114.09	0.91	10.68	0.09	100.8
44	121,529.9	123	0.000991	120.45	2.55	10.97	0.23	102.1
45	118,191.4	132	0.001084	128.16	3.84	11.32	0.34	103.0
46	115,624.6	141	0.001185	137.02	3.98	11.71	0.34	102.9
47	113,106.7	145	0.001294	146.33	–1.33	12.10	–0.11	99.1
48	111,305.6	157	0.001411	157.03	–0.03	12.53	–0.00	100.0
49	110,163.4	170	0.001537	169.30	0.70	13.01	0.05	100.4
50	108,959.2	215	0.001676	182.58	32.42	13.51	2.40	117.8
51	108,266.4	217	0.001830	198.11	18.89	14.08	1.34	109.5
52	108,111.6	228	0.001997	215.90	12.10	14.69	0.82	105.6
53	104,699.7	237	0.002178	228.05	8.95	15.10	0.59	103.9
54	97,068.2	223	0.002374	230.48	–7.48	15.18	–0.49	96.8
55	88,452.7	223	0.002587	228.81	–5.81	15.13	–0.38	97.5

Table 5.12. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
56	78,477.7	237	0.002817	221.04	15.96	14.87	1.07	107.2
57	69,239.8	231	0.003065	212.23	18.77	14.57	1.29	108.8
58	61,674.0	181	0.003334	205.62	–24.62	14.34	–1.72	88.0
59	53,951.7	213	0.003624	195.54	17.46	13.98	1.25	108.9
60	47,488.8	170	0.003938	187.02	–17.02	13.68	–1.24	90.9
61	43,757.9	199	0.004277	187.16	11.84	13.68	0.87	106.3
62	39,378.3	197	0.004644	182.85	14.15	13.52	1.05	107.7
63	34,720.9	172	0.005039	174.96	–2.96	13.23	–0.22	98.3
64	30,321.8	141	0.005466	165.75	–24.75	12.87	–1.92	85.1
65	26,108.1	113	0.005928	154.77	–41.77	12.44	–3.36	73.0
66	22,336.7	116	0.006427	143.55	–27.55	11.98	–2.30	80.8
67	18,718.0	129	0.006966	130.38	–1.38	11.42	–0.12	98.9
68	15,538.1	112	0.007548	117.28	–5.28	10.83	–0.49	95.5
69	12,853.9	114	0.008178	105.12	8.88	10.25	0.87	108.4
70	10,511.7	75	0.008859	93.12	–18.12	9.65	–1.88	80.5
71	8,510.6	88	0.009596	81.66	6.34	9.04	0.70	107.8
72	6,941.6	66	0.010393	72.15	–6.15	8.49	–0.72	91.5
73	5,561.3	68	0.011257	62.60	5.40	7.91	0.68	108.6
74	4,393.0	34	0.012227	53.71	–19.71	7.33	–2.69	63.3
75	3,399.0	33	0.013812	46.95	–13.95	6.85	–2.04	70.3
76	2,371.5	37	0.015684	37.19	–0.19	6.10	–0.03	99.5
77	1,752.8	34	0.017890	31.36	2.64	5.60	0.47	108.4
78	1,380.8	37	0.020485	28.29	8.71	5.32	1.64	130.8
79	1,086.0	26	0.023531	25.55	0.45	5.06	0.09	101.7
80	819.3	26	0.027100	22.20	3.80	4.71	0.81	117.1
81	595.3	12	0.031271	18.62	–6.62	4.31	–1.53	64.5
82	410.0	12	0.036138	14.82	–2.82	3.85	–0.73	81.0
83	276.0	12	0.041804	11.54	0.46	3.40	0.14	104.0
84	190.5	16	0.048387	9.22	6.78	3.04	2.23	173.6
85	128.0	2	0.056020	7.17	–5.17	2.68	–1.93	27.9
86	82.0	8	0.064852	5.32	2.68	2.31	1.16	150.4
87	53.0	3	0.075050	3.98	–0.98			
88	29.0	2	0.086801	2.52	–0.52			
89	13.5	0	0.100314	1.35	–1.35			
90	6.0	1	0.115820	0.69	0.31			
87-90	101.5	6		8.54	–2.54	2.92	–0.87	70.2
Totals	4,613,097.2	6,340		6,369.89	–29.89			99.5

6. LIFE OFFICE PENSIONERS

6.1 *The data*

6.1.1 This investigation covers the mortality experience of life office pensioners, i.e. retirements from occupational schemes where the benefits have been insured. It is carried out for both sexes, on the basis of both lives and amounts, and is sub-divided into those who retired at or after the normal retirement age for their scheme (referred to as 'Normal' retirements) and those who retired before their normal retirement age (referred to as 'Early' retirements).

6.1.2 The investigation is carried out by what is intended to be select duration since retirement. However, the number of those at select duration 0 at ages well above 65 must cast doubt over the coding by offices. Possibly some of these have been coded by duration since bulk purchase by scheme trustees of annuities for pensioners, or by duration since the last increment. Furthermore, while there is some evidence of select effects at shorter durations, the consultation process did not give rise to a desire for select rates to be graduated. Only the "all durations" experience is therefore considered.

6.1.3 Total numbers of exposed to risk and of deaths are shown in Tables 6.1 and 6.2. Data volumes have generally increased since 1991-1994. 'Early' (and hence 'Combined') data are not available for 1979-1982.

6.1.4 The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Table 6.3.

6.1.5 Average amounts per life, based on the whole age range, are shown in Table 6.4. As would be expected, with the effect of inflation, these have increased significantly since previous graduations, although it is interesting to note that they are much lower than corresponding average pensions observed in the self-administered pension schemes investigation.

6.2 *Ultimate graduations*

6.2.1 In previous graduations, only tables produced from the 'Normal' experience were officially adopted. For the "00" Series it was decided to expand the range of life office pensioner tables to include graduations of the 'Early' experience, and an aggregated 'Normal' and 'Early' experience, designated 'Combined' retirements.

6.2.2 These were produced separately for males and females and for lives and amounts, giving a total of twelve life office pensioner tables. The key statistics from the resulting unadjusted ultimate graduations are shown in Tables 6.5 to 6.7. These tables also show the '–Log likelihood' value calculated from the adjusted ultimate graduations.

6.2.3 For the amounts experiences, exposures and deaths were divided by a 'scaling factor' based on the average pension size for the relevant experience. This does not affect the crude or graduated mortality rates, but does allow more meaningful statistical tests to be carried out. The scaling factors, shown in Tables 6.5 to 6.7, were based on the data in the relevant fitted age ranges, and so are not the same as the respective average pension amounts shown in Table 6.4. However, it should be borne in mind that the test results for amounts graduations should be viewed as only approximate for this reason and that the serial correlation tests and chi-squared tests are very unreliable.

6.3 *Adjustments*

6.3.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages, though the "run-in" age and the "curvature" parameter did vary by category. These are summarised in the table below.

Table	Run-in age	Curvature
Male, Normal, Lives	96	0.75
Male, Early, Lives	96	0.75
Male, Combined, Lives	97	0.80
Male, Normal, Amounts	97	0.70
Male, Early, Amounts	94	0.70
Male, Combined, Amounts	97	0.80

Table	Run-in age	Curvature
Female, Normal, Lives	97	0.85
Female, Early, Lives	95	0.80
Female, Combined, Lives	97	0.90
Female, Normal, Amounts	97	0.90
Female, Early, Amounts	95	0.70
Female, Combined, Amounts	97	0.90

6.3.2 There is very little data at younger ages, and so the 'Early' and 'Combined' tables have been produced to start at age 50. (But see Section 8 for a description of subsequent work, not part of the officially adopted "00" Series, on extending these tables to younger ages.) For 'Normals', however, the rates were extended down to age 20. The observed mortality rates at these younger ages were relatively high, suggesting that the data may in fact contain a proportion of ill-health retirements. The decision was therefore taken to produce a 'healthy' lives extension (as was the case with previous graduations). The method adopted was to find a GM(1,2) formula that satisfied the following:

— $\mu_{20} = \mu_{20}$ from AMC00 (males) or AFC00 (females)
— $D\mu_{20} = D\mu_{20}$ from AMC00 (males) or AFC00 (females)
— $\mu_{65} = \mu_{65}$ from graduated pensioner table for 'Normals'

where $D\mu_{20}$ represents the derivative of the curve at age 20.

6.3.3 Optimal parameters for the GM(1,2) function were found using the Microsoft Excel 'Solver' tool. It is recognised that this results in a discontinuity in the derivative at age 65. The choice of a GM(1,2) function was arbitrary in order to generate the appropriate shape. The parameters of the GM(1,2) functions are shown in Table 6.5.

6.3.4 For female 'Earlies' and 'Combined', the graduated curves exhibited a 'U-shape' at the younger ages. This was retained for the 'Earlies', but was partly removed for the 'Combined'. This was done by starting with arbitrary values of μ_{16} and blending them, using the method described in Paragraph 1.2.5 above, into the graduated values of μ_{57} for amounts and μ_{54} for lives. The starting values of μ_{16} are 0.00347646 for lives and 0.00332832 for amounts, and in each case the "curvature" parameter is 1.0.

6.3.5 In addition, the resulting curves sometimes crossed over in undesirable ways, generally at the younger or older ages. These tend to be features of the curves, rather than the actual data, which are sparse at the extremities of age. A number of constraints were therefore applied to ensure that the relativities of the different tables remained 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, separately for the amounts and lives experiences, to be:

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

6.3.6 Some further adjustments were made, for example to ensure that female rates did not exceed equivalent male rates and that amounts rates did not exceed equivalent lives rates, as listed below:

- For male amounts, rates for 'Normals' would exceed those for 'Combined' between ages 81.99 and 90.03 and so are constrained to equal the 'Combined' rates. Above age 90.03 the rates for 'Normals' would then fall back below those for 'Combined'. However, it was felt that once there had been a crossing over, the 'Combined' rates should be maintained for the older ages even though the graduated rates at these ages were lower than the 'Combined' rates.
- Further adjustments for males were made after a comparison of lives against amounts. Mortality rates for male lives were lower than for amounts from age 89.77 for 'Combined', from age 89.33 for 'Normals' and from age 90.67 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 98.49 onwards, and for 'Combined' and 'Normals' from age 89.77 onwards.

— For female 'Earlies', amounts the use of a GM(0,5) curve causes 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. It was therefore decided to set the 'Early' amounts rates equal to the 'Early' lives rates up to age 51.03. In addition, the graduated amounts rates above age 88.37 are higher than for lives. The amounts rates were therefore set to equal the lives rates at these ages to ensure the resulting rates did not exceed the equivalent male rates.

— At older ages, for 'Combined' amounts, the female rates rise above the male rates from age 105.60 and for 'Combined' lives from age 102.87. These rates have been adjusted to equal the equivalent male rates from these ages.

— For female 'Normal' lives, 'Combined' rates are adopted between ages 100.03 and 105.32 even though the 'Normal' lives rates are lower than the 'Combined' rates at these ages following a crossover in the rates at age 90.49 (similar to the adjustments made in the case of male 'Normal' amounts.)

6.3.7 The effect of the adjustments can be seen in Tables 6.8 to 6.11, which show the calculated values of μ_x both pre- and post-adjustments. Adjusted values that differ from unadjusted values are highlighted in bold.

6.3.8 Details of the ultimate rates graduations, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in Tables 6.12 to 6.23.

Table 6.1. Pensioners, males, lives and amounts, all durations: Normal, Early and Combined: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Normal			
Lives			
Central exposed	1,044,662.0	989,283.9	1,377,059.5
Deaths	53,571	63,614	85,426
Amounts £			
Central exposed	2,495,288,364.5	1,379,231,516.2	446,740,045.5
Deaths	85,770,581	46,124,571	20,021,034
Early			
Lives			
Central exposed	543,928.5	484,250.5	-
Deaths	20,239	22,344	-
Amounts £			
Central exposed	1,399,271,076.0	757,363,502.5	-
Deaths	34,745,283	19,595,649	-
Combined			
Lives			
Central exposed	1,588,590.5	1,473,534.4	-
Deaths	73,810	85,958	-
Amounts £			
Central exposed	3,894,559,440.5	2,136,595,018.7	-
Deaths	120,515,864	65,720,220	-

Table 6.2. Pensioners, females, lives and amounts, all durations: Normal, Early and Combined: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Normal			
Lives			
Central exposed	464,155.5	354,628.5	336,887.0
Deaths	14,317	13,272	10,536
Amounts £			
Central exposed	590,772,390.0	289,720,365.4	64,781,941.0
Deaths	12,013,916	5,620,576	1,445,796
Early			
Lives			
Central exposed	198,566.5	119,041.1	-
Deaths	3,621	2,750	-
Amounts £			
Central exposed	214,218,226.5	84,476,027.1	-
Deaths	2,706,970	1,188,352	-
Combined			
Lives			
Central exposed	662,722.0	473,669.6	-
Deaths	17,938	16,022	-
Amounts £			
Central exposed	804,990,616.5	374,196,392.5	-
Deaths	14,720,886	6,808,928	-

Table 6.3. Pensioners, males and females, lives: age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Normal	27-108	37-101	51-102
Early	10-108	35-97	51-98
Combined	10-108	35-101	48-102
Females			
Normal	25-108	38-101	54-103[†]
Early	10-105	37-94	52-96
Combined	10-108	34-101	49-103

[†] Some other single ages outside the range given meet the criterion.

Table 6.4. Pensioners, males and females: average amounts per life by exposed to risk for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Males			
Normal	£2,388.61	£1,394.17	£324.42
Early	£2,572.53	£1,563.99	
Combined	£2,451.58	£1,449.98	
Females			
Normal	£1,272.79	£816.97	£192.30
Early	£1,078.82	£709.64	
Combined	£1,214.67	£789.99	

Table 6.5. Unadjusted graduations of the Normal pensioners ultimate experience: key statistics.

Sex	Males	Males	Females	Females
Lives/Amounts	Lives	Amounts	Lives	Amounts
For ages 65 and over:				
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
T-ratio	18.3	17.1	–5.5	–4.0
$100\times a_2$			–3.778481	–2.532105
T-ratio			–6.5	–4.9
b_1	–10.196636	–7.397703	–3.602183	–3.894701
T-ratio	–12.9	–27.5	–38.8	–36.3
b_2	15.407579	9.134072	4.552974	4.973934
T-ratio	8.9	34.2	26.8	22.2
b_3	–5.859048	–2.868544		
T-ratio	–7.7	–12.3		
b_4	1.872415			
T-ratio	4.2			
–Log likelihood	192,032.5	144,335.5	54,657.2	41,343.3
–Log likelihood (adj.)*	192,149.0	144,408.0	54,685.9	41,355.0
Sign test: +/–	20 / 30	21 / 27	24 / 26	24 / 25
Sign test: p(pos)	0.1013	0.2354	0.4439	0.5000
Runs test: p(runs)	0.5000	0.7104	0.0315	0.5000
K-S test: $p(KS)$	0.9951	0.5672	0.6048	0.1325
Serial correlation test:				
T-ratio 1	0.33	–0.72	1.93	0.11
T-ratio 2	–1.83	–1.19	–0.06	–0.96
T-ratio 3	–0.64	0.16	1.31	–0.82
χ^2 test:				
χ^2	88.59	276.59	89.09	332.61
Degrees of freedom	45	44	46	45
$p(\chi^2)$	0.0001	0.0000	0.0001	0.0000
For ages below 65:				
GM formula	GM(1,2)	GM(1,2)	GM(1,2)	GM(1,2)
Optimised parameters:				
$100\times a_1$	0.044516	0.044442	0.014382	0.014225
b_1	–3.706861	–3.955698	–4.429354	–4.574768
b_2	7.228252	6.938504	5.535225	5.357102

* Calculated from adjusted ultimate graduations.

Table 6.6. Unadjusted graduations of the Early pensioners ultimate experience: key statistics.

Sex	Males	Males	Females	Females
Lives/Amounts	Lives	Amounts	Lives	Amounts
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	
T-ratio	15.8	–0.5	–3.2	
$100\times a_2$			–6.446960	
T-ratio			–4.2	
b_1	–8.903854	–2.410636	–3.065582	7.065115
T-ratio	–10.6	–3.9	–14.9	4.1
b_2	13.353462	0.481060	3.595655	–5.594119
T-ratio	6.4	0.6	10.0	–5.3
b_3	–4.913046	1.470896		15.031700
T-ratio	–6.0	3.1		6.2
b_4	1.645541	–1.565250		–3.988009
T-ratio	2.7	–6.0		–10.0
b_5				3.700078
T-ratio				5.0
–Log likelihood	78,330.7	59,273.8	16,016.2	12,428.2
–Log likelihood (adj.)*	78,332.3	59,273.4	16,016.6	12,432.9
Sign test: +/–	23 / 27	23 / 25	26 / 24	20 / 29
Sign test: p(pos)	0.3359	0.4427	0.5561	0.1264
Runs test: p(runs)	0.8534	0.3341	0.4466	0.5969
K-S test: $p(KS)$	1.0000	0.8208	1.0000	1.0000
Serial correlation test:				
T-ratio 1	–1.76	–0.36	0.10	–2.06
T-ratio 2	–0.11	–0.86	–1.32	–1.30
T-ratio 3	0.72	–1.82	–0.83	1.20
χ^2 test:				
χ^2	45.27	189.76	54.09	193.39
Degrees of freedom	45	43	46	44
$p(\chi^2)$	0.4607	0.0000	0.1929	0.0000

* Calculated from adjusted ultimate graduations, assuming Working Paper 26 extensions below age 50.

Table 6.7. Unadjusted graduations of the Combined pensioners ultimate experience: key statistics.

Sex	Males	Males	Females	Females
Lives/Amounts	Lives	Amounts	Lives	Amounts
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
T-ratio	24.8	19.7	–6.6	–5.3
$100\times a_2$			–4.144155	–3.607197
T-ratio			–8.1	–6.9
b_1	–9.258547	–6.688640	–3.511518	–3.693170
T-ratio	–16.8	–31.9	–43.3	–37.7
b_2	13.714773	8.359170	4.377971	4.602553
T-ratio	11.0	41.5	29.3	23.1
b_3	–5.064792	–2.286393		
T-ratio	–9.6	–12.3		
b_4	1.565239			
T-ratio	4.6			
–Log likelihood	270,457.6	202,873.3	70,699.7	54,383.3
–Log likelihood (adj.)*	270,462.9	202,873.3	70,700.8	54,387.8
Sign test: +/–	24 / 28	25 / 25	26 / 27	25 / 26
Sign test: *p*(pos)	0.3389	0.5000	0.5000	0.5000
Runs test: *p*(runs)	0.5720	0.6646	0.1334	0.1981
K-S test: *p*(*KS*)	1.0000	0.2983	0.4407	0.1156
Serial correlation test:				
T-ratio 1	0.33	–1.13	1.40	0.04
T-ratio 2	–0.56	0.09	0.11	–1.38
T-ratio 3	0.75	–0.16	0.76	–0.90
χ^2 test:				
χ^2	80.48	259.21	95.90	330.33
Degrees of freedom	47	46	49	47
$p(\chi^2)$	0.0017	0.0000	0.0001	0.0000

* Calculated from adjusted ultimate graduations, assuming Working Paper 26 extensions below age 50.

Table 6.8. Pensioners, males, lives, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
20		0.000463			0.000463	
21		0.000466			0.000466	
22		0.000469			0.000469	
23		0.000473			0.000473	
24		0.000477			0.000477	
25		0.000482			0.000482	
26		0.000488			0.000488	
27		0.000494			0.000494	
28		0.000502			0.000502	
29		0.000511			0.000511	
30		0.000521			0.000521	
31		0.000533			0.000533	
32		0.000546			0.000546	
33		0.000562			0.000562	
34		0.000580			0.000580	
35		0.000601			0.000601	
36		0.000625			0.000625	
37		0.000653			0.000653	
38		0.000686			0.000686	
39		0.000723			0.000723	
40		0.000766			0.000766	
41		0.000816			0.000816	
42		0.000874			0.000874	
43		0.000941			0.000941	
44		0.001018			0.001018	
45		0.001107			0.001107	
46		0.001210			0.001210	
47		0.001328			0.001328	
48		0.001466			0.001466	
49		0.001625			0.001625	
50	0.006820	0.001808	0.007413	**0.007413**	0.001808	0.007413
51	0.006860	0.002020	0.007439	**0.007439**	0.002020	0.007439
52	0.006917	0.002265	0.007477	**0.007477**	0.002265	0.007477
53	0.006995	0.002548	0.007529	**0.007529**	0.002548	0.007529
54	0.007102	0.002875	0.007602	**0.007602**	0.002875	0.007602
55	0.007245	0.003253	0.007701	**0.007701**	0.003253	0.007701

Table 6.8. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
56	0.007435	0.003690	0.007834	**0.007834**	0.003690	0.007834
57	0.007683	0.004194	0.008012	**0.008012**	0.004194	0.008012
58	0.008004	0.004778	0.008245	**0.008245**	0.004778	0.008245
59	0.008415	0.005451	0.008547	**0.008547**	0.005451	0.008547
60	0.008932	0.006230	0.008935	**0.008935**	0.006230	0.008935
61	0.009577	0.007130	0.009425	0.009577	0.007130	0.009425
62	0.010372	0.008169	0.010039	0.010372	0.008169	0.010039
63	0.011342	0.009371	0.010799	0.011342	0.009371	0.010799
64	0.012511	0.010759	0.011730	0.012511	0.010759	0.011730
65	0.013907	0.012363	0.012857	0.013907	0.012363	0.012857
66	0.015556	0.013548	0.014210	0.015556	0.013548	0.014210
67	0.017486	0.014981	0.015816	0.017486	0.014981	0.015816
68	0.019723	0.016695	0.017705	0.019723	0.016695	0.017705
69	0.022292	0.018723	0.019906	0.022292	0.018723	0.019906
70	0.025218	0.021098	0.022448	0.025218	0.021098	0.022448
71	0.028522	0.023851	0.025359	0.028522	0.023851	0.025359
72	0.032224	0.027012	0.028664	0.032224	0.027012	0.028664
73	0.036340	0.030609	0.032387	0.036340	0.030609	0.032387
74	0.040884	0.034665	0.036551	0.040884	0.034665	0.036551
75	0.045866	0.039201	0.041172	0.045866	0.039201	0.041172
76	0.051294	0.044235	0.046268	0.051294	0.044235	0.046268
77	0.057173	0.049779	0.051851	0.057173	0.049779	0.051851
78	0.063506	0.055843	0.057930	0.063506	0.055843	0.057930
79	0.070294	0.062434	0.064512	0.070294	0.062434	0.064512
80	0.077538	0.069554	0.071604	0.077538	0.069554	0.071604
81	0.085238	0.077204	0.079209	0.085238	0.077204	0.079209
82	0.093394	0.085386	0.087329	0.093394	0.085386	0.087329
83	0.102008	0.094098	0.095968	0.102008	0.094098	0.095968
84	0.111087	0.103343	0.105129	0.111087	0.103343	0.105129
85	0.120639	0.113124	0.114817	0.120639	0.113124	0.114817
86	0.130677	0.123448	0.125041	0.130677	0.123448	0.125041
87	0.141222	0.134327	0.135814	0.141222	0.134327	0.135814
88	0.152301	0.145782	0.147154	0.152301	0.145782	0.147154
89	0.163951	0.157840	0.159085	0.163951	0.157840	0.159085
90	0.176219	0.170540	0.171642	0.176219	**0.172287**	**0.172287**

Table 6.8. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
91	0.189161	0.183932	0.184865	**0.190266**	**0.188407**	**0.188407**
92	0.202852	0.198080	0.198809	**0.207197**	**0.205351**	**0.205351**
93	0.217378	0.213065	0.213541	**0.224658**	**0.223066**	**0.223066**
94	0.232846	0.228988	0.229142	**0.242468**	**0.241484**	**0.241484**
95	0.249382	0.245969	0.245711	**0.262982**	**0.260526**	**0.260526**
96	0.267137	0.264157	0.263367	**0.283745**	**0.280096**	**0.280096**
97	0.286290	0.283727	0.282251	**0.304769**	**0.300087**	**0.300087**
98	0.307053	0.304890	0.302531	**0.326069**	**0.324539**	**0.324539**
99	0.329676	0.327900	0.324405	**0.349215**	**0.349215**	**0.349215**
100	0.354456	0.353055	0.348109	**0.374128**	**0.374128**	**0.374128**
101	0.381743	0.380715	0.373919	**0.399290**	**0.399290**	**0.399290**
102	0.411954	0.411304	0.402163	**0.424719**	**0.424719**	**0.424719**
103	0.445585	0.445335	0.433227	**0.450433**	**0.450433**	**0.450433**
104	0.483228	0.483420	0.467569	**0.476450**	**0.476450**	**0.476450**
105	0.525592	0.526295	0.505733	**0.502796**	**0.502796**	**0.502796**
106	0.573532	0.574853	0.548366	**0.529495**	**0.529495**	**0.529495**
107	0.628081	0.630176	0.596244	**0.556579**	**0.556579**	**0.556579**
108	0.690493	0.693585	0.650294	**0.584083**	**0.584083**	**0.584083**
109	0.762299	0.766703	0.711637	**0.612050**	**0.612050**	**0.612050**
110	0.845378	0.851529	0.781629	**0.640531**	**0.640531**	**0.640531**
111	0.942050	0.950545	0.861917	**0.669588**	**0.669588**	**0.669588**
112	1.055192	1.066850	0.954517	**0.699300**	**0.699300**	**0.699300**
113	1.188394	1.204336	1.061906	**0.729766**	**0.729766**	**0.729766**
114	1.346165	1.367922	1.187142	**0.761118**	**0.761118**	**0.761118**
115	1.534199	1.563872	1.334025	**0.793539**	**0.793539**	**0.793539**
116	1.759739	1.800207	1.507303	**0.827293**	**0.827293**	**0.827293**
117	2.032049	2.087281	1.712942	**0.862799**	**0.862799**	**0.862799**
118	2.363071	2.438554	1.958486	**0.900806**	**0.900806**	**0.900806**
119	2.768293	2.871654	2.253534	**0.943028**	**0.943028**	**0.943028**
120	3.267959	3.409848	2.610380	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 6.9. Pensioners, males, amounts, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
20		0.000463			0.000463	
21		0.000466			0.000466	
22		0.000469			0.000469	
23		0.000473			0.000473	
24		0.000477			0.000477	
25		0.000482			0.000482	
26		0.000487			0.000487	
27		0.000493			0.000493	
28		0.000501			0.000501	
29		0.000509			0.000509	
30		0.000519			0.000519	
31		0.000530			0.000530	
32		0.000543			0.000543	
33		0.000557			0.000557	
34		0.000574			0.000574	
35		0.000593			0.000593	
36		0.000615			0.000615	
37		0.000641			0.000641	
38		0.000670			0.000670	
39		0.000704			0.000704	
40		0.000742			0.000742	
41		0.000787			0.000787	
42		0.000838			0.000838	
43		0.000896			0.000896	
44		0.000963			0.000963	
45		0.001041			0.001041	
46		0.001129			0.001129	
47		0.001231			0.001231	
48		0.001348			0.001348	
49		0.001483			0.001483	
50	0.004854	0.001638	0.005572	**0.005572**	0.001638	0.005572
51	0.004857	0.001815	0.005628	**0.005628**	0.001815	0.005628
52	0.004910	0.002019	0.005698	**0.005698**	0.002019	0.005698
53	0.005014	0.002254	0.005785	**0.005785**	0.002254	0.005785
54	0.005167	0.002523	0.005893	**0.005893**	0.002523	0.005893
55	0.005372	0.002833	0.006025	**0.006025**	0.002833	0.006025

Table 6.9. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
56	0.005631	0.003188	0.006188	**0.006188**	0.003188	0.006188
57	0.005949	0.003596	0.006387	**0.006387**	0.003596	0.006387
58	0.006328	0.004066	0.006630	**0.006630**	0.004066	0.006630
59	0.006776	0.004605	0.006925	**0.006925**	0.004605	0.006925
60	0.007298	0.005224	0.007281	0.007298	0.005224	0.007281
61	0.007904	0.005936	0.007710	0.007904	0.005936	0.007710
62	0.008602	0.006753	0.008224	0.008602	0.006753	0.008224
63	0.009404	0.007692	0.008839	0.009404	0.007692	0.008839
64	0.010323	0.008771	0.009570	0.010323	0.008771	0.009570
65	0.011373	0.010010	0.010437	0.011373	0.010010	0.010437
66	0.012570	0.010932	0.011459	0.012570	0.010932	0.011459
67	0.013935	0.012033	0.012661	0.013935	0.012033	0.012661
68	0.015488	0.013342	0.014068	0.015488	0.013342	0.014068
69	0.017253	0.014891	0.015709	0.017253	0.014891	0.015709
70	0.019259	0.016713	0.017614	0.019259	0.016713	0.017614
71	0.021534	0.018846	0.019816	0.021534	0.018846	0.019816
72	0.024112	0.021330	0.022353	0.024112	0.021330	0.022353
73	0.027030	0.024207	0.025262	0.027030	0.024207	0.025262
74	0.030329	0.027521	0.028583	0.030329	0.027521	0.028583
75	0.034052	0.031320	0.032360	0.034052	0.031320	0.032360
76	0.038245	0.035651	0.036637	0.038245	0.035651	0.036637
77	0.042960	0.040560	0.041459	0.042960	0.040560	0.041459
78	0.048249	0.046096	0.046873	0.048249	0.046096	0.046873
79	0.054165	0.052302	0.052924	0.054165	0.052302	0.052924
80	0.060766	0.059223	0.059659	0.060766	0.059223	0.059659
81	0.068105	0.066895	0.067121	0.068105	0.066895	0.067121
82	0.076238	0.075353	0.075352	0.076238	**0.075352**	0.075352
83	0.085215	0.084622	0.084390	0.085215	**0.084390**	0.084390
84	0.095080	0.094720	0.094269	0.095080	**0.094269**	0.094269
85	0.105870	0.105655	0.105018	0.105870	**0.105018**	0.105018
86	0.117611	0.117423	0.116660	0.117611	**0.116660**	0.116660
87	0.130313	0.130009	0.129207	0.130313	**0.129207**	0.129207
88	0.143971	0.143384	0.142665	0.143971	**0.142665**	0.142665
89	0.158556	0.157502	0.157030	0.158556	**0.157030**	0.157030
90	0.174015	0.172306	0.172287	0.174015	**0.172287**	0.172287

Table 6.9. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
91	0.190266	0.187719	0.188407	0.190266	**0.188407**	0.188407
92	0.207197	0.203650	0.205351	0.207197	**0.205351**	0.205351
93	0.224658	0.219993	0.223066	0.224658	**0.223066**	0.223066
94	0.242468	0.236625	0.241484	0.242468	**0.241484**	0.241484
95	0.260405	0.253411	0.260526	**0.262982**	**0.260526**	0.260526
96	0.278216	0.270202	0.280096	**0.283745**	**0.280096**	0.280096
97	0.295613	0.286841	0.300087	**0.304769**	**0.300087**	0.300087
98	0.312281	0.303159	0.320378	**0.326069**	**0.324539**	**0.324539**
99	0.327882	0.318985	0.340837	**0.349215**	**0.349215**	**0.349215**
100	0.342068	0.334145	0.361320	**0.374128**	**0.374128**	**0.374128**
101	0.354486	0.348462	0.381675	**0.399290**	**0.399290**	**0.399290**
102	0.364794	0.361767	0.401740	**0.424719**	**0.424719**	**0.424719**
103	0.372675	0.373896	0.421351	**0.450433**	**0.450433**	**0.450433**
104	0.377845	0.384696	0.440339	**0.476450**	**0.476450**	**0.476450**
105	0.380076	0.394027	0.458532	**0.502796**	**0.502796**	**0.502796**
106	0.379200	0.401768	0.475762	**0.529495**	**0.529495**	**0.529495**
107	0.375125	0.407814	0.491864	**0.556579**	**0.556579**	**0.556579**
108	0.367843	0.412084	0.506680	**0.584083**	**0.584083**	**0.584083**
109	0.357434	0.414520	0.520061	**0.612050**	**0.612050**	**0.612050**
110	0.344068	0.415088	0.531869	**0.640531**	**0.640531**	**0.640531**
111	0.328000	0.413781	0.541982	**0.669588**	**0.669588**	**0.669588**
112	0.309564	0.410616	0.550292	**0.699300**	**0.699300**	**0.699300**
113	0.289162	0.405637	0.556710	**0.729766**	**0.729766**	**0.729766**
114	0.267245	0.398911	0.561166	**0.761118**	**0.761118**	**0.761118**
115	0.244296	0.390529	0.563613	**0.793539**	**0.793539**	**0.793539**
116	0.220812	0.380603	0.564023	**0.827293**	**0.827293**	**0.827293**
117	0.197282	0.369261	0.562391	**0.862799**	**0.862799**	**0.862799**
118	0.174165	0.356649	0.558737	**0.900806**	**0.900806**	**0.900806**
119	0.151877	0.342925	0.553099	**0.943028**	**0.943028**	**0.943028**
120	0.130774	0.328255	0.545539	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 6.10. Pensioners, females, lives, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
20		0.000191			0.000191	
21		0.000196			0.000196	
22		0.000203			0.000203	
23		0.000209			0.000209	
24		0.000217			0.000217	
25		0.000226			0.000226	
26		0.000235			0.000235	
27		0.000246			0.000246	
28		0.000258			0.000258	
29		0.000271			0.000271	
30		0.000286			0.000286	
31		0.000303			0.000303	
32		0.000321			0.000321	
33		0.000342			0.000342	
34		0.000365			0.000365	
35		0.000391			0.000391	
36		0.000420			0.000420	
37		0.000453			0.000453	
38		0.000489			0.000489	
39		0.000529			0.000529	
40		0.000574			0.000574	
41		0.000625			0.000625	
42		0.000681			0.000681	
43		0.000744			0.000744	
44		0.000814			0.000814	
45		0.000893			0.000893	
46		0.000980			0.000980	
47		0.001078			0.001078	
48		0.001188			0.001188	
49		0.001310			0.001310	
50	0.006382	0.001446	0.005815	0.006382	0.001446	**0.004547**
51	0.005918	0.001599	0.005460	0.005918	0.001599	**0.004578**
52	0.005515	0.001769	0.005149	0.005515	0.001769	**0.004610**
53	0.005179	0.001959	0.004885	0.005179	0.001959	**0.004641**
54	0.004913	0.002172	0.004673	0.004913	0.002172	0.004673
55	0.004724	0.002409	0.004517	0.004724	0.002409	0.004517

Table 6.10. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
56	0.004617	0.002675	0.004422	0.004617	0.002675	0.004422
57	0.004597	0.002971	0.004395	0.004597	0.002971	0.004395
58	0.004673	0.003302	0.004442	0.004673	0.003302	0.004442
59	0.004851	0.003672	0.004568	0.004851	0.003672	0.004568
60	0.005137	0.004085	0.004782	0.005137	0.004085	0.004782
61	0.005542	0.004546	0.005091	0.005542	0.004546	0.005091
62	0.006072	0.005061	0.005504	0.006072	0.005061	0.005504
63	0.006739	0.005637	0.006031	0.006739	0.005637	0.006031
64	0.007551	0.006280	0.006682	0.007551	0.006280	0.006682
65	0.008519	0.006998	0.007469	0.008519	0.006998	0.007469
66	0.009657	0.007891	0.008403	0.009657	0.007891	0.008403
67	0.010975	0.008941	0.009499	0.010975	0.008941	0.009499
68	0.012487	0.010163	0.010771	0.012487	0.010163	0.010771
69	0.014209	0.011574	0.012235	0.014209	0.011574	0.012235
70	0.016155	0.013191	0.013909	0.016155	0.013191	0.013909
71	0.018342	0.015035	0.015811	0.018342	0.015035	0.015811
72	0.020788	0.017126	0.017964	0.020788	0.017126	0.017964
73	0.023513	0.019489	0.020390	0.023513	0.019489	0.020390
74	0.026538	0.022149	0.023113	0.026538	0.022149	0.023113
75	0.029883	0.025134	0.026162	0.029883	0.025134	0.026162
76	0.033575	0.028477	0.029565	0.033575	0.028477	0.029565
77	0.037638	0.032210	0.033355	0.037638	0.032210	0.033355
78	0.042100	0.036371	0.037569	0.042100	0.036371	0.037569
79	0.046991	0.041000	0.042243	0.046991	0.041000	0.042243
80	0.052342	0.046143	0.047421	0.052342	0.046143	0.047421
81	0.058189	0.051849	0.053149	0.058189	0.051849	0.053149
82	0.064568	0.058170	0.059477	0.064568	0.058170	0.059477
83	0.071519	0.065166	0.066460	0.071519	0.065166	0.066460
84	0.079084	0.072901	0.074158	0.079084	0.072901	0.074158
85	0.087309	0.081446	0.082635	0.087309	0.081446	0.082635
86	0.096244	0.090877	0.091965	0.096244	0.090877	0.091965
87	0.105941	0.101279	0.102224	0.105941	0.101279	0.102224
88	0.116457	0.112745	0.113498	0.116457	0.112745	0.113498
89	0.127853	0.125376	0.125879	0.127853	0.125376	0.125879
90	0.140196	0.139284	0.139468	0.140196	0.139284	0.139468

Table 6.10. (Continued.)

Age x	Unadjusted μ_x			Adjusted μ_x		
	Early	Normal	Combined	Early	Normal	Combined
91	0.153554	0.154589	0.154378	**0.154378**	**0.154378**	0.154378
92	0.168005	0.171426	0.170727	**0.170727**	**0.170727**	0.170727
93	0.183630	0.189939	0.188649	**0.188649**	**0.188649**	0.188649
94	0.200515	0.210290	0.208286	**0.208286**	**0.208286**	0.208286
95	0.218756	0.232653	0.229796	**0.229796**	**0.229796**	0.229796
96	0.238453	0.257220	0.253350	**0.253350**	**0.253350**	0.253350
97	0.259715	0.284200	0.279135	**0.279135**	**0.279135**	0.279135
98	0.282658	0.313825	0.307356	**0.307405**	**0.307405**	**0.307405**
99	0.307408	0.346347	0.338235	**0.335804**	**0.335804**	**0.335804**
100	0.334100	0.382041	0.372015	**0.364339**	**0.364339**	**0.364339**
101	0.362878	0.421210	0.408963	**0.393016**	**0.393016**	**0.393016**
102	0.393898	0.464185	0.449367	**0.421845**	**0.421845**	**0.421845**
103	0.427327	0.511329	0.493544	**0.450433**	**0.450433**	**0.450433**
104	0.463345	0.563039	0.541840	**0.476450**	**0.476450**	**0.476450**
105	0.502144	0.619751	0.594631	**0.502796**	**0.502796**	**0.502796**
106	0.543932	0.681942	0.652329	**0.529495**	**0.529495**	**0.529495**
107	0.588933	0.750134	0.715382	**0.556579**	**0.556579**	**0.556579**
108	0.637384	0.824899	0.784281	**0.584083**	**0.584083**	**0.584083**
109	0.689545	0.906864	0.859560	**0.612050**	**0.612050**	**0.612050**
110	0.745691	0.996714	0.941804	**0.640531**	**0.640531**	**0.640531**
111	0.806119	1.095203	1.031650	**0.669588**	**0.669588**	**0.669588**
112	0.871149	1.203153	1.129793	**0.699300**	**0.699300**	**0.699300**
113	0.941125	1.321466	1.236992	**0.729766**	**0.729766**	**0.729766**
114	1.016413	1.451131	1.354077	**0.761118**	**0.761118**	**0.761118**
115	1.097412	1.593229	1.481952	**0.793539**	**0.793539**	**0.793539**
116	1.184546	1.748946	1.621604	**0.827293**	**0.827293**	**0.827293**
117	1.278273	1.919580	1.774112	**0.862799**	**0.862799**	**0.862799**
118	1.379085	2.106554	1.940650	**0.900806**	**0.900806**	**0.900806**
119	1.487510	2.311424	2.122504	**0.943028**	**0.943028**	**0.943028**
120	1.604115	2.535898	2.321075	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 6.11. Pensioners, females, amounts, all durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
20		0.000191			0.000191	
21		0.000196			0.000196	
22		0.000202			0.000202	
23		0.000209			0.000209	
24		0.000217			0.000217	
25		0.000225			0.000225	
26		0.000235			0.000235	
27		0.000245			0.000245	
28		0.000257			0.000257	
29		0.000270			0.000270	
30		0.000284			0.000284	
31		0.000300			0.000300	
32		0.000318			0.000318	
33		0.000338			0.000338	
34		0.000360			0.000360	
35		0.000385			0.000385	
36		0.000412			0.000412	
37		0.000443			0.000443	
38		0.000477			0.000477	
39		0.000514			0.000514	
40		0.000557			0.000557	
41		0.000603			0.000603	
42		0.000656			0.000656	
43		0.000714			0.000714	
44		0.000778			0.000778	
45		0.000850			0.000850	
46		0.000930			0.000930	
47		0.001019			0.001019	
48		0.001118			0.001118	
49		0.001229			0.001229	
50	0.007001	0.001352	0.005517	**0.006382**	0.001352	**0.003919**
51	0.005930	0.001488	0.005177	**0.005918**	0.001488	**0.003936**
52	0.005204	0.001641	0.004873	0.005204	0.001641	**0.003954**
53	0.004719	0.001810	0.004609	0.004719	0.001810	**0.003971**
54	0.004408	0.001999	0.004389	0.004408	0.001999	**0.003988**
55	0.004231	0.002209	0.004218	0.004231	0.002209	**0.004006**

Table 6.11. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
56	0.004162	0.002442	0.004100	0.004162	0.002442	**0.004023**
57	0.004187	0.002703	0.004040	0.004187	0.002703	0.004040
58	0.004297	0.002992	0.004044	0.004297	0.002992	0.004044
59	0.004488	0.003314	0.004118	0.004488	0.003314	0.004118
60	0.004762	0.003673	0.004269	0.004762	0.003673	0.004269
61	0.005123	0.004073	0.004503	0.005123	0.004073	0.004503
62	0.005577	0.004517	0.004830	0.005577	0.004517	0.004830
63	0.006133	0.005012	0.005258	0.006133	0.005012	0.005258
64	0.006802	0.005562	0.005796	0.006802	0.005562	0.005796
65	0.007597	0.006175	0.006457	0.007597	0.006175	0.006457
66	0.008533	0.006963	0.007250	0.008533	0.006963	0.007250
67	0.009627	0.007887	0.008189	0.009627	0.007887	0.008189
68	0.010895	0.008960	0.009289	0.010895	0.008960	0.009289
69	0.012356	0.010198	0.010564	0.012356	0.010198	0.010564
70	0.014031	0.011618	0.012032	0.014031	0.011618	0.012032
71	0.015938	0.013240	0.013711	0.015938	0.013240	0.013711
72	0.018099	0.015085	0.015621	0.018099	0.015085	0.015621
73	0.020533	0.017175	0.017785	0.020533	0.017175	0.017785
74	0.023263	0.019537	0.020227	0.023263	0.019537	0.020227
75	0.026308	0.022200	0.022974	0.026308	0.022200	0.022974
76	0.029692	0.025193	0.026056	0.029692	0.025193	0.026056
77	0.033438	0.028553	0.029504	0.033438	0.028553	0.029504
78	0.037575	0.032317	0.033354	0.037575	0.032317	0.033354
79	0.042135	0.036528	0.037646	0.042135	0.036528	0.037646
80	0.047157	0.041232	0.042420	0.047157	0.041232	0.042420
81	0.052694	0.046482	0.047725	0.052694	0.046482	0.047725
82	0.058813	0.052333	0.053610	0.058813	0.052333	0.053610
83	0.065602	0.058849	0.060133	0.065602	0.058849	0.060133
84	0.073176	0.066100	0.067353	0.073176	0.066100	0.067353
85	0.081690	0.074162	0.075340	0.081690	0.074162	0.075340
86	0.091348	0.083120	0.084167	0.091348	0.083120	0.084167
87	0.102422	0.093068	0.093914	0.102422	0.093068	0.093914
88	0.115274	0.104110	0.104670	0.115274	0.104110	0.104670
89	0.130390	0.116360	0.116533	**0.127853**	0.116360	0.116533
90	0.148428	0.129944	0.129610	**0.140196**	**0.129610**	0.129610

Table 6.11. (Continued.)

	Unadjusted μ_x			Adjusted μ_x		
Age x	Early	Normal	Combined	Early	Normal	Combined
91	0.170284	0.145002	0.144017	**0.154378**	**0.144017**	0.144017
92	0.197197	0.161687	0.159882	**0.170727**	**0.159882**	0.159882
93	0.230898	0.180171	0.177347	**0.188649**	**0.177347**	0.177347
94	0.273851	0.200641	0.196566	**0.208286**	**0.196566**	0.196566
95	0.329617	0.223305	0.217707	**0.229796**	**0.217707**	0.217707
96	0.403443	0.248393	0.240956	**0.253350**	**0.240956**	0.240956
97	0.503221	0.276157	0.266517	**0.279135**	**0.266517**	0.266517
98	0.641085	0.306879	0.294611	**0.307405**	**0.295282**	**0.295282**
99	0.836137	0.340867	0.325484	**0.335804**	**0.324178**	**0.324178**
100	1.119227	0.378463	0.359404	**0.364339**	**0.353212**	**0.353212**
101	1.541565	0.420044	0.396663	**0.393016**	**0.382391**	**0.382391**
102	2.190692	0.466028	0.437585	**0.421845**	**0.411725**	**0.411725**
103	3.221062	0.516874	0.482522	**0.450433**	**0.441222**	**0.441222**
104	4.914589	0.573091	0.531861	**0.476450**	**0.470893**	**0.470893**
105	7.804889	0.635241	0.586027	**0.502796**	**0.500751**	**0.500751**
106	12.94220	0.703945	0.645486	**0.529495**	**0.529495**	**0.529495**
107	22.48182	0.779888	0.710747	**0.556579**	**0.556579**	**0.556579**
108	41.04930	0.863827	0.782370	**0.584083**	**0.584083**	**0.584083**
109	79.05874	0.956598	0.860969	**0.612050**	**0.612050**	**0.612050**
110	161.1876	1.059126	0.947215	**0.640531**	**0.640531**	**0.640531**
111	349.1956	1.172431	1.041848	**0.669588**	**0.669588**	**0.669588**
112	806.9146	1.297640	1.145674	**0.699300**	**0.699300**	**0.699300**
113	1996.753	1.435998	1.259581	**0.729766**	**0.729766**	**0.729766**
114	5312.813	1.588880	1.384541	**0.761118**	**0.761118**	**0.761118**
115	15263.11	1.757807	1.521619	**0.793539**	**0.793539**	**0.793539**
116	47549.26	1.944455	1.671984	**0.827293**	**0.827293**	**0.827293**
117	161339.5	2.150678	1.836916	**0.862799**	**0.862799**	**0.862799**
118	598958.0	2.378525	2.017821	**0.900806**	**0.900806**	**0.900806**
119	2444124	2.630256	2.216239	**0.943028**	**0.943028**	**0.943028**
120	11014961	2.908369	2.433857	**1.000000**	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 6.12. Details of graduations for male pensioners, lives, Normals: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	0.0	0	0.000463	0.00	0.00			
21	0.0	0	0.000466	0.00	0.00			
22	0.0	0	0.000469	0.00	0.00			
23	0.0	0	0.000473	0.00	0.00			
24	0.0	0	0.000477	0.00	0.00			
25	0.0	0	0.000482	0.00	0.00			
26	0.0	0	0.000488	0.00	0.00			
27	1.0	0	0.000494	0.00	–0.00			
28	4.0	0	0.000502	0.00	–0.00			
29	5.5	0	0.000511	0.00	–0.00			
30	8.0	0	0.000521	0.00	–0.00			
31	8.5	0	0.000533	0.00	–0.00			
32	14.0	1	0.000546	0.01	0.99			
33	19.0	0	0.000562	0.01	–0.01			
34	26.0	0	0.000580	0.02	–0.02			
35	42.5	0	0.000601	0.03	–0.03			
36	99.5	0	0.000625	0.06	–0.06			
37	143.0	1	0.000653	0.09	0.91			
38	165.0	0	0.000686	0.11	–0.11			
39	189.0	1	0.000723	0.14	0.86			
40	242.5	0	0.000766	0.19	–0.19			
41	257.5	3	0.000816	0.21	2.79			
42	264.5	2	0.000874	0.23	1.77			
43	251.0	5	0.000941	0.24	4.76			
44	224.5	1	0.001018	0.23	0.77			
45	251.0	1	0.001107	0.28	0.72			
46	269.0	3	0.001210	0.33	2.67			
47	303.5	2	0.001328	0.40	1.60			
48	367.0	5	0.001466	0.54	4.46			
49	411.0	6	0.001625	0.67	5.33			
50	860.5	5	0.001808	1.56	3.44			
20-50	4,427.0	36		5.34	30.66	2.31	13.27	674.4
51	2,037.0	16	0.002020	4.11	11.89			
52	2,823.5	17	0.002265	6.40	10.60			
51-52	4,860.5	33		10.51	22.49	3.24	6.94	314.0
53	3,365.0	22	0.002548	8.57	13.43	2.93	4.59	256.6
54	3,607.0	27	0.002875	10.37	16.63	3.22	5.16	260.4
55	3,915.0	33	0.003253	12.74	20.26	3.57	5.68	259.1
56	4,613.5	38	0.003690	17.02	20.98	4.13	5.08	223.2
57	4,878.5	44	0.004194	20.46	23.54	4.52	5.20	215.0
58	4,916.0	34	0.004778	23.49	10.51	4.85	2.17	144.8
59	5,091.0	58	0.005451	27.75	30.25	5.27	5.74	209.0
60	7,545.5	82	0.006230	47.01	34.99	6.86	5.10	174.4

Table 6.12. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
61	12,557.5	118	0.007130	89.53	28.47	9.46	3.01	131.8
62	13,942.5	121	0.008169	113.90	7.10	10.67	0.66	106.2
63	14,851.5	149	0.009371	139.17	9.83	11.80	0.83	107.1
64	16,194.0	262	0.010759	174.23	87.77	13.20	6.65	150.4
65	36,351.0	460	0.012363	449.42	10.58	21.20	0.50	102.4
66	59,019.0	755	0.013548	799.59	–44.59	28.28	–1.58	94.4
67	52,351.5	756	0.014981	784.27	–28.27	28.00	–1.01	96.4
68	48,001.0	795	0.016695	801.37	–6.37	28.31	–0.22	99.2
69	47,242.0	873	0.018723	884.50	–11.50	29.74	–0.39	98.7
70	46,529.5	945	0.021098	981.66	–36.66	31.33	–1.17	96.3
71	44,446.5	1,045	0.023851	1,060.08	–15.08	32.56	–0.46	98.6
72	42,173.5	1,128	0.027012	1,139.19	–11.19	33.75	–0.33	99.0
73	41,007.0	1,265	0.030609	1,255.16	9.84	35.43	0.28	100.8
74	40,837.0	1,452	0.034665	1,415.60	36.40	37.62	0.97	102.6
75	41,161.0	1,700	0.039201	1,613.56	86.44	40.17	2.15	105.4
76	41,137.0	1,897	0.044235	1,819.69	77.31	42.66	1.81	104.2
77	40,402.0	1,963	0.049779	2,011.18	–48.18	44.85	–1.07	97.6
78	39,532.0	2,266.00	0.055843	2,207.60	58.40	46.99	1.24	102.6
79	38,800.0	2,382.00	0.062434	2,422.43	–40.43	49.22	–0.82	98.3
80	36,277.0	2,413.00	0.069554	2,523.19	–110.19	50.23	–2.19	95.6
81	31,641.0	2,414.00	0.077204	2,442.82	–28.82	49.42	–0.58	98.8
82	27,488.5	2,371.00	0.085386	2,347.13	23.87	48.45	0.49	101.0
83	24,786.5	2,322.00	0.094098	2,332.37	–10.37	48.29	–0.21	99.6
84	24,047.0	2,501.00	0.103343	2,485.10	15.90	49.85	0.32	100.6
85	23,781.5	2,743.00	0.113124	2,690.26	52.74	51.87	1.02	102.0
86	22,497.0	2,678.00	0.123448	2,777.20	–99.20	52.70	–1.88	96.4
87	20,074.5	2,731.00	0.134327	2,696.55	34.45	51.93	0.66	101.3
88	16,752.0	2,422.00	0.145782	2,442.14	–20.14	49.42	–0.41	99.2
89	13,547.0	2,135.00	0.157840	2,138.26	–3.26	46.24	–0.07	99.8
90	10,659.0	1,857.00	0.172287	1,836.40	20.60	42.85	0.48	101.1
91	8,186.0	1,508.00	0.188407	1,542.30	–34.30	39.27	–0.87	97.8
92	6,155.0	1,180.00	0.205351	1,263.93	–83.93	35.55	–2.36	93.4
93	4,550.0	1,033.00	0.223066	1,014.95	18.05	31.86	0.57	101.8
94	3,334.5	793.00	0.241484	805.23	–12.23	28.38	–0.43	98.5
95	2,370.5	574.00	0.260526	617.58	–43.58	24.85	–1.75	92.9
96	1,669.5	423.00	0.280096	467.62	–44.62	21.62	–2.06	90.5
97	1,116.0	298.00	0.300087	334.90	–36.90	18.30	–2.02	89.0
98	689.5	170.00	0.324539	223.77	–53.77	14.96	–3.59	76.0
99	500.0	106.00	0.349215	174.61	–68.61	13.21	–5.19	60.7
100	308.5	75.00	0.374128	115.42	–40.42	10.74	–3.76	65.0
Totals	1,044,185.0	53,486		53,617.13	–131.13			99.8

Table 6.13. Details of graduations for male pensioners, lives, Earlies: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	1,185.5	9	0.007413	8.79	0.21	2.96	0.07	102.4
51	3,089.5	27	0.007439	22.98	4.02	4.79	0.84	117.5
52	4,492.0	25	0.007477	33.58	–8.58	5.80	–1.48	74.4
53	5,995.5	40	0.007529	45.14	–5.14	6.72	–0.77	88.6
54	7,652.5	51	0.007602	58.17	–7.17	7.63	–0.94	87.7
55	9,140.5	52	0.007701	70.39	–18.39	8.39	–2.19	73.9
56	10,183.0	80	0.007834	79.78	0.22	8.93	0.02	100.3
57	11,173.5	83	0.008012	89.52	–6.52	9.46	–0.69	92.7
58	12,093.0	96	0.008245	99.71	–3.71	9.99	–0.37	96.3
59	12,854.0	120	0.008547	109.87	10.13	10.48	0.97	109.2
60	14,690.5	128	0.008935	131.25	–3.25	11.46	–0.28	97.5
61	17,787.5	161	0.009577	170.35	–9.35	13.05	–0.72	94.5
62	19,987.0	214	0.010372	207.31	6.69	14.40	0.46	103.2
63	21,776.5	257	0.011342	246.99	10.01	15.72	0.64	104.1
64	22,932.5	288	0.012511	286.91	1.09	16.94	0.06	100.4
65	24,072.5	314	0.013907	334.77	–20.77	18.30	–1.14	93.8
66	23,371.0	382	0.015556	363.56	18.44	19.07	0.97	105.1
67	21,572.0	379	0.017486	377.20	1.80	19.42	0.09	100.5
68	20,378.0	420	0.019723	401.91	18.09	20.05	0.90	104.5
69	19,731.0	403	0.022292	439.84	–36.84	20.97	–1.76	91.6
70	19,402.0	485	0.025218	489.28	–4.28	22.12	–0.19	99.1
71	19,238.0	580	0.028522	548.71	31.29	23.42	1.34	105.7
72	19,002.5	612	0.032224	612.34	–0.34	24.75	–0.01	99.9
73	18,606.5	651	0.036340	676.16	–25.16	26.00	–0.97	96.3
74	18,037.5	736	0.040884	737.44	–1.44	27.16	–0.05	99.8
75	17,442.0	762	0.045866	799.99	–37.99	28.28	–1.34	95.3
76	16,875.5	900	0.051294	865.61	34.39	29.42	1.17	104.0
77	16,303.0	932	0.057173	932.09	–0.09	30.53	–0.00	100.0
78	15,816.5	1,019	0.063506	1,004.44	14.56	31.69	0.46	101.4
79	15,324.0	1,126	0.070294	1,077.19	48.81	32.82	1.49	104.5
80	14,102.5	1,079	0.077538	1,093.48	–14.48	33.07	–0.44	98.7
81	12,100.0	1,008	0.085238	1,031.38	–23.38	32.12	–0.73	97.7
82	9,890.0	932	0.093394	923.66	8.34	30.39	0.27	100.9
83	7,967.0	765	0.102008	812.70	–47.70	28.51	–1.67	94.1
84	6,765.5	796	0.111087	751.56	44.44	27.41	1.62	105.9
85	6,032.5	716	0.120639	727.75	–11.75	26.98	–0.44	98.4
86	5,151.0	638	0.130677	673.12	–35.12	25.94	–1.35	94.8
87	4,241.0	631	0.141222	598.92	32.08	24.47	1.31	105.4
88	3,420.0	511	0.152301	520.87	–9.87	22.82	–0.43	98.1
89	2,656.5	425	0.163951	435.54	–10.54	20.87	–0.50	97.6
90	2,022.0	375	0.176219	356.31	18.69	18.88	0.99	105.2

Table 6.13. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	1,506.0	281	0.190266	286.54	–5.54	16.93	–0.33	98.1
92	1,097.5	234	0.207197	227.40	6.60	15.08	0.44	102.9
93	749.0	160	0.224658	168.27	–8.27	12.97	–0.64	95.1
94	497.5	124	0.242468	120.63	3.37	10.98	0.31	102.8
95	315.0	62	0.262982	82.84	–20.84	9.10	–2.29	74.8
96	177.0	54	0.283745	50.22	3.78	7.09	0.53	107.5
97	117.0	31	0.304769	35.66	–4.66	5.97	–0.78	86.9
98	74.0	22	0.326069	24.13	–2.13	4.91	–0.43	91.2
99	38.5	9	0.349215	13.44	–4.44	3.67	–1.21	66.9
100	19.5	5	0.374128	7.30	–2.30	2.70	–0.85	68.5
Totals	539,144.0	20,190		20,262.99	–72.99			99.6

Table 6.14. Details of graduations for male pensioners, lives, Combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	2,046.0	14	0.007413	15.17	–1.17	3.89	–0.30	92.3
51	5,126.5	43	0.007439	38.14	4.86	6.18	0.79	112.8
52	7,315.5	42	0.007477	54.69	–12.69	7.40	–1.72	76.8
53	9,360.5	62	0.007529	70.48	–8.48	8.39	–1.01	88.0
54	11,259.5	78	0.007602	85.59	–7.59	9.25	–0.82	91.1
55	13,055.5	85	0.007701	100.54	–15.54	10.03	–1.55	84.5
56	14,796.5	118	0.007834	115.92	2.08	10.77	0.19	101.8
57	16,052.0	127	0.008012	128.61	–1.61	11.34	–0.14	98.8
58	17,009.0	130	0.008245	140.24	–10.24	11.84	–0.86	92.7
59	17,945.0	178	0.008547	153.38	24.62	12.38	1.99	116.1
60	22,236.0	210	0.008935	198.67	11.33	14.10	0.80	105.7
61	30,345.0	279	0.009425	286.01	–7.01	16.91	–0.41	97.6
62	33,929.5	335	0.010039	340.62	–5.62	18.46	–0.30	98.3
63	36,628.0	406	0.010799	395.55	10.45	19.89	0.53	102.6
64	39,126.5	550	0.011730	458.95	91.05	21.42	4.25	119.8
65	60,423.5	774	0.012857	776.89	–2.89	27.87	–0.10	99.6
66	82,390.0	1,137	0.014210	1,170.76	–33.76	34.22	–0.99	97.1
67	73,923.5	1,135	0.015816	1,169.17	–34.17	34.19	–1.00	97.1
68	68,379.0	1,215	0.017705	1,210.65	4.35	34.79	0.13	100.4
69	66,973.0	1,276	0.019906	1,333.17	–57.17	36.51	–1.57	95.7
70	65,931.5	1,430	0.022448	1,480.04	–50.04	38.47	–1.30	96.6
71	63,684.5	1,625	0.025359	1,614.96	10.04	40.19	0.25	100.6
72	61,176.0	1,740	0.028664	1,753.54	–13.54	41.88	–0.32	99.2
73	59,613.5	1,916	0.032387	1,930.73	–14.73	43.94	–0.34	99.2
74	58,874.5	2,188	0.036551	2,151.91	36.09	46.39	0.78	101.7
75	58,603.0	2,462	0.041172	2,412.83	49.17	49.12	1.00	102.0
76	58,012.5	2,797	0.046268	2,684.13	112.87	51.81	2.18	104.2
77	56,705.0	2,895	0.051851	2,940.19	–45.19	54.22	–0.83	98.5
78	55,348.5	3,285	0.057930	3,206.31	78.69	56.62	1.39	102.5
79	54,124.0	3,508	0.064512	3,491.67	16.33	59.09	0.28	100.5
80	50,379.5	3,492	0.071604	3,607.39	–115.39	60.06	–1.92	96.8
81	43,741.0	3,422	0.079209	3,464.69	–42.69	58.86	–0.73	98.8
82	37,378.5	3,303	0.087329	3,264.24	38.76	57.13	0.68	101.2
83	32,753.5	3,087	0.095968	3,143.29	–56.29	56.07	–1.00	98.2
84	30,812.5	3,297	0.105129	3,239.27	57.73	56.91	1.01	101.8
85	29,814.0	3,459	0.114817	3,423.14	35.86	58.51	0.61	101.0
86	27,648.0	3,316	0.125041	3,457.13	–141.13	58.80	–2.40	95.9
87	24,315.5	3,362	0.135814	3,302.38	59.62	57.47	1.04	101.8
88	20,172.0	2,933	0.147154	2,968.38	–35.38	54.48	–0.65	98.8
89	16,203.5	2,560	0.159085	2,577.74	–17.74	50.77	–0.35	99.3
90	12,681.0	2,232	0.172287	2,184.77	47.23	46.74	1.01	102.2

Table 6.14. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	9,692.0	1,789	0.188407	1,826.04	–37.04	42.73	–0.87	98.0
92	7,252.5	1,414	0.205351	1,489.31	–75.31	38.59	–1.95	94.9
93	5,299.0	1,193	0.223066	1,182.02	10.98	34.38	0.32	100.9
94	3,832.0	917	0.241484	925.37	–8.37	30.42	–0.28	99.1
95	2,685.5	636	0.260526	699.64	–63.64	26.45	–2.41	90.9
96	1,846.5	477	0.280096	517.20	–40.20	22.74	–1.77	92.2
97	1,233.0	329	0.300087	370.01	–41.01	19.24	–2.13	88.9
98	763.5	192	0.324539	247.79	–55.79	15.74	–3.54	77.5
99	538.5	115	0.349215	188.05	–73.05	13.71	–5.33	61.2
100	328.0	80	0.374128	122.71	–42.71	11.08	–3.86	65.2
Totals	1,579,762.5	73,645		74,110.07	–465.07			99.4

Table 6.15. Details of graduations for male pensioners, amounts, Normals: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	0.0	0.00	0.000463	0.00	0.00			
21	0.0	0.00	0.000466	0.00	0.00			
22	0.0	0.00	0.000469	0.00	0.00			
23	0.0	0.00	0.000473	0.00	0.00			
24	0.0	0.00	0.000477	0.00	0.00			
25	0.0	0.00	0.000482	0.00	0.00			
26	0.0	0.00	0.000487	0.00	0.00			
27	0.1	0.00	0.000493	0.00	–0.00			
28	0.3	0.00	0.000501	0.00	–0.00			
29	3.3	0.52	0.000509	0.00	0.52			
30	2.6	0.17	0.000519	0.00	0.16			
31	2.4	0.00	0.000530	0.00	–0.00			
32	6.6	0.25	0.000543	0.00	0.24			
33	12.1	0.00	0.000557	0.01	–0.01			
34	12.1	0.40	0.000574	0.01	0.40			
35	23.9	0.00	0.000593	0.01	–0.01			
36	77.2	0.00	0.000615	0.05	–0.05			
37	112.2	0.00	0.000641	0.07	–0.07			
38	123.6	0.00	0.000670	0.08	–0.08			
39	168.8	0.12	0.000704	0.12	–0.00			
40	227.9	0.00	0.000742	0.17	–0.17			
41	222.1	0.38	0.000787	0.17	0.20			
42	239.0	0.66	0.000838	0.20	0.46			
43	201.3	2.08	0.000896	0.18	1.90			
44	145.0	2.49	0.000963	0.14	2.35			
45	142.9	0.40	0.001041	0.15	0.25			
46	146.2	1.08	0.001129	0.17	0.91			
47	165.3	0.64	0.001231	0.20	0.44			
48	195.7	4.52	0.001348	0.26	4.26			
49	215.7	2.67	0.001483	0.32	2.35			
50	488.8	0.78	0.001638	0.80	–0.02			
51	1,206.5	8.50	0.001815	2.19	6.31			
20-51	4,141.6	25.66		5.31	20.35	2.30	8.83	483.0
52	1,800.2	7.01	0.002019	3.64	3.37			
53	2,321.5	10.81	0.002254	5.23	5.57			
52-53	4,121.7	17.81		8.87	8.95	2.98	3.00	200.9
54	3,003.1	21.14	0.002523	7.58	13.57	2.75	4.93	279.0
55	3,662.6	17.93	0.002833	10.37	7.56	3.22	2.35	172.9
56	4,452.7	29.54	0.003188	14.20	15.35	3.77	4.07	208.1
57	4,952.8	42.06	0.003596	17.81	24.25	4.22	5.74	236.1
58	5,117.0	23.17	0.004066	20.80	2.37	4.56	0.52	111.4
59	5,666.9	55.57	0.004605	26.09	29.47	5.11	5.77	212.9
60	9,162.3	145.43	0.005224	47.86	97.57	6.92	14.10	303.8

Table 6.15. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
61	15,870.2	81.38	0.005936	94.20	–12.82	9.71	–1.32	86.4
62	19,199.4	160.82	0.006753	129.65	31.16	11.39	2.74	124.0
63	22,890.4	148.26	0.007692	176.07	–27.81	13.27	–2.10	84.2
64	26,744.0	216.80	0.008771	234.57	–17.77	15.32	–1.16	92.4
65	41,784.1	463.57	0.010010	418.27	45.30	20.45	2.21	110.8
66	58,358.6	626.70	0.010932	637.97	–11.27	25.26	–0.45	98.2
67	55,697.9	592.50	0.012033	670.22	–77.72	25.89	–3.00	88.4
68	54,837.1	699.07	0.013342	731.66	–32.59	27.05	–1.20	95.5
69	54,966.3	885.49	0.014891	818.50	66.99	28.61	2.34	108.2
70	54,631.9	904.65	0.016713	913.07	–8.42	30.22	–0.28	99.1
71	52,275.9	1,028.58	0.018846	985.19	43.39	31.39	1.38	104.4
72	48,562.1	1,065.88	0.021330	1,035.81	30.07	32.18	0.93	102.9
73	46,967.7	1,023.12	0.024207	1,136.93	–113.81	33.72	–3.38	90.0
74	46,520.5	1,319.76	0.027521	1,280.31	39.45	35.78	1.10	103.1
75	47,289.0	1,540.08	0.031320	1,481.11	58.97	38.49	1.53	104.0
76	48,186.8	1,916.61	0.035651	1,717.90	198.72	41.45	4.79	111.6
77	46,945.5	1,818.28	0.040560	1,904.12	–85.84	43.64	–1.97	95.5
78	43,984.2	1,986.44	0.046096	2,027.48	–41.05	45.03	–0.91	98.0
79	40,315.2	2,176.59	0.052302	2,108.58	68.01	45.92	1.48	103.2
80	35,139.6	1,958.27	0.059223	2,081.07	–122.80	45.62	–2.69	94.1
81	28,698.7	1,818.29	0.066895	1,919.81	–101.52	43.82	–2.32	94.7
82	22,722.8	1,792.02	0.075352	1,712.19	79.82	41.38	1.93	104.7
83	18,167.0	1,515.05	0.084390	1,533.10	–18.05	39.15	–0.46	98.8
84	15,634.4	1,415.78	0.094269	1,473.84	–58.05	38.39	–1.51	96.1
85	14,224.9	1,493.73	0.105018	1,493.87	–0.15	38.65	–0.00	100.0
86	12,139.7	1,312.89	0.116660	1,416.21	–103.32	37.63	–2.75	92.7
87	9,726.8	1,372.11	0.129207	1,256.77	115.35	35.45	3.25	109.2
88	7,473.9	1,170.95	0.142665	1,066.26	104.69	32.65	3.21	109.8
89	5,291.9	848.63	0.157030	830.99	17.64	28.83	0.61	102.1
90	3,750.9	641.85	0.172287	646.23	–4.38	25.42	–0.17	99.3
91	2,735.8	576.81	0.188407	515.45	61.36	22.70	2.70	111.9
92	1,875.3	343.43	0.205351	385.10	–41.67	19.62	–2.12	89.2
93	1,264.6	276.53	0.223066	282.09	–5.56	16.80	–0.33	98.0
94	874.1	173.69	0.241484	211.09	–37.40	14.53	–2.57	82.3
95	595.0	140.12	0.260526	155.02	–14.90	12.45	–1.20	90.4
96	394.4	102.19	0.280096	110.47	–8.28	10.51	–0.79	92.5
97	208.0	68.77	0.300087	62.42	6.34	7.90	0.80	110.2
98	123.5	38.98	0.324539	40.07	–1.09	6.33	–0.17	97.3
99	77.0	19.21	0.349215	26.88	–7.67	5.18	–1.48	71.5
100	37.4	10.36	0.374128	14.00	–3.64	3.74	–0.97	74.0
Totals	1,051,463.1	36,122.55		35,893.44	229.11			100.6

Table 6.16. Details of graduations for male pensioners, amounts, Earlies: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	577.5	2.84	0.005572	3.22	–0.37			
51	1,483.8	8.10	0.005628	8.35	–0.25			
50-51	2,061.3	10.94		11.57	–0.63	3.40	–0.18	94.6
52	2,230.4	5.89	0.005698	12.71	–6.81	3.56	–1.91	46.4
53	3,238.9	12.88	0.005785	18.74	–5.86	4.33	–1.35	68.7
54	4,497.8	24.73	0.005893	26.50	–1.78	5.15	–0.35	93.3
55	6,151.3	41.53	0.006025	37.06	4.46	6.09	0.73	112.0
56	7,355.1	41.02	0.006188	45.51	–4.49	6.75	–0.67	90.1
57	8,707.6	56.61	0.006387	55.62	0.99	7.46	0.13	101.8
58	10,045.0	69.16	0.006630	66.60	2.56	8.16	0.31	103.8
59	10,985.2	106.69	0.006925	76.07	30.62	8.72	3.51	140.2
60	13,129.1	86.75	0.007298	95.82	–9.07	9.79	–0.93	90.5
61	16,850.2	95.75	0.007904	133.19	–37.43	11.54	–3.24	71.9
62	19,971.1	185.82	0.008602	171.80	14.02	13.11	1.07	108.2
63	22,763.6	178.24	0.009404	214.08	–35.83	14.63	–2.45	83.3
64	25,512.5	235.93	0.010323	263.36	–27.43	16.23	–1.69	89.6
65	27,665.8	267.15	0.011373	314.63	–47.48	17.74	–2.68	84.9
66	27,557.0	417.05	0.012570	346.40	70.66	18.61	3.80	120.4
67	26,954.7	432.62	0.013935	375.61	57.01	19.38	2.94	115.2
68	26,593.1	430.93	0.015488	411.87	19.06	20.29	0.94	104.6
69	26,813.1	359.66	0.017253	462.61	–102.96	21.51	–4.79	77.7
70	26,960.5	516.08	0.019259	519.22	–3.14	22.79	–0.14	99.4
71	26,450.3	622.26	0.021534	569.57	52.69	23.87	2.21	109.3
72	26,021.0	646.89	0.024112	627.41	19.48	25.05	0.78	103.1
73	25,241.1	670.33	0.027030	682.27	–11.94	26.12	–0.46	98.3
74	23,908.6	791.10	0.030329	725.12	65.98	26.93	2.45	109.1
75	21,732.7	704.55	0.034052	740.03	–35.48	27.20	–1.30	95.2
76	19,177.4	804.05	0.038245	733.45	70.60	27.08	2.61	109.6
77	16,378.2	568.70	0.042960	703.61	–134.92	26.53	–5.09	80.8
78	13,995.1	752.11	0.048249	675.24	76.87	25.99	2.96	111.4
79	12,394.8	696.03	0.054165	671.36	24.67	25.91	0.95	103.7
80	10,359.5	593.62	0.060766	629.50	–35.88	25.09	–1.43	94.3
81	8,321.0	506.22	0.068105	566.70	–60.48	23.81	–2.54	89.3
82	6,326.0	441.77	0.076238	482.28	–40.51	21.96	–1.84	91.6
83	4,639.6	387.02	0.085215	395.36	–8.34	19.88	–0.42	97.9
84	3,558.1	321.63	0.095080	338.31	–16.67	18.39	–0.91	95.1
85	2,845.7	347.64	0.105870	301.28	46.36	17.36	2.67	115.4
86	2,226.1	308.74	0.117611	261.81	46.93	16.18	2.90	117.9
87	1,689.3	244.95	0.130313	220.13	24.82	14.84	1.67	111.3
88	1,224.8	156.64	0.143971	176.33	–19.70	13.28	–1.48	88.8
89	844.3	139.79	0.158556	133.87	5.92	11.57	0.51	104.4
90	565.6	104.14	0.174015	98.43	5.71	9.92	0.58	105.8

Table 6.16. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
91	363.9	61.99	0.190266	69.24	–7.25	8.32	–0.87	89.5
92	230.3	44.73	0.207197	47.73	–3.00	6.91	–0.43	93.7
93	150.0	31.86	0.224658	33.70	–1.83	5.80	–0.32	94.6
94	97.9	19.88	0.242468	23.73	–3.85	4.87	–0.79	83.8
95	57.6	11.29	0.262982	15.16	–3.87	3.89	–0.99	74.5
96	32.6	7.34	0.283745	9.25	–1.92	3.04	–0.63	79.3
97	17.7	7.85	0.304769	5.40	2.45	2.32	1.05	145.4
98	10.0	1.92	0.326069	3.25	–1.33			
99	3.3	3.20	0.349215	1.17	2.04			
100	1.7	0.16	0.374128	0.64	–0.48			
98-100	15.0	5.28		5.05	0.22	2.25	0.10	104.4
Totals	544,907.3	13,573.86		13,600.30	–26.44			99.8

Table 6.17. Details of graduations for male pensioners, amounts, Combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	1,082.5	3.74	0.005572	6.03	–2.29	2.46	–0.93	62.1
51	2,733.2	16.78	0.005628	15.38	1.40	3.92	0.36	109.1
52	4,095.4	13.02	0.005698	23.34	–10.32	4.83	–2.14	55.8
53	5,662.0	24.05	0.005785	32.75	–8.70	5.72	–1.52	73.4
54	7,647.9	46.56	0.005893	45.07	1.49	6.71	0.22	103.3
55	10,026.2	61.07	0.006025	60.41	0.66	7.77	0.08	101.1
56	12,059.8	71.85	0.006188	74.63	–2.78	8.64	–0.32	96.3
57	13,967.0	100.40	0.006387	89.21	11.19	9.45	1.19	112.5
58	15,531.1	95.18	0.006630	102.97	–7.79	10.15	–0.77	92.4
59	17,054.0	166.14	0.006925	118.10	48.05	10.87	4.42	140.7
60	22,709.9	232.76	0.007281	165.35	67.41	12.86	5.24	140.8
61	33,151.3	179.81	0.007710	255.60	–75.79	15.99	–4.74	70.3
62	39,671.1	351.76	0.008224	326.27	25.48	18.06	1.41	107.8
63	46,198.6	331.57	0.008839	408.35	–76.78	20.21	–3.80	81.2
64	52,838.6	458.90	0.009570	505.68	–46.78	22.49	–2.08	90.7
65	69,750.8	732.07	0.010437	727.97	4.11	26.98	0.15	100.6
66	85,782.6	1,048.37	0.011459	983.01	65.36	31.35	2.08	106.6
67	82,558.3	1,031.40	0.012661	1,045.29	–13.90	32.33	–0.43	98.7
68	81,340.2	1,133.44	0.014068	1,144.33	–10.88	33.83	–0.32	99.0
69	81,697.0	1,240.21	0.015709	1,283.37	–43.17	35.82	–1.20	96.6
70	81,526.1	1,423.11	0.017614	1,435.98	–12.88	37.89	–0.34	99.1
71	78,695.3	1,655.32	0.019816	1,559.46	95.86	39.49	2.43	106.1
72	74,626.7	1,717.52	0.022353	1,668.12	49.39	40.84	1.21	103.0
73	72,254.7	1,700.47	0.025262	1,825.27	–124.80	42.72	–2.92	93.2
74	70,420.0	2,116.24	0.028583	2,012.83	103.41	44.86	2.30	105.1
75	68,884.1	2,239.99	0.032360	2,229.11	10.88	47.21	0.23	100.5
76	67,075.9	2,711.26	0.036637	2,457.47	253.78	49.57	5.12	110.3
77	62,927.7	2,368.36	0.041459	2,608.95	–240.59	51.08	–4.71	90.8
78	57,541.0	2,724.75	0.046873	2,697.12	27.62	51.93	0.53	101.0
79	52,286.6	2,851.10	0.052924	2,767.24	83.86	52.60	1.59	103.0
80	45,107.8	2,530.90	0.059659	2,691.09	–160.19	51.88	–3.09	94.0
81	36,693.2	2,302.78	0.067121	2,462.87	–160.10	49.63	–3.23	93.5
82	28,777.1	2,209.52	0.075352	2,168.40	41.12	46.57	0.88	101.9
83	22,568.5	1,882.23	0.084390	1,904.55	–22.32	43.64	–0.51	98.8
84	18,966.0	1,716.88	0.094269	1,787.91	–71.03	42.28	–1.68	96.0
85	16,844.9	1,820.11	0.105018	1,769.03	51.08	42.06	1.21	102.9
86	14,163.1	1,603.11	0.116660	1,652.26	–49.15	40.65	–1.21	97.0
87	11,248.9	1,593.83	0.129207	1,453.44	140.39	38.12	3.68	109.7
88	8,566.6	1,305.14	0.142665	1,222.15	82.98	34.96	2.37	106.8
89	6,041.6	973.46	0.157030	948.71	24.76	30.80	0.80	102.6
90	4,247.8	734.60	0.172287	731.84	2.76	27.05	0.10	100.4

Table 6.17. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{1/2}$	z_x	100 A/E
91	3,047.2	626.99	0.188407	574.11	52.88	23.96	2.21	109.2
92	2,068.7	381.52	0.205351	424.81	–43.29	20.61	–2.10	89.8
93	1,389.4	302.84	0.223066	309.92	–7.09	17.60	–0.40	97.7
94	954.3	190.07	0.241484	230.44	–40.37	15.18	–2.66	82.5
95	640.2	148.35	0.260526	166.78	–18.43	12.91	–1.43	89.0
96	418.4	107.25	0.280096	117.21	–9.95	10.83	–0.92	91.5
97	221.2	75.23	0.300087	66.39	8.84	8.15	1.08	113.3
98	130.7	39.98	0.324539	42.43	–2.44	6.51	–0.38	94.2
99	78.5	22.08	0.349215	27.41	–5.34	5.24	–1.02	80.5
100	38.2	10.25	0.374128	14.30	–4.05	3.78	–1.07	71.7
Totals	1,594,008.0	49,424.27		49,440.71	–16.44			100.0

Table 6.18. Details of graduations for female pensioners, lives, Normals: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	0.0	0	0.000191	0.00	0.00			
21	0.0	0	0.000196	0.00	0.00			
22	0.0	0	0.000203	0.00	0.00			
23	0.0	0	0.000209	0.00	0.00			
24	0.0	0	0.000217	0.00	0.00			
25	4.5	0	0.000226	0.00	–0.00			
26	4.0	0	0.000235	0.00	–0.00			
27	5.0	0	0.000246	0.00	–0.00			
28	9.0	0	0.000258	0.00	–0.00			
29	17.0	1	0.000271	0.00	1.00			
30	17.5	0	0.000286	0.01	–0.01			
31	17.5	0	0.000303	0.01	–0.01			
32	32.0	0	0.000321	0.01	–0.01			
33	40.5	0	0.000342	0.01	–0.01			
34	54.5	0	0.000365	0.02	–0.02			
35	65.5	0	0.000391	0.03	–0.03			
36	80.5	0	0.000420	0.03	–0.03			
37	99.5	0	0.000453	0.05	–0.05			
38	103.0	1	0.000489	0.05	0.95			
39	121.0	1	0.000529	0.06	0.94			
40	154.5	1	0.000574	0.09	0.91			
41	176.5	1	0.000625	0.11	0.89			
42	182.0	0	0.000681	0.12	–0.12			
43	231.5	0	0.000744	0.17	–0.17			
44	284.0	3	0.000814	0.23	2.77			
45	324.0	2	0.000893	0.29	1.71			
46	361.5	2	0.000980	0.35	1.65			
47	418.5	1	0.001078	0.45	0.55			
48	502.0	0	0.001188	0.60	–0.60			
49	597.0	3	0.001310	0.78	2.22			
50	840.0	5	0.001446	1.21	3.79			
51	1,438.0	8	0.001599	2.30	5.70			
20-51	6,180.5	29		7.00	22.00	2.65	8.32	414.5
52	2,108.5	11	0.001769	3.73	7.27			
53	2,856.5	9	0.001959	5.60	3.40			
52-53	4,965.0	20		9.33	10.67	3.05	3.49	214.4
54	3,173.5	14	0.002172	6.89	7.11	2.63	2.71	203.1
55	3,562.0	16	0.002409	8.58	7.42	2.93	2.53	186.4
56	4,263.5	20	0.002675	11.40	8.60	3.38	2.55	175.4
57	4,491.5	28	0.002971	13.34	14.66	3.65	4.01	209.8
58	4,628.0	22	0.003302	15.28	6.72	3.91	1.72	144.0
59	4,741.0	22	0.003672	17.41	4.59	4.17	1.10	126.4
60	10,917.5	60	0.004085	44.59	15.41	6.68	2.31	134.6

Table 6.18. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
61	22,024.5	97	0.004546	100.12	–3.12	10.01	–0.31	96.9
62	21,886.5	106	0.005061	110.77	–4.77	10.52	–0.45	95.7
63	20,513.0	127	0.005637	115.63	11.37	10.75	1.06	109.8
64	19,637.0	93	0.006280	123.32	–30.32	11.10	–2.73	75.4
65	19,779.0	126	0.006998	138.42	–12.42	11.77	–1.06	91.0
66	19,467.5	153	0.007891	153.62	–0.62	12.39	–0.05	99.6
67	17,319.0	146	0.008941	154.85	–8.85	12.44	–0.71	94.3
68	15,764.5	156	0.010163	160.22	–4.22	12.66	–0.33	97.4
69	15,205.0	193	0.011574	175.98	17.02	13.27	1.28	109.7
70	15,022.5	189	0.013191	198.17	–9.17	14.08	–0.65	95.4
71	14,884.5	230	0.015035	223.78	6.22	14.96	0.42	102.8
72	14,632.5	278	0.017126	250.60	27.40	15.83	1.73	110.9
73	14,315.5	267	0.019489	278.99	–11.99	16.70	–0.72	95.7
74	14,145.0	307	0.022149	313.29	–6.29	17.70	–0.36	98.0
75	14,136.0	388	0.025134	355.30	32.70	18.85	1.73	109.2
76	14,247.0	425	0.028477	405.71	19.29	20.14	0.96	104.8
77	14,352.5	529	0.032210	462.29	66.71	21.50	3.10	114.4
78	14,455.0	549.00	0.036371	525.74	23.26	22.93	1.01	104.4
79	14,739.5	551.00	0.041000	604.32	–53.32	24.58	–2.17	91.2
80	14,132.5	624.00	0.046143	652.12	–28.12	25.54	–1.10	95.7
81	12,318.0	640.00	0.051849	638.67	1.33	25.27	0.05	100.2
82	10,426.5	555.00	0.058170	606.51	–51.51	24.63	–2.09	91.5
83	8,757.5	500.00	0.065166	570.69	–70.69	23.89	–2.96	87.6
84	7,772.5	595.00	0.072901	566.63	28.37	23.80	1.19	105.0
85	7,297.5	583.00	0.081446	594.35	–11.35	24.38	–0.47	98.1
86	6,707.5	587.00	0.090877	609.56	–22.56	24.69	–0.91	96.3
87	6,026.5	605.00	0.101279	610.36	–5.36	24.71	–0.22	99.1
88	5,219.5	604.00	0.112745	588.47	15.53	24.26	0.64	102.6
89	4,461.5	564.00	0.125376	559.37	4.63	23.65	0.20	100.8
90	3,822.5	552.00	0.139284	532.41	19.59	23.07	0.85	103.7
91	3,207.5	558.00	0.154378	495.17	62.83	22.25	2.82	112.7
92	2,618.0	499.00	0.170727	446.96	52.04	21.14	2.46	111.6
93	2,093.0	397.00	0.188649	394.84	2.16	19.87	0.11	100.5
94	1,596.5	335.00	0.208286	332.53	2.47	18.24	0.14	100.7
95	1,235.5	249.00	0.229796	283.91	–34.91	16.85	–2.07	87.7
96	942.0	221.00	0.253350	238.66	–17.66	15.45	–1.14	92.6
97	674.0	186.00	0.279135	188.14	–2.14	13.72	–0.16	98.9
98	493.0	106.00	0.307405	151.55	–45.55	12.31	–3.70	69.9
99	345.5	89.00	0.335804	116.02	–27.02	10.77	–2.51	76.7
100	225.5	55.00	0.364339	82.16	–27.16	9.06	–3.00	66.9
Totals	463,821.0	14,245		14,244.02	0.98			100.0

Table 6.19. Details of graduations for female pensioners, lives, Earlies: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	804.0	5	0.006382	5.13	–0.13	2.27	–0.06	97.4
51	1,614.5	9	0.005918	9.55	–0.55	3.09	–0.18	94.2
52	2,336.5	11	0.005515	12.89	–1.89	3.59	–0.53	85.4
53	3,204.5	11	0.005179	16.59	–5.59	4.07	–1.37	66.3
54	4,261.5	30	0.004913	20.94	9.06	4.58	1.98	143.3
55	5,299.0	28	0.004724	25.03	2.97	5.00	0.59	111.9
56	6,149.5	22	0.004617	28.39	–6.39	5.33	–1.20	77.5
57	6,992.0	28	0.004597	32.15	–4.15	5.67	–0.73	87.1
58	7,866.0	37	0.004673	36.76	0.24	6.06	0.04	100.7
59	8,497.0	42	0.004851	41.22	0.78	6.42	0.12	101.9
60	9,597.5	45	0.005137	49.31	–4.31	7.02	–0.61	91.3
61	10,372.5	53	0.005542	57.48	–4.48	7.58	–0.59	92.2
62	10,082.5	74	0.006072	61.22	12.78	7.82	1.63	120.9
63	9,710.0	82	0.006739	65.43	16.57	8.09	2.05	125.3
64	9,117.5	68	0.007551	68.84	–0.84	8.30	–0.10	98.8
65	8,495.5	69	0.008519	72.38	–3.38	8.51	–0.40	95.3
66	7,812.0	66	0.009657	75.44	–9.44	8.69	–1.09	87.5
67	7,088.5	84	0.010975	77.79	6.21	8.82	0.70	108.0
68	6,509.5	66	0.012487	81.29	–15.29	9.02	–1.70	81.2
69	5,998.0	76	0.014209	85.22	–9.22	9.23	–1.00	89.2
70	5,622.5	86	0.016155	90.83	–4.83	9.53	–0.51	94.7
71	5,371.0	91	0.018342	98.51	–7.51	9.93	–0.76	92.4
72	5,130.0	116	0.020788	106.64	9.36	10.33	0.91	108.8
73	4,959.0	118	0.023513	116.60	1.40	10.80	0.13	101.2
74	4,766.0	120	0.026538	126.48	–6.48	11.25	–0.58	94.9
75	4,647.5	165	0.029883	138.88	26.12	11.78	2.22	118.8
76	4,516.5	172	0.033575	151.64	20.36	12.31	1.65	113.4
77	4,267.5	165	0.037638	160.62	4.38	12.67	0.35	102.7
78	3,969.0	155	0.042100	167.09	–12.09	12.93	–0.94	92.8
79	3,602.5	171	0.046991	169.28	1.72	13.01	0.13	101.0
80	3,082.5	138	0.052342	161.35	–23.35	12.70	–1.84	85.5
81	2,457.0	144	0.058189	142.97	1.03	11.96	0.09	100.7
82	1,921.5	141	0.064568	124.07	16.93	11.14	1.52	113.6
83	1,515.0	92	0.071519	108.35	–16.35	10.41	–1.57	84.9
84	1,272.5	107	0.079084	100.63	6.37	10.03	0.63	106.3
85	1,100.5	99	0.087309	96.08	2.92	9.80	0.30	103.0
86	967.0	98	0.096244	93.07	4.93	9.65	0.51	105.3
87	806.5	73	0.105941	85.44	–12.44	9.24	–1.35	85.4
88	674.0	78	0.116457	78.49	–0.49	8.86	–0.06	99.4
89	558.0	60	0.127853	71.34	–11.34	8.45	–1.34	84.1
90	438.5	68	0.140196	61.48	6.52	7.84	0.83	110.6

Table 6.19. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	325.0	51	0.154378	50.17	0.83	7.08	0.12	101.6
92	251.0	42	0.170727	42.85	–0.85	6.55	–0.13	98.0
93	184.0	34	0.188649	34.71	–0.71	5.89	–0.12	98.0
94	129.5	34	0.208286	26.97	7.03	5.19	1.35	126.1
95	89.0	22	0.229796	20.45	1.55	4.52	0.34	107.6
96	65.5	16	0.253350	16.59	–0.59	4.07	–0.15	96.4
97	46.0	7	0.279135	12.84	–5.84	3.58	–1.63	54.5
98	33.0	8	0.307405	10.14	–2.14	3.19	–0.67	78.9
99	22.5	4	0.335804	7.56	–3.56	2.75	–1.29	52.9
100	15.0	2	0.364339	5.47	–3.47	2.34	–1.48	36.6
Totals	194,613.0	3,583		3,600.67	–17.67			99.5

Table 6.20. Details of graduations for female pensioners, lives, Combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	1,644.0	10	0.004547	7.47	2.53	2.73	0.92	133.8
51	3,052.5	17	0.004578	13.97	3.03	3.74	0.81	121.6
52	4,445.0	22	0.004610	20.49	1.51	4.53	0.33	107.4
53	6,061.0	20	0.004641	28.13	–8.13	5.30	–1.53	71.1
54	7,435.0	44	0.004673	34.74	9.26	5.89	1.57	126.7
55	8,861.0	44	0.004517	40.02	3.98	6.33	0.63	109.9
56	10,413.0	42	0.004422	46.05	–4.05	6.79	–0.60	91.2
57	11,483.5	56	0.004395	50.47	5.53	7.10	0.78	110.9
58	12,494.0	59	0.004442	55.49	3.51	7.45	0.47	106.3
59	13,238.0	64	0.004568	60.47	3.53	7.78	0.45	105.8
60	20,515.0	105	0.004782	98.10	6.90	9.90	0.70	107.0
61	32,397.0	150	0.005091	164.93	–14.93	12.84	–1.16	90.9
62	31,969.0	180	0.005504	175.97	4.03	13.27	0.30	102.3
63	30,223.0	209	0.006031	182.29	26.71	13.50	1.98	114.7
64	28,754.5	161	0.006682	192.15	–31.15	13.86	–2.25	83.8
65	28,274.5	195	0.007469	211.18	–16.18	14.53	–1.11	92.3
66	27,279.5	219	0.008403	229.24	–10.24	15.14	–0.68	95.5
67	24,407.5	230	0.009499	231.85	–1.85	15.23	–0.12	99.2
68	22,274.0	222	0.010771	239.91	–17.91	15.49	–1.16	92.5
69	21,203.0	269	0.012235	259.41	9.59	16.11	0.60	103.7
70	20,645.0	275	0.013909	287.14	–12.14	16.95	–0.72	95.8
71	20,255.5	321	0.015811	320.27	0.73	17.90	0.04	100.2
72	19,762.5	394	0.017964	355.02	38.98	18.84	2.07	111.0
73	19,274.5	385	0.020390	393.00	–8.00	19.82	–0.40	98.0
74	18,911.0	427	0.023113	437.09	–10.09	20.91	–0.48	97.7
75	18,783.5	553	0.026162	491.41	61.59	22.17	2.78	112.5
76	18,763.5	597	0.029565	554.74	42.26	23.55	1.79	107.6
77	18,620.0	694	0.033355	621.08	72.92	24.92	2.93	111.7
78	18,424.0	704	0.037569	692.16	11.84	26.31	0.45	101.7
79	18,342.0	722	0.042243	774.82	–52.82	27.84	–1.90	93.2
80	17,215.0	762	0.047421	816.36	–54.36	28.57	–1.90	93.3
81	14,775.0	784	0.053149	785.28	–1.28	28.02	–0.05	99.8
82	12,348.0	696	0.059477	734.42	–38.42	27.10	–1.42	94.8
83	10,272.5	592	0.066460	682.71	–90.71	26.13	–3.47	86.7
84	9,045.0	702	0.074158	670.76	31.24	25.90	1.21	104.7
85	8,398.0	682	0.082635	693.97	–11.97	26.34	–0.45	98.3
86	7,674.5	685	0.091965	705.78	–20.78	26.57	–0.78	97.1
87	6,833.0	678	0.102224	698.50	–20.50	26.43	–0.78	97.1
88	5,893.5	682	0.113498	668.90	13.10	25.86	0.51	102.0
89	5,019.5	624	0.125879	631.85	–7.85	25.14	–0.31	98.8
90	4,261.0	620	0.139468	594.28	25.72	24.38	1.06	104.3

Table 6.20. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	3,532.5	609	0.154378	545.34	63.66	23.35	2.73	111.7
92	2,869.0	541	0.170727	489.82	51.18	22.13	2.31	110.4
93	2,277.0	431	0.188649	429.55	1.45	20.73	0.07	100.3
94	1,726.0	369	0.208286	359.50	9.50	18.96	0.50	102.6
95	1,324.5	271	0.229796	304.36	–33.36	17.45	–1.91	89.0
96	1,007.5	237	0.253350	255.25	–18.25	15.98	–1.14	92.9
97	720.0	193	0.279135	200.98	–7.98	14.18	–0.56	96.0
98	526.0	114	0.307405	161.70	–47.70	12.72	–3.75	70.5
99	368.0	93	0.335804	123.58	–30.58	11.12	–2.75	75.3
100	240.5	57	0.364339	87.62	–30.62	9.36	–3.27	65.1
Totals	654,531.5	17,812		17,909.58	–97.58			99.5

Table 6.21. Details of graduations for female pensioners, amounts, Normals: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	0.0	0.00	0.000191	0.00	0.00			
21	0.0	0.00	0.000196	0.00	0.00			
22	0.0	0.00	0.000202	0.00	0.00			
23	0.0	0.00	0.000209	0.00	0.00			
24	0.0	0.00	0.000217	0.00	0.00			
25	2.2	0.00	0.000225	0.00	–0.00			
26	1.1	0.00	0.000235	0.00	–0.00			
27	2.9	0.00	0.000245	0.00	–0.00			
28	11.7	0.00	0.000257	0.00	–0.00			
29	26.0	0.04	0.000270	0.01	0.03			
30	27.9	0.00	0.000284	0.01	–0.01			
31	24.4	0.00	0.000300	0.01	–0.01			
32	31.6	0.00	0.000318	0.01	–0.01			
33	37.2	0.00	0.000338	0.01	–0.01			
34	50.8	0.00	0.000360	0.02	–0.02			
35	75.7	0.00	0.000385	0.03	–0.03			
36	85.0	0.00	0.000412	0.04	–0.04			
37	103.8	0.00	0.000443	0.05	–0.05			
38	106.1	0.06	0.000477	0.05	0.01			
39	124.6	0.03	0.000514	0.06	–0.03			
40	175.5	1.90	0.000557	0.10	1.80			
41	201.1	0.08	0.000603	0.12	–0.04			
42	209.3	0.00	0.000656	0.14	–0.14			
43	276.0	0.00	0.000714	0.20	–0.20			
44	339.1	0.88	0.000778	0.26	0.61			
45	345.8	1.57	0.000850	0.29	1.27			
46	368.8	0.47	0.000930	0.34	0.13			
47	456.8	0.02	0.001019	0.47	–0.44			
48	532.7	0.00	0.001118	0.60	–0.60			
49	654.0	1.05	0.001229	0.80	0.25			
50	867.7	1.39	0.001352	1.17	0.22			
51	1,288.8	7.83	0.001488	1.92	5.91			
20-51	6,426.8	15.32		6.70	8.62	2.59	3.33	228.6
52	1,767.4	5.89	0.001641	2.90	2.99			
53	2,401.5	7.50	0.001810	4.35	3.15			
52-53	4,168.9	13.38		7.25	6.14	2.69	2.28	184.7
54	2,757.4	11.50	0.001999	5.51	5.99	2.35	2.55	208.7
55	3,085.7	7.60	0.002209	6.82	0.78	2.61	0.30	111.5
56	3,718.3	17.58	0.002442	9.08	8.49	3.01	2.82	193.5
57	4,093.6	22.75	0.002703	11.06	11.68	3.33	3.51	205.6
58	4,426.3	21.77	0.002992	13.24	8.52	3.64	2.34	164.4
59	4,691.3	11.61	0.003314	15.55	–3.93	3.94	–1.00	74.7
60	9,531.4	58.47	0.003673	35.01	23.46	5.92	3.96	167.0

Table 6.21. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
61	19,156.4	75.48	0.004073	78.02	–2.53	8.83	–0.29	96.8
62	20,273.8	113.62	0.004517	91.58	22.05	9.57	2.30	124.1
63	20,985.5	92.22	0.005012	105.17	–12.96	10.26	–1.26	87.7
64	21,606.6	83.30	0.005562	120.19	–36.88	10.96	–3.36	69.3
65	22,369.5	120.10	0.006175	138.14	–18.04	11.75	–1.53	86.9
66	22,563.7	177.14	0.006963	157.12	20.02	12.53	1.60	112.7
67	20,870.1	113.64	0.007887	164.60	–50.96	12.83	–3.97	69.0
68	19,597.5	161.31	0.008960	175.58	–14.28	13.25	–1.08	91.9
69	18,775.0	160.61	0.010198	191.46	–30.84	13.84	–2.23	83.9
70	18,902.7	234.73	0.011618	219.61	15.12	14.82	1.02	106.9
71	19,187.6	322.05	0.013240	254.04	68.01	15.94	4.27	126.8
72	19,130.1	303.49	0.015085	288.57	14.92	16.99	0.88	105.2
73	18,725.6	271.66	0.017175	321.62	–49.95	17.93	–2.79	84.5
74	18,144.7	321.05	0.019537	354.50	–33.45	18.83	–1.78	90.6
75	17,441.8	419.08	0.022200	387.20	31.88	19.68	1.62	108.2
76	17,249.1	629.77	0.025193	434.56	195.21	20.85	9.36	144.9
77	16,635.6	491.11	0.028553	475.00	16.11	21.79	0.74	103.4
78	15,551.8	458.10	0.032317	502.59	–44.49	22.42	–1.98	91.1
79	14,013.7	452.53	0.036528	511.89	–59.37	22.63	–2.62	88.4
80	12,179.1	550.68	0.041232	502.17	48.51	22.41	2.16	109.7
81	9,938.8	360.76	0.046482	461.97	–101.21	21.49	–4.71	78.1
82	7,978.8	487.95	0.052333	417.55	70.39	20.43	3.44	116.9
83	6,170.8	333.50	0.058849	363.15	–29.64	19.06	–1.56	91.8
84	4,829.0	276.78	0.066100	319.20	–42.42	17.87	–2.37	86.7
85	4,089.2	388.04	0.074162	303.26	84.78	17.41	4.87	128.0
86	3,473.7	249.60	0.083120	288.74	–39.13	16.99	–2.30	86.4
87	2,888.0	196.34	0.093068	268.78	–72.44	16.39	–4.42	73.0
88	2,316.6	204.12	0.104110	241.18	–37.06	15.53	–2.39	84.6
89	1,852.5	183.89	0.116360	215.55	–31.66	14.68	–2.16	85.3
90	1,426.7	201.37	0.129610	184.92	16.45	13.60	1.21	108.9
91	1,120.5	203.57	0.144017	161.38	42.19	12.70	3.32	126.1
92	878.0	137.14	0.159882	140.37	–3.23	11.85	–0.27	97.7
93	694.6	146.39	0.177347	123.19	23.20	11.10	2.09	118.8
94	442.5	101.63	0.196566	86.98	14.65	9.33	1.57	116.8
95	320.7	75.49	0.217707	69.82	5.67	8.36	0.68	108.1
96	235.0	60.46	0.240956	56.63	3.83	7.53	0.51	106.8
97	149.0	43.05	0.266517	39.71	3.34	6.30	0.53	108.4
98	106.0	30.63	0.295282	31.29	–0.65	5.59	–0.12	97.9
99	80.3	17.24	0.324178	26.03	–8.80	5.10	–1.72	66.2
100	62.6	15.93	0.353212	22.12	–6.20	4.70	–1.32	72.0
Totals	465,312.9	9,445.54		9,405.66	39.89			100.4

Table 6.22. Details of graduations for female pensioners, amounts, Earlies: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	687.8	2.67	0.006382	4.39	–1.72			
51	1,423.8	27.95	0.005918	8.43	19.52			
50-51	2,111.6	30.62		12.82	17.81	3.58	4.97	238.9
52	1,966.1	13.03	0.005204	10.23	2.80	3.20	0.88	127.4
53	2,692.1	12.46	0.004719	12.70	–0.24	3.56	–0.07	98.1
54	3,539.1	13.26	0.004408	15.60	–2.34	3.95	–0.59	85.0
55	4,617.8	19.21	0.004231	19.54	–0.33	4.42	–0.07	98.3
56	5,631.7	18.17	0.004162	23.44	–5.27	4.84	–1.09	77.5
57	6,352.2	26.32	0.004187	26.60	–0.28	5.16	–0.05	99.0
58	7,426.6	26.79	0.004297	31.91	–5.12	5.65	–0.91	84.0
59	8,694.0	51.62	0.004488	39.02	12.60	6.25	2.02	132.3
60	10,271.3	39.21	0.004762	48.92	–9.71	6.99	–1.39	80.2
61	11,346.0	55.49	0.005123	58.13	–2.64	7.62	–0.35	95.5
62	11,411.9	53.38	0.005577	63.64	–10.26	7.98	–1.29	83.9
63	11,376.6	60.44	0.006133	69.77	–9.33	8.35	–1.12	86.6
64	10,951.0	87.95	0.006802	74.49	13.47	8.63	1.56	118.1
65	10,311.3	64.80	0.007597	78.34	–13.53	8.85	–1.53	82.7
66	9,394.7	118.90	0.008533	80.17	38.73	8.95	4.33	148.3
67	8,701.8	83.26	0.009627	83.77	–0.51	9.15	–0.06	99.4
68	8,245.1	55.44	0.010895	89.83	–34.39	9.48	–3.63	61.7
69	7,663.8	103.54	0.012356	94.70	8.84	9.73	0.91	109.3
70	7,078.4	90.33	0.014031	99.32	–8.99	9.97	–0.90	90.9
71	6,680.0	102.17	0.015938	106.47	–4.30	10.32	–0.42	96.0
72	6,097.1	129.34	0.018099	110.35	18.99	10.50	1.81	117.2
73	5,460.9	125.72	0.020533	112.13	13.59	10.59	1.28	112.1
74	4,829.4	88.17	0.023263	112.34	–24.17	10.60	–2.28	78.5
75	4,240.0	148.39	0.026308	111.54	36.85	10.56	3.49	133.0
76	3,700.4	84.25	0.029692	109.87	–25.62	10.48	–2.44	76.7
77	3,294.1	104.76	0.033438	110.15	–5.39	10.50	–0.51	95.1
78	2,849.5	112.70	0.037575	107.07	5.63	10.35	0.54	105.3
79	2,336.1	122.40	0.042135	98.43	23.97	9.92	2.42	124.4
80	1,751.6	57.38	0.047157	82.60	–25.22	9.09	–2.78	69.5
81	1,325.0	68.94	0.052694	69.82	–0.88	8.36	–0.11	98.7
82	948.1	68.45	0.058813	55.76	12.68	7.47	1.70	122.7
83	627.6	23.96	0.065602	41.17	–17.21	6.42	–2.68	58.2
84	493.2	43.32	0.073176	36.09	7.23	6.01	1.20	120.0
85	375.4	37.25	0.081690	30.67	6.59	5.54	1.19	121.5
86	295.0	27.79	0.091348	26.95	0.83	5.19	0.16	103.1
87	224.6	20.87	0.102422	23.00	–2.13	4.80	–0.44	90.7
88	170.7	18.17	0.115274	19.68	–1.51	4.44	–0.34	92.4
89	133.9	7.32	0.127853	17.12	–9.80	4.14	–2.37	42.8
90	98.2	20.03	0.140196	13.76	6.27	3.71	1.69	145.6

Table 6.22. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	69.6	16.40	0.154378	10.75	5.66	3.28	1.73	152.6
92	58.6	5.02	0.170727	10.00	–4.98	3.16	–1.57	50.2
93	41.3	5.20	0.188649	7.78	–2.58			
94	22.6	7.87	0.208286	4.71	3.15			
93-94	63.9	13.07		12.50	0.57	3.53	0.16	104.6
95	10.7	11.48	0.229796	2.45	9.02			
96	5.7	1.46	0.253350	1.44	0.02			
97	3.4	0.40	0.279135	0.95	–0.55			
98	2.4	0.37	0.307405	0.74	–0.37			
99	2.0	0.17	0.335804	0.66	–0.49			
100	1.7	0.02	0.364339	0.61	–0.60			
95-100	25.8	13.89		6.85	7.04	2.62	2.69	202.7
Totals	195,931.6	2,484.00		2,468.01	15.99			100.6

Table 6.23. Details of graduations for female pensioners, amounts, Combined: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
50	1,519.9	3.83	0.003919	5.96	–2.13	2.44	–0.87	64.3
51	2,614.8	33.03	0.003936	10.29	22.73	3.21	7.09	320.9
52	3,597.9	17.74	0.003954	14.22	3.52	3.77	0.93	124.7
53	4,906.9	18.92	0.003971	19.48	–0.57	4.41	–0.13	97.1
54	6,032.0	23.82	0.003988	24.06	–0.23	4.90	–0.05	99.0
55	7,334.0	25.02	0.004006	29.38	–4.36	5.42	–0.80	85.2
56	8,897.3	34.55	0.004023	35.79	–1.24	5.98	–0.21	96.5
57	9,930.4	47.21	0.004040	40.12	7.08	6.33	1.12	117.7
58	11,233.2	46.60	0.004044	45.43	1.17	6.74	0.17	102.6
59	12,636.4	58.01	0.004118	52.04	5.98	7.21	0.83	111.5
60	19,108.1	96.08	0.004269	81.56	14.51	9.03	1.61	117.8
61	30,146.7	128.36	0.004503	135.76	–7.39	11.65	–0.63	94.6
62	31,375.8	166.45	0.004830	151.54	14.91	12.31	1.21	109.8
63	32,090.1	150.30	0.005258	168.72	–18.42	12.99	–1.42	89.1
64	32,362.9	165.39	0.005796	187.59	–22.20	13.70	–1.62	88.2
65	32,594.0	183.38	0.006457	210.45	–27.06	14.51	–1.87	87.1
66	31,983.3	291.19	0.007250	231.88	59.31	15.23	3.89	125.6
67	29,593.6	193.00	0.008189	242.36	–49.36	15.57	–3.17	79.6
68	27,854.8	218.23	0.009289	258.74	–40.51	16.09	–2.52	84.3
69	26,476.8	260.23	0.010564	279.71	–19.48	16.72	–1.16	93.0
70	26,090.6	326.14	0.012032	313.92	12.22	17.72	0.69	103.9
71	26,035.3	428.15	0.013711	356.96	71.19	18.89	3.77	119.9
72	25,457.3	432.83	0.015621	397.67	35.17	19.94	1.76	108.8
73	24,468.5	396.27	0.017785	435.17	–38.90	20.86	–1.86	91.1
74	23,299.0	414.67	0.020227	471.27	–56.60	21.71	–2.61	88.0
75	22,039.2	570.86	0.022974	506.33	64.53	22.50	2.87	112.7
76	21,358.0	734.63	0.026056	556.50	178.13	23.59	7.55	132.0
77	20,354.5	607.57	0.029504	600.54	7.03	24.51	0.29	101.2
78	18,824.1	580.03	0.033354	627.87	–47.84	25.06	–1.91	92.4
79	16,756.7	582.81	0.037646	630.82	–48.01	25.12	–1.91	92.4
80	14,315.6	627.90	0.042420	607.27	20.63	24.64	0.84	103.4
81	11,589.5	439.19	0.047725	553.11	–113.92	23.52	–4.84	79.4
82	9,201.4	572.00	0.053610	493.29	78.72	22.21	3.54	116.0
83	7,022.5	370.69	0.060133	422.28	–51.59	20.55	–2.51	87.8
84	5,497.3	328.45	0.067353	370.27	–41.81	19.24	–2.17	88.7
85	4,617.6	439.63	0.075340	347.89	91.74	18.65	4.92	126.4
86	3,901.4	286.18	0.084167	328.37	–42.19	18.12	–2.33	87.2
87	3,225.2	224.25	0.093914	302.89	–78.64	17.40	–4.52	74.0
88	2,578.7	230.00	0.104670	269.92	–39.92	16.43	–2.43	85.2
89	2,059.7	199.16	0.116533	240.03	–40.87	15.49	–2.64	83.0
90	1,581.9	228.76	0.129610	205.03	23.73	14.32	1.66	111.6

Table 6.23. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
91	1,235.8	227.85	0.144017	177.98	49.87	13.34	3.74	128.0
92	971.9	148.14	0.159882	155.38	–7.24	12.47	–0.58	95.3
93	764.4	158.00	0.177347	135.56	22.43	11.64	1.93	116.5
94	483.7	113.46	0.196566	95.08	18.38	9.75	1.89	119.3
95	345.5	89.28	0.217707	75.21	14.07	8.67	1.62	118.7
96	251.3	64.64	0.240956	60.54	4.09	7.78	0.53	106.8
97	159.1	45.46	0.266517	42.41	3.05	6.51	0.47	107.2
98	113.1	32.42	0.295282	33.41	–0.99	5.78	–0.17	97.0
99	85.9	18.21	0.324178	27.83	–9.63	5.28	–1.82	65.4
100	67.1	16.70	0.353212	23.71	–7.01	4.87	–1.44	70.4
Totals	657,040.6	12,095.68		12,089.57	6.11			100.1

7. WIDOWS OF LIFE OFFICE PENSIONERS

7.1 *The data*

7.1.1 This investigation covers the experiences of spouses granted pensions on the death of life office pension scheme members either in service or after retirement, referred to here as 'Widows' (or 'Widowers' for males). The investigation is carried out on both an amounts basis and a lives basis. Data volumes for males are low, and so are not considered further.

7.1.2 Total numbers of exposed to risk and of deaths are shown in Table 7.1. Data volumes have increased substantially since 1991-1994. The age range of the data, and the continuous age range within which the central exposed to risk is greater than or equal to 100, and the continuous age range within which the number of deaths is greater than or equal to 10 are shown in Table 7.2. Average amounts per life are shown in Table 7.3. As with the life office pensioners, there has been a significant increase in the average amount since the previous graduations.

7.2 *Ultimate graduations*

7.2.1 Separate Widows graduations were carried out for lives and amounts, as was the case with the "92" Series. The age range chosen for fitting the data was 55-98.

7.2.2 The key statistics from the resulting unadjusted ultimate graduations are shown in Table 7.4. This table also shows the '–Log likelihood' value calculated from the adjusted ultimate graduations.

7.2.3 For the amounts experience, exposures and deaths were divided by a 'scaling factor' based on the average pension size. This does not affect the crude or graduated mortality rates, but does allow more meaningful statistical tests to be carried out. The scaling factor, shown in Table 7.4, was based on the data in the fitted age range, and so is not the same as the respective average pension amount shown in Table 7.3. However, it should be borne in mind that the test results for amounts graduations should be viewed as only approximate for this reason and that the serial correlation tests and the chi-squared tests are very unreliable.

7.3 *Adjustments*

7.3.1 The method described in Paragraph 1.2.5 above was used to produce rates at the oldest ages for the vested sections, with a "run-in" age of 98 and "curvature" parameters of 0.90 for lives and 1.10 for amounts.

7.3.2 This method was also used to produce rates at the younger ages, where there was very little data but it was recognised that rates would likely be needed. In this case, arbitrary values of μ_{16} were blended into the graduated rates of μ_{55}. The starting values of μ_{16} were 0.000200 for lives and 0.000150 for amounts, and the "curvature" parameter was 1.15 in both cases.

7.3.3 Additionally, lives rates were constrained not to fall below equivalent amounts rates at the older ages.

7.3.4 The effect of the adjustments can be seen in Table 7.5, which show the calculated values of μ_x both pre- and post-adjustments. Adjusted values that differ from unadjusted values are highlighted in bold.

7.3.5 Details of the ultimate rates graduations, with exposed to risk, actual deaths, expected deaths, deviations and standardised deviations (z_x) are shown in Tables 7.6 and 7.7.

Table 7.1. Widows, lives and amounts: comparison of (central) exposed to risk and deaths for 1999-2002, 1991-1994 and 1979-1982.

	1999-2002	1991-1994	1979-1982
Lives			
Central exposed	249,605.0	162,237.1	28,386.5
Deaths	10,282	5,452	692
Amounts £			
Central exposed	450,522,129.0	179,126,584.6	15,892,759.0
Deaths	14,237,681	4,279,423	238,438

Table 7.2. Widows, lives: age ranges.

Range of data	Exposed ≥ 100	Deaths ≥ 10
10-108	38-100	57-100[†]

[†] Some other single ages outside the range given meet the criterion.

Table 7.3. Widows: average amounts per life by exposed to risk for 1999-2002, 1991-1994 and 1979-1982.

1999-2002	1991-1994	1979-1982
£1,804.94	£1,104.10	£559.87

Table 7.4. Unadjusted graduations of the Widows ultimate experience: key statistics.

Sex	Females	Females
Lives/Amounts	Lives	Amounts
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
T-ratio	3.6	4.3
b_1	–4.235211	–4.468221
T-ratio	–74.6	–81.0
b_2	5.258961	5.839618
T-ratio	36.1	38.1
–Log likelihood	39,792.7	32,130.4
–Log likelihood (adj.)*	39,794.1	32,130.4
Sign test: +/–	24 / 20	21 / 23
Sign test: *p*(pos)	0.6742	0.4402
Runs test: *p*(runs)	0.9254	0.6825
K-S test: *p*(*KS*)	1.0000	0.0560
Serial correlation test:		
T-ratio 1	–1.41	0.06
T-ratio 2	–0.51	–1.86
T-ratio 3	0.53	–1.03
χ^2 test:		
χ^2	49.30	259.08
Degrees of freedom	41	41
$p(\chi^2)$	0.1752	0.0000

* Calculated from adjusted ultimate graduations.

Table 7.5. Widows, lives and amounts, ultimate durations: unadjusted and adjusted values of μ_x.

	Unadjusted μ_x		Adjusted μ_x	
Age x	Lives	Amounts	Lives	Amounts
20	0.003147	0.002728	**0.000886**	**0.000680**
21	0.003155	0.002732	**0.001055**	**0.000812**
22	0.003165	0.002737	**0.001224**	**0.000942**
23	0.003175	0.002742	**0.001392**	**0.001072**
24	0.003186	0.002748	**0.001560**	**0.001202**
25	0.003199	0.002754	**0.001726**	**0.001331**
26	0.003213	0.002762	**0.001892**	**0.001459**
27	0.003229	0.002770	**0.002057**	**0.001587**
28	0.003246	0.002779	**0.002221**	**0.001713**
29	0.003266	0.002790	**0.002384**	**0.001840**
30	0.003287	0.002802	**0.002546**	**0.001965**
31	0.003311	0.002815	**0.002707**	**0.002090**
32	0.003338	0.002830	**0.002867**	**0.002214**
33	0.003367	0.002847	**0.003027**	**0.002337**
34	0.003400	0.002866	**0.003185**	**0.002459**
35	0.003436	0.002887	**0.003342**	**0.002580**
36	0.003477	0.002911	**0.003497**	**0.002701**
37	0.003522	0.002938	**0.003652**	**0.002820**
38	0.003572	0.002968	**0.003805**	**0.002939**
39	0.003627	0.003001	**0.003957**	**0.003056**
40	0.003689	0.003040	**0.004107**	**0.003173**
41	0.003757	0.003082	**0.004256**	**0.003288**
42	0.003833	0.003130	**0.004404**	**0.003402**
43	0.003918	0.003184	**0.004549**	**0.003515**
44	0.004011	0.003245	**0.004693**	**0.003626**
45	0.004116	0.003313	**0.004835**	**0.003736**
46	0.004231	0.003390	**0.004975**	**0.003844**
47	0.004360	0.003476	**0.005112**	**0.003950**
48	0.004503	0.003573	**0.005247**	**0.004055**
49	0.004662	0.003681	**0.005379**	**0.004157**
50	0.004838	0.003804	**0.005508**	**0.004256**
51	0.005034	0.003941	**0.005633**	**0.004353**
52	0.005252	0.004096	**0.005754**	**0.004446**
53	0.005493	0.004269	**0.005868**	**0.004535**
54	0.005762	0.004464	**0.005974**	**0.004616**
55	0.006060	0.004684	0.006060	0.004684

Table 7.5. (Continued.)

	Unadjusted μ_x		Adjusted μ_x	
Age x	Lives	Amounts	Lives	Amounts
56	0.006392	0.004930	0.006392	0.004930
57	0.006760	0.005207	0.006760	0.005207
58	0.007169	0.005518	0.007169	0.005518
59	0.007624	0.005868	0.007624	0.005868
60	0.008129	0.006261	0.008129	0.006261
61	0.008689	0.006703	0.008689	0.006703
62	0.009312	0.007200	0.009312	0.007200
63	0.010005	0.007758	0.010005	0.007758
64	0.010774	0.008385	0.010774	0.008385
65	0.011628	0.009090	0.011628	0.009090
66	0.012577	0.009882	0.012577	0.009882
67	0.013631	0.010773	0.013631	0.010773
68	0.014802	0.011773	0.014802	0.011773
69	0.016103	0.012898	0.016103	0.012898
70	0.017548	0.014162	0.017548	0.014162
71	0.019154	0.015583	0.019154	0.015583
72	0.020938	0.017180	0.020938	0.017180
73	0.022919	0.018974	0.022919	0.018974
74	0.025120	0.020991	0.025120	0.020991
75	0.027566	0.023258	0.027566	0.023258
76	0.030283	0.025805	0.030283	0.025805
77	0.033301	0.028668	0.033301	0.028668
78	0.036653	0.031886	0.036653	0.031886
79	0.040378	0.035502	0.040378	0.035502
80	0.044515	0.039567	0.044515	0.039567
81	0.049112	0.044135	0.049112	0.044135
82	0.054218	0.049269	0.054218	0.049269
83	0.059891	0.055038	0.059891	0.055038
84	0.066193	0.061523	0.066193	0.061523
85	0.073193	0.068811	0.073193	0.068811
86	0.080971	0.077002	0.080971	0.077002
87	0.089610	0.086208	0.089610	0.086208
88	0.099208	0.096554	0.099208	0.096554
89	0.109871	0.108182	0.109871	0.108182
90	0.121716	0.121250	0.121716	0.121250

Table 7.5. (Continued.)

	Unadjusted μ_x		Adjusted μ_x	
Age x	Lives	Amounts	Lives	Amounts
91	0.134875	0.135937	**0.135937**	0.135937
92	0.149493	0.152444	**0.152444**	0.152444
93	0.165732	0.170996	**0.170996**	0.170996
94	0.183773	0.191847	**0.191847**	0.191847
95	0.203814	0.215280	**0.215280**	0.215280
96	0.226079	0.241616	**0.241616**	0.241616
97	0.250812	0.271215	**0.271215**	0.271215
98	0.278289	0.304481	**0.304481**	0.304481
99	0.308814	0.341868	**0.339177**	**0.339177**
100	0.342723	0.383887	**0.373708**	**0.373708**
101	0.380394	0.431112	**0.408067**	**0.408067**
102	0.422243	0.484187	**0.442245**	**0.442245**
103	0.468733	0.543837	**0.476233**	**0.476233**
104	0.520379	0.610877	**0.510023**	**0.510023**
105	0.577754	0.686222	**0.543601**	**0.543601**
106	0.641491	0.770902	**0.576957**	**0.576957**
107	0.712298	0.866072	**0.610075**	**0.610075**
108	0.790959	0.973032	**0.642938**	**0.642938**
109	0.878343	1.093243	**0.675529**	**0.675529**
110	0.975419	1.228347	**0.707824**	**0.707824**
111	1.083262	1.380188	**0.739798**	**0.739798**
112	1.203065	1.550841	**0.771418**	**0.771418**
113	1.336156	1.742634	**0.802643**	**0.802643**
114	1.484008	1.958188	**0.833425**	**0.833425**
115	1.648258	2.200447	**0.863695**	**0.863695**
116	1.830726	2.472718	**0.893363**	**0.893363**
117	2.033430	2.778719	**0.922290**	**0.922290**
118	2.258616	3.122630	**0.950252**	**0.950252**
119	2.508778	3.509146	**0.976792**	**0.976792**
120	2.786685	3.943547	**1.000000**	**1.000000**

Adjusted values that differ from unadjusted values are highlighted in **bold**.

Table 7.6. Details of graduations for Widows, lives: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	7.0	0.0	0.000886	0.01	–0.01			
21	5.0	1.0	0.001055	0.01	0.99			
22	0.5	0.0	0.001224	0.00	–0.00			
23	2.0	0.0	0.001392	0.00	–0.00			
24	5.0	0.0	0.001560	0.01	–0.01			
25	8.5	0.0	0.001726	0.01	–0.01			
26	4.0	0.0	0.001892	0.01	–0.01			
27	7.5	0.0	0.002057	0.02	–0.02			
28	8.5	0.0	0.002221	0.02	–0.02			
29	8.0	0.0	0.002384	0.02	–0.02			
30	12.5	0.0	0.002546	0.03	–0.03			
31	16.5	0.0	0.002707	0.04	–0.04			
32	18.5	0.0	0.002867	0.05	–0.05			
33	30.0	0.0	0.003027	0.09	–0.09			
34	35.0	0.0	0.003185	0.11	–0.11			
35	44.0	0.0	0.003342	0.15	–0.15			
36	50.5	0.0	0.003497	0.18	–0.18			
37	67.5	0.0	0.003652	0.25	–0.25			
38	104.0	0.0	0.003805	0.40	–0.40			
39	130.5	0.0	0.003957	0.52	–0.52			
40	162.5	0.0	0.004107	0.67	–0.67			
41	194.0	1.0	0.004256	0.83	0.17			
42	207.5	0.0	0.004404	0.91	–0.91			
43	241.0	1.0	0.004549	1.10	–0.10			
20-43	1,370.0	3.0		5.42	–2.42	2.33	–1.04	55.4
44	270.5	0.0	0.004693	1.27	–1.27			
45	288.0	0.0	0.004835	1.39	–1.39			
46	334.0	1.0	0.004975	1.66	–0.66			
47	368.5	6.0	0.005112	1.88	4.12			
44-47	1,261.0	7.0		6.21	0.79	2.49	0.32	112.8
48	439.0	1.0	0.005247	2.30	–1.30			
49	506.5	4.0	0.005379	2.72	1.28			
48-49	945.5	5.0		5.03	–0.03	2.24	–0.01	99.4
50	577.0	2.0	0.005508	3.18	–1.18			
51	701.5	4.0	0.005633	3.95	0.05			
50-51	1,278.5	6.0		7.13	–1.13	2.67	–0.42	84.2
52	837.0	6.0	0.005754	4.82	1.18			
53	996.0	5.0	0.005868	5.84	–0.84			
52-53	1,833.0	11.0		10.66	0.34	3.26	0.10	103.2

Table 7.6. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
54	1,158.0	6.0	0.005974	6.92	–0.92	2.63	–0.35	86.7
55	1,301.5	13.0	0.006060	7.89	5.11	2.81	1.82	164.8
56	1,419.5	5.0	0.006392	9.07	–4.07	3.01	–1.35	55.1
57	1,542.5	13.0	0.006760	10.43	2.57	3.23	0.80	124.7
58	1,655.5	13.0	0.007169	11.87	1.13	3.45	0.33	109.5
59	1,839.5	13.0	0.007624	14.02	–1.02	3.74	–0.27	92.7
60	2,068.5	18.0	0.008129	16.81	1.19	4.10	0.29	107.1
61	2,332.0	13.0	0.008689	20.26	–7.26	4.50	–1.61	64.2
62	2,771.5	31.0	0.009312	25.81	5.19	5.08	1.02	120.1
63	3,138.0	32.0	0.010005	31.39	0.61	5.60	0.11	101.9
64	3,557.5	33.0	0.010774	38.33	–5.33	6.19	–0.86	86.1
65	4,094.5	49.0	0.011628	47.61	1.39	6.90	0.20	102.9
66	4,606.0	50.0	0.012577	57.93	–7.93	7.61	–1.04	86.3
67	5,213.0	67.0	0.013631	71.06	–4.06	8.43	–0.48	94.3
68	5,827.0	87.0	0.014802	86.25	0.75	9.29	0.08	100.9
69	6,595.5	99.0	0.016103	106.21	–7.21	10.31	–0.70	93.2
70	7,550.5	121.0	0.017548	132.50	–11.50	11.51	–1.00	91.3
71	8,377.5	174.0	0.019154	160.46	13.54	12.67	1.07	108.4
72	9,144.0	203.0	0.020938	191.45	11.55	13.84	0.83	106.0
73	9,884.5	235.0	0.022919	226.54	8.46	15.05	0.56	103.7
74	10,524.0	262.0	0.025120	264.37	–2.37	16.26	–0.15	99.1
75	11,062.0	314.0	0.027566	304.93	9.07	17.46	0.52	103.0
76	11,573.5	357.0	0.030283	350.48	6.52	18.72	0.35	101.9
77	11,996.0	438.0	0.033301	399.47	38.53	19.99	1.93	109.6
78	12,423.5	443.0	0.036653	455.36	–12.36	21.34	–0.58	97.3
79	12,791.0	493.0	0.040378	516.47	–23.47	22.73	–1.03	95.5
80	12,360.0	541.0	0.044515	550.21	–9.21	23.46	–0.39	98.3
81	11,119.0	499.0	0.049112	546.07	–47.07	23.37	–2.01	91.4
82	9,703.5	586.0	0.054218	526.11	59.89	22.94	2.61	111.4
83	8,465.0	520.0	0.059891	506.98	13.02	22.52	0.58	102.6
84	7,740.0	488.0	0.066193	512.33	–24.33	22.63	–1.07	95.3
85	7,397.0	511.0	0.073193	541.41	–30.41	23.27	–1.31	94.4
86	6,799.0	563.0	0.080971	550.52	12.48	23.46	0.53	102.3
87	5,897.0	492.0	0.089610	528.43	–36.43	22.99	–1.58	93.1
88	4,842.5	483.0	0.099208	480.42	2.58	21.92	0.12	100.5
89	3,758.5	435.0	0.109871	412.95	22.05	20.32	1.09	105.3
90	2,803.0	339.0	0.121716	341.17	–2.17	18.47	–0.12	99.4
91	2,054.0	288.0	0.135937	279.22	8.78	16.71	0.53	103.1
92	1,515.0	246.0	0.152444	230.95	15.05	15.20	0.99	106.5
93	1,113.0	172.0	0.170996	190.32	–18.32	13.80	–1.33	90.4
94	801.0	153.0	0.191847	153.67	–0.67	12.40	–0.05	99.6
95	569.5	135.0	0.215280	122.60	12.40	11.07	1.12	110.1
Totals	254,759.5	10,097.0		10,106.1	–9.14			99.9

Table 7.7. Details of graduations for Widows, amounts: exposed to risk and actual deaths.

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
20	6.5	0.0	0.000680	0.00	–0.00			
21	6.1	0.0	0.000812	0.00	0.00			
22	0.8	0.0	0.000942	0.00	–0.00			
23	1.3	0.0	0.001072	0.00	–0.00			
24	3.5	0.0	0.001202	0.00	–0.00			
25	6.0	0.0	0.001331	0.01	–0.01			
26	3.3	0.0	0.001459	0.00	–0.00			
27	5.5	0.0	0.001587	0.01	–0.01			
28	10.7	0.0	0.001713	0.02	–0.02			
29	12.5	0.0	0.001840	0.02	–0.02			
30	20.9	0.0	0.001965	0.04	–0.04			
31	30.3	0.0	0.002090	0.06	–0.06			
32	36.5	0.0	0.002214	0.08	–0.08			
33	51.1	0.0	0.002337	0.12	–0.12			
34	62.1	0.0	0.002459	0.15	–0.15			
35	66.6	0.0	0.002580	0.17	–0.17			
36	78.6	0.0	0.002701	0.21	–0.21			
37	110.4	0.0	0.002820	0.31	–0.31			
38	151.7	0.0	0.002939	0.45	–0.45			
39	204.4	0.0	0.003056	0.62	–0.62			
40	280.5	0.0	0.003173	0.89	–0.89			
41	358.5	1.8	0.003288	1.18	0.62			
42	388.0	0.0	0.003402	1.32	–1.32			
20-42	1,895.7	1.8		5.69	–3.89	2.39	–1.63	31.7
43	482.4	0.3	0.003515	1.70	–1.42			
44	465.0	0.0	0.003626	1.69	–1.69			
45	487.3	0.0	0.003736	1.82	–1.82			
43-45	1,434.8	0.3		5.20	–4.93	2.28	–2.16	5.3
46	573.9	0.1	0.003844	2.21	–2.09			
47	597.5	7.1	0.003950	2.36	4.77			
48	662.0	4.0	0.004055	2.68	1.35			
46-48	1,833.4	11.3		7.25	4.03	2.69	1.50	155.6
49	750.9	3.8	0.004157	3.12	0.65			
50	829.6	1.0	0.004256	3.53	–2.53			
49-50	1,580.5	4.8		6.65	–1.89	2.58	–0.73	71.6
51	1,005.6	2.0	0.004353	4.38	–2.36			
52	1,140.1	12.8	0.004446	5.07	7.70			
51-52	2,145.6	14.8		9.45	5.34	3.07	1.74	156.6

Table 7.7. (Continued.)

Age x	R_x	A_x	Adjusted μ_x	E_x	Dev_x	$(V_x)^{½}$	z_x	100 A/E
53	1,362.8	3.1	0.004535	6.18	–3.09	2.49	–1.24	50.1
54	1,649.0	6.3	0.004616	7.61	–1.32	2.76	–0.48	82.7
55	1,884.8	14.0	0.004684	8.83	5.18	2.97	1.74	158.7
56	2,068.2	1.6	0.004930	10.20	–8.56	3.19	–2.68	16.1
57	2,273.2	15.2	0.005207	11.84	3.40	3.44	0.99	128.7
58	2,503.9	19.8	0.005518	13.82	5.95	3.72	1.60	143.1
59	2,592.1	10.5	0.005868	15.21	–4.73	3.90	–1.21	68.9
60	2,639.8	19.3	0.006261	16.53	2.72	4.07	0.67	116.5
61	2,958.5	9.9	0.006703	19.83	–9.91	4.45	–2.22	50.1
62	3,701.5	35.3	0.007200	26.65	8.62	5.16	1.67	132.3
63	4,281.9	29.7	0.007758	33.22	–3.56	5.76	–0.62	89.3
64	4,787.9	30.1	0.008385	40.15	–10.07	6.34	–1.59	74.9
65	5,145.3	57.4	0.009090	46.77	10.62	6.84	1.55	122.7
66	5,281.0	69.6	0.009882	52.19	17.37	7.22	2.40	133.3
67	5,921.9	66.0	0.010773	63.79	2.22	7.99	0.28	103.5
68	6,643.4	89.7	0.011773	78.22	11.46	8.84	1.30	114.6
69	7,850.3	80.7	0.012898	101.25	–20.51	10.06	–2.04	79.7
70	9,094.4	99.6	0.014162	128.80	–29.24	11.35	–2.58	77.3
71	9,847.5	168.0	0.015583	153.45	14.54	12.39	1.17	109.5
72	10,357.0	151.8	0.017180	177.93	–26.14	13.34	–1.96	85.3
73	10,518.1	210.4	0.018974	199.57	10.87	14.13	0.77	105.4
74	10,757.1	200.9	0.020991	225.80	–24.94	15.03	–1.66	89.0
75	11,103.0	244.2	0.023258	258.23	–13.99	16.07	–0.87	94.6
76	11,532.1	320.4	0.025805	297.59	22.83	17.25	1.32	107.7
77	11,700.1	410.0	0.028668	335.42	74.59	18.31	4.07	122.2
78	11,651.6	354.0	0.031886	371.52	–17.48	19.27	–0.91	95.3
79	11,786.6	413.4	0.035502	418.45	–5.07	20.46	–0.25	98.8
80	11,199.2	382.5	0.039567	443.12	–60.63	21.05	–2.88	86.3
81	9,758.1	382.8	0.044135	430.67	–47.84	20.75	–2.31	88.9
82	8,201.6	507.9	0.049269	404.08	103.83	20.10	5.17	125.7
83	6,815.7	531.3	0.055038	375.12	156.16	19.37	8.06	141.6
84	5,923.8	320.0	0.061523	364.45	–44.43	19.09	–2.33	87.8
85	5,537.0	312.5	0.068811	381.01	–68.47	19.52	–3.51	82.0
86	5,053.9	371.5	0.077002	389.16	–17.63	19.73	–0.89	95.5
87	4,339.1	287.7	0.086208	374.06	–86.41	19.34	–4.47	76.9
88	3,592.1	345.8	0.096554	346.83	–1.02	18.62	–0.05	99.7
89	2,768.1	352.5	0.108182	299.46	53.01	17.30	3.06	117.7
90	1,917.7	185.8	0.121250	232.52	–46.74	15.25	–3.07	79.9
91	1,318.6	205.8	0.135937	179.25	26.57	13.39	1.98	114.8
92	944.1	155.1	0.152444	143.92	11.22	12.00	0.94	107.8
93	677.3	137.8	0.170996	115.81	22.02	10.76	2.05	119.0
94	483.2	68.1	0.191847	92.70	–24.55	9.63	–2.55	73.5
95	321.3	60.3	0.215280	69.17	–8.90	8.32	–1.07	87.1
Totals	258,523.2	7,804.1		7,828.8	–24.71			99.7

8. Extensions To Younger Ages Of The Life Office Pensioner Tables

8.1 *Background*

8.1.1 The main problem encountered when constructing the "00" Series 'Normal', 'Early' and 'Combined' pensioner tables was the very low volume of data at younger ages. Compounded to this was an apparent flattening of the crude rates of mortality for pensioners in their 50s – and for some sections of the data this was in fact more of a U-shape, with crude rates at the younger ages decreasing as age rises before increasing again at the older ages.

8.1.2 The original approach, as reported in CMI Working Paper 16, was to start all tables at age 50. Subsequently, following feedback received, the 'Normal' tables were extended to include rates in the age range 20-50, as described in Section 6 above. The officially adopted "00" Series 'Early' and 'Combined' pensioner tables remained with a starting age of 50. However, proposed extensions down to age 20 were published in CMI Working Paper 26. These do not form part of the officially adopted "00" Series, but are included here for completeness.

8.2 *Males, Combined*

8.2.1 For both lives and amounts, the shape of the original graduation looks reasonably sensible, reducing very slightly as age reduces. The graduation formula was therefore simply extended down to age 20. The parameter values for the GM formulae are summarised below:

Parameter	Lives	Amounts
GM formula	GM(1,4)	GM(1,3)
$100\times a_1$	0.735863	0.536403
b_1	–9.258547	–6.688640
b_2	13.714773	8.359170
b_3	–5.064792	–2.286393
b_4	1.565239	

8.3 *Males, Earlies*

8.3.1 The graduated rates for 'Earlies' are constrained not to fall below those for the relevant 'Combined' rates. This happens at a little over age 60 for lives and a little below age 60 for amounts. Thus, below about age 60, the 'Early' rates were set equal to the 'Combined' rates for males (i.e. q_x(PEML00) = q_x(PCML00) and q_x(PEMA00) = q_x(PCMA00) for x < about 60). These equalities were then simply extended down to age 20.

8.4 *Females, Combined*

8.4.1 The original graduation formula for 'Combined' females contained a U-shape with a minimum value at about age 57. As described in Paragraph 6.3.4 above, this was partially removed by an adjustment whereby the rates were blended from arbitrary values of μ_{16} into the graduated values of μ_{54} for lives and μ_{57} for amounts. The arbitrary values of μ_{16} were 0.00347646 for lives and 0.00332832 for amounts. As again this gives a reasonable shape, these were simply extended down to age 20.

8.5 *Females, Earlies*

In contrast to the 'Combined' females, the U-shape is much more pronounced, and was retained for the final graduated "00" Series tables. Thus simply extending the formula down to younger ages, as is the case for the other tables, is not possible as it would result in rapidly increasing mortality rates as age reduces. Instead, a similar adjustment to that already applied to the 'Combined' females was made, but taking effect from age 50. Thus, for both lives and amounts, the graduated value of μ_{50} (which for amounts is itself constrained not to be greater than the equivalent graduated lives value) is blended into the values of μ_{16} assumed for 'Combined' females. This necessarily creates a significant discontinuity in the derivative at age 50, but it was felt that the resulting rates are sensible compared to the other sections of the data.

8.6 *Final rates*

8.6.1 The final rates are set out in Appendix B.

9. CONTRIBUTING OFFICES

The Executive Committee and the Life Office Mortality Committee wish to thank the following offices that have contributed to the data underlying the "00" Series tables contained in this report. The office names given (in short titles) are, generally, those applying at the time of submission.

AXA EQUITY AND LAW
AXA SUN LIFE
ALLIED DUNBAR
COLONIAL MUTUAL
COMMERCIAL UNION
EAGLE STAR
EQUITABLE LIFE
FRIENDS' PROVIDENT
GENERAL ACCIDENT
GUARDIAN
HALIFAX LIFE
LEGAL & GENERAL
MEDICAL SICKNESS
NATIONAL MUTUAL
NATWEST LIFE
NORWICH UNION
PROVIDENT MUTUAL
PRUDENTIAL
RELIANCE MUTUAL
ROYAL LONDON MUTUAL
SCOTTISH AMICABLE
SCOTTISH LIFE
SCOTTISH MUTUAL
SCOTTISH PROVIDENT
SCOTTISH WIDOWS
STANDARD LIFE
SUN LIFE OF CANADA
TSB LIFE
WESLEYAN
WINDSOR LIFE
ZURICH LIFE

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APPENDIX A

VALUES OF MORTALITY RATES FOR THE "00" SERIES BASE TABLES

Base tables for the 1999-2002 experience.

Table A1. Permanent Assurances, males, combined – AMC00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000282	0.000386	0.000458
18	0.000283	0.000386	0.000459
19	0.000285	0.000389	0.000462
20	0.000286	0.000391	0.000464
21	0.000288	0.000393	0.000467
22	0.000290	0.000397	0.000471
23	0.000293	0.000400	0.000475
24	0.000296	0.000404	0.000480
25	0.000299	0.000408	0.000485
26	0.000303	0.000414	0.000492
27	0.000308	0.000421	0.000500
28	0.000313	0.000428	0.000508
29	0.000321	0.000438	0.000519
30	0.000332	0.000452	0.000531
31	0.000348	0.000471	0.000545
32	0.000367	0.000494	0.000561
33	0.000389	0.000520	0.000579
34	0.000414	0.000549	0.000601
35	0.000441	0.000582	0.000626
36	0.000470	0.000617	0.000654
37	0.000502	0.000657	0.000687
38	0.000539	0.000703	0.000726
39	0.000580	0.000753	0.000769
40	0.000626	0.000810	0.000820
41	0.000677	0.000873	0.000878
42	0.000734	0.000942	0.000944
43	0.000800	0.001021	0.001021
44	0.000873	0.001108	0.001108
45	0.000956	0.001208	0.001208
46	0.001049	0.001322	0.001322
47	0.001153	0.001452	0.001452
48	0.001271	0.001601	0.001601
49	0.001404	0.001770	0.001770
50	0.001552	0.001963	0.001963
51	0.001720	0.002183	0.002183
52	0.001906	0.002432	0.002432
53	0.002115	0.002713	0.002715
54	0.002349	0.003026	0.003036

Table A1. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.002609	0.003374	0.003400
56	0.002900	0.003759	0.003812
57	0.003223	0.004187	0.004277
58	0.003582	0.004664	0.004802
59	0.003982	0.005198	0.005395
60	0.004428	0.005794	0.006064
61	0.004922	0.006457	0.006816
62	0.005471	0.007197	0.007662
63	0.006082	0.008023	0.008613
64	0.006762	0.008943	0.009679
65	0.007520	0.009970	0.010875
66	0.008366	0.011118	0.012214
67	0.009313	0.012402	0.013712
68	0.010373	0.013839	0.015385
69	0.011565	0.015452	0.017252
70	0.012908	0.017264	0.019333
71	0.014426	0.019303	0.021649
72	0.016147	0.021605	0.024224
73	0.018106	0.024208	0.027084
74	0.020342	0.027159	0.030255
75	0.022905	0.030512	0.033767
76	0.025850	0.034333	0.037652
77	0.029246	0.038696	0.041942
78	0.033172	0.043688	0.046672
79	0.037594	0.049283	0.051882
80	0.042409	0.055389	0.057610
81	0.047427	0.061823	0.063897
82	0.052694	0.068642	0.070787
83	0.058305	0.075952	0.078325
84	0.064432	0.083933	0.086556
85	0.071111	0.092634	0.095529
86	0.078378	0.102099	0.105290
87	0.086267	0.112376	0.115888
88	0.094814	0.123510	0.127370
89	0.104053	0.135546	0.139782

Table A1. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.114018	0.148527	0.153168
91		0.162493	0.167571
92			0.183029
93			0.199573
94			0.217232
95			0.236024
96			0.255963
97			0.277048
98			0.299269
99			0.322606
100			0.346759
101			0.370214
102			0.392528
103			0.413752
104			0.433932
105			0.453110
106			0.471326
107			0.488618
108			0.505018
109			0.520556
110			0.535256
111			0.549141
112			0.562225
113			0.574517
114			0.586017
115			0.596712
116			0.606569
117			0.615519
118			0.623412
119			0.629820
120			1.000000

Table A2. Permanent Assurances, males, smokers – AMS00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000491	0.000670	0.000679
18	0.000492	0.000672	0.000681
19	0.000494	0.000675	0.000684
20	0.000496	0.000678	0.000687
21	0.000499	0.000681	0.000690
22	0.000502	0.000686	0.000695
23	0.000506	0.000691	0.000700
24	0.000510	0.000697	0.000706
25	0.000515	0.000704	0.000713
26	0.000522	0.000712	0.000722
27	0.000529	0.000722	0.000732
28	0.000538	0.000734	0.000744
29	0.000550	0.000750	0.000759
30	0.000569	0.000769	0.000776
31	0.000595	0.000792	0.000796
32	0.000629	0.000819	0.000820
33	0.000668	0.000848	0.000848
34	0.000711	0.000881	0.000881
35	0.000759	0.000920	0.000920
36	0.000813	0.000966	0.000966
37	0.000873	0.001019	0.001019
38	0.000941	0.001081	0.001081
39	0.001019	0.001154	0.001154
40	0.001107	0.001238	0.001238
41	0.001207	0.001336	0.001336
42	0.001321	0.001449	0.001449
43	0.001452	0.001581	0.001581
44	0.001599	0.001732	0.001732
45	0.001768	0.001907	0.001907
46	0.001961	0.002109	0.002109
47	0.002178	0.002340	0.002340
48	0.002425	0.002605	0.002605
49	0.002704	0.002909	0.002909
50	0.003018	0.003256	0.003256
51	0.003372	0.003652	0.003652
52	0.003769	0.004103	0.004103
53	0.004214	0.004615	0.004615
54	0.004711	0.005196	0.005196

Table A2. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.005266	0.005855	0.005855
56	0.005884	0.006599	0.006599
57	0.006569	0.007438	0.007438
58	0.007330	0.008383	0.008383
59	0.008172	0.009446	0.009446
60	0.009102	0.010637	0.010637
61	0.010131	0.011971	0.011971
62	0.011265	0.013462	0.013462
63	0.012517	0.015124	0.015124
64	0.013898	0.016974	0.016974
65	0.015422	0.019029	0.019029
66	0.017105	0.021307	0.021307
67	0.018965	0.023826	0.023826
68	0.021025	0.026607	0.026607
69	0.023310	0.029670	0.029670
70	0.025851	0.033036	0.033036
71	0.028683	0.036728	0.036728
72	0.031849	0.040768	0.040768
73	0.035397	0.045179	0.045179
74	0.039387	0.049983	0.049983
75	0.043887	0.055205	0.055205
76	0.048975	0.060865	0.060865
77	0.054745	0.066988	0.066988
78	0.061303	0.073593	0.073593
79	0.068536	0.080703	0.080703
80	0.076211	0.088334	0.088334
81	0.083952	0.096506	0.096506
82	0.091808	0.105232	0.105232
83	0.099917	0.114527	0.114527
84	0.108530	0.124399	0.124399
85	0.117653	0.134856	0.134856
86	0.127290	0.145902	0.145902
87	0.137440	0.157536	0.157536
88	0.148099	0.169754	0.169754
89	0.159261	0.182548	0.182548

Table A2. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.170914	0.195905	0.195905
91		0.209808	0.209808
92			0.224234
93			0.239158
94			0.254548
95			0.270369
96			0.286580
97			0.303139
98			0.319997
99			0.337105
100			0.357329
101			0.379761
102			0.401123
103			0.421463
104			0.440820
105			0.459236
106			0.476745
107			0.493381
108			0.509174
109			0.524150
110			0.538332
111			0.551739
112			0.564383
113			0.576272
114			0.587403
115			0.597764
116			0.607319
117			0.616001
118			0.623663
119			0.629886
120			1.000000

Table A3. Permanent Assurances, males, non-smokers – AMN00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000223	0.000305	0.000363
18	0.000225	0.000307	0.000365
19	0.000226	0.000309	0.000368
20	0.000229	0.000313	0.000372
21	0.000231	0.000315	0.000375
22	0.000234	0.000319	0.000380
23	0.000236	0.000323	0.000384
24	0.000240	0.000328	0.000390
25	0.000244	0.000333	0.000396
26	0.000248	0.000339	0.000403
27	0.000253	0.000345	0.000411
28	0.000259	0.000354	0.000421
29	0.000266	0.000363	0.000431
30	0.000276	0.000376	0.000443
31	0.000290	0.000393	0.000456
32	0.000308	0.000414	0.000471
33	0.000328	0.000438	0.000489
34	0.000349	0.000463	0.000508
35	0.000373	0.000492	0.000531
36	0.000399	0.000524	0.000556
37	0.000427	0.000558	0.000585
38	0.000458	0.000596	0.000617
39	0.000492	0.000639	0.000654
40	0.000530	0.000686	0.000696
41	0.000572	0.000738	0.000744
42	0.000620	0.000795	0.000798
43	0.000672	0.000858	0.000860
44	0.000731	0.000927	0.000929
45	0.000796	0.001006	0.001008
46	0.000869	0.001096	0.001098
47	0.000951	0.001198	0.001200
48	0.001042	0.001312	0.001315
49	0.001145	0.001444	0.001447
50	0.001259	0.001592	0.001595
51	0.001387	0.001760	0.001764
52	0.001529	0.001951	0.001955
53	0.001689	0.002166	0.002172
54	0.001867	0.002405	0.002418

Table A3. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.002066	0.002671	0.002697
56	0.002288	0.002965	0.003013
57	0.002535	0.003293	0.003371
58	0.002813	0.003662	0.003778
59	0.003122	0.004075	0.004238
60	0.003469	0.004539	0.004760
61	0.003856	0.005059	0.005351
62	0.004291	0.005644	0.006021
63	0.004779	0.006304	0.006781
64	0.005327	0.007045	0.007640
65	0.005945	0.007882	0.008614
66	0.006643	0.008827	0.009717
67	0.007432	0.009898	0.010965
68	0.008329	0.011112	0.012378
69	0.009351	0.012493	0.013977
70	0.010519	0.014068	0.015786
71	0.011858	0.015868	0.017832
72	0.013401	0.017931	0.020145
73	0.015184	0.020302	0.022759
74	0.017253	0.023034	0.025712
75	0.019664	0.026196	0.029048
76	0.022483	0.029861	0.032813
77	0.025790	0.034123	0.037060
78	0.029685	0.039095	0.041849
79	0.034165	0.044788	0.047245
80	0.039172	0.051161	0.053319
81	0.044559	0.058084	0.060153
82	0.050394	0.065646	0.067833
83	0.056798	0.073989	0.076454
84	0.063955	0.083312	0.086088
85	0.070969	0.092449	0.095529
86	0.078221	0.101895	0.105290
87	0.086094	0.112151	0.115888
88	0.094624	0.123263	0.127370
89	0.103845	0.135275	0.139782

Table A3. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.113790	0.148229	0.153168
91		0.162168	0.167571
92			0.183029
93			0.199573
94			0.217232
95			0.236024
96			0.255963
97			0.277048
98			0.299269
99			0.322606
100			0.346759
101			0.370214
102			0.392528
103			0.413752
104			0.433932
105			0.453110
106			0.471326
107			0.488618
108			0.505018
109			0.520556
110			0.535256
111			0.549141
112			0.562225
113			0.574517
114			0.586017
115			0.596712
116			0.606569
117			0.615519
118			0.623412
119			0.629820
120			1.000000

Table A4. Permanent Assurances, females, combined – AFC00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000055	0.000111	0.000179
18	0.000056	0.000114	0.000184
19	0.000057	0.000117	0.000188
20	0.000059	0.000120	0.000194
21	0.000061	0.000123	0.000199
22	0.000063	0.000128	0.000206
23	0.000065	0.000132	0.000213
24	0.000067	0.000137	0.000221
25	0.000070	0.000143	0.000230
26	0.000073	0.000150	0.000241
27	0.000077	0.000156	0.000252
28	0.000081	0.000164	0.000265
29	0.000085	0.000174	0.000279
30	0.000092	0.000185	0.000295
31	0.000100	0.000199	0.000313
32	0.000110	0.000215	0.000333
33	0.000122	0.000234	0.000355
34	0.000135	0.000255	0.000380
35	0.000150	0.000278	0.000408
36	0.000166	0.000305	0.000439
37	0.000184	0.000333	0.000473
38	0.000205	0.000367	0.000512
39	0.000228	0.000404	0.000556
40	0.000254	0.000445	0.000604
41	0.000284	0.000492	0.000659
42	0.000317	0.000544	0.000720
43	0.000354	0.000603	0.000788
44	0.000396	0.000669	0.000864
45	0.000442	0.000742	0.000949
46	0.000495	0.000825	0.001044
47	0.000554	0.000917	0.001150
48	0.000620	0.001021	0.001269
49	0.000694	0.001136	0.001401
50	0.000777	0.001267	0.001550
51	0.000870	0.001412	0.001716
52	0.000975	0.001575	0.001901
53	0.001092	0.001758	0.002109
54	0.001223	0.001962	0.002341

Table A4. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.001370	0.002191	0.002600
56	0.001534	0.002446	0.002890
57	0.001717	0.002731	0.003213
58	0.001922	0.003052	0.003576
59	0.002151	0.003408	0.003980
60	0.002408	0.003808	0.004433
61	0.002694	0.004253	0.004938
62	0.003014	0.004752	0.005503
63	0.003371	0.005308	0.006134
64	0.003770	0.005930	0.006840
65	0.004216	0.006625	0.007628
66	0.004714	0.007401	0.008508
67	0.005271	0.008268	0.009492
68	0.005893	0.009237	0.010591
69	0.006588	0.010320	0.011818
70	0.007365	0.011529	0.013188
71	0.008234	0.012883	0.014719
72	0.009207	0.014395	0.016427
73	0.010296	0.016086	0.018333
74	0.011516	0.017977	0.020460
75	0.012883	0.020094	0.022833
76	0.014417	0.022464	0.025480
77	0.016139	0.025117	0.028431
78	0.018073	0.028090	0.031720
79	0.020235	0.031410	0.035385
80	0.022636	0.035099	0.039466
81	0.025281	0.039179	0.044009
82	0.028200	0.043694	0.049064
83	0.031430	0.048699	0.054684
84	0.035018	0.054260	0.060928
85	0.039004	0.060435	0.067862
86	0.043425	0.067286	0.075555
87	0.048326	0.074879	0.084081
88	0.053752	0.083286	0.093522
89	0.059753	0.092584	0.103963

Table A4. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.066381	0.102854	0.115495
91		0.114182	0.128215
92			0.142221
93			0.157615
94			0.174502
95			0.192984
96			0.213160
97			0.235123
98			0.258956
99			0.284727
100			0.312189
101			0.339060
102			0.364540
103			0.388697
104			0.411593
105			0.433285
106			0.453826
107			0.473266
108			0.491649
109			0.509014
110			0.525398
111			0.540829
112			0.555332
113			0.568922
114			0.581604
115			0.593370
116			0.604189
117			0.613992
118			0.622620
119			0.629613
120			1.000000

Table A5. Permanent Assurances, females, smokers – AFS00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000100	0.000204	0.000250
18	0.000101	0.000207	0.000253
19	0.000103	0.000209	0.000256
20	0.000104	0.000212	0.000260
21	0.000106	0.000216	0.000265
22	0.000108	0.000220	0.000270
23	0.000111	0.000225	0.000276
24	0.000114	0.000232	0.000284
25	0.000117	0.000239	0.000293
26	0.000121	0.000247	0.000303
27	0.000126	0.000257	0.000315
28	0.000132	0.000269	0.000329
29	0.000139	0.000282	0.000345
30	0.000149	0.000300	0.000364
31	0.000162	0.000322	0.000385
32	0.000178	0.000349	0.000411
33	0.000198	0.000381	0.000440
34	0.000221	0.000418	0.000474
35	0.000247	0.000461	0.000513
36	0.000278	0.000509	0.000558
37	0.000312	0.000566	0.000610
38	0.000352	0.000630	0.000669
39	0.000399	0.000705	0.000738
40	0.000452	0.000791	0.000816
41	0.000513	0.000889	0.000906
42	0.000584	0.001000	0.001009
43	0.000666	0.001124	0.001127
44	0.000760	0.001260	0.001261
45	0.000868	0.001415	0.001415
46	0.000991	0.001589	0.001589
47	0.001133	0.001788	0.001788
48	0.001294	0.002013	0.002013
49	0.001478	0.002269	0.002269
50	0.001688	0.002558	0.002558
51	0.001926	0.002886	0.002886
52	0.002197	0.003257	0.003257
53	0.002503	0.003674	0.003674
54	0.002850	0.004146	0.004146

Table A5. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.003241	0.004676	0.004676
56	0.003681	0.005272	0.005272
57	0.004176	0.005941	0.005941
58	0.004732	0.006691	0.006691
59	0.005355	0.007530	0.007530
60	0.006052	0.008469	0.008469
61	0.006831	0.009517	0.009517
62	0.007700	0.010686	0.010686
63	0.008667	0.011987	0.011987
64	0.009742	0.013433	0.013433
65	0.010936	0.015039	0.015039
66	0.012261	0.016819	0.016819
67	0.013726	0.018789	0.018789
68	0.015348	0.020967	0.020967
69	0.017139	0.023370	0.023370
70	0.019117	0.026019	0.026019
71	0.021296	0.028932	0.028932
72	0.023696	0.032133	0.032133
73	0.026337	0.035643	0.035643
74	0.029241	0.039486	0.039486
75	0.032431	0.043686	0.043686
76	0.035935	0.048270	0.048270
77	0.039779	0.053262	0.053262
78	0.043997	0.058691	0.058691
79	0.048591	0.064583	0.064583
80	0.053552	0.070965	0.070965
81	0.058851	0.077867	0.077867
82	0.064515	0.085314	0.085314
83	0.070579	0.093334	0.093334
84	0.077098	0.101954	0.101954
85	0.084089	0.111199	0.111199
86	0.091571	0.121093	0.121093
87	0.099560	0.131658	0.131658
88	0.108072	0.142914	0.142914
89	0.117118	0.154877	0.154877

Table A5. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.126711	0.167563	0.167563
91		0.180981	0.180981
92			0.195138
93			0.210036
94			0.225672
95			0.242039
96			0.259122
97			0.276902
98			0.295354
99			0.314444
100			0.336839
101			0.361264
102			0.384479
103			0.406538
104			0.427492
105			0.447389
106			0.466271
107			0.484178
108			0.501148
109			0.517211
110			0.532397
111			0.546727
112			0.560221
113			0.572889
114			0.584732
115			0.595738
116			0.605875
117			0.615073
118			0.623181
119			0.629760
120			1.000000

Table A6. Permanent Assurances, females, non-smokers – AFN00 two years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Durations 2+
17	0.000055	0.000111	0.000179
18	0.000056	0.000114	0.000184
19	0.000057	0.000117	0.000188
20	0.000059	0.000120	0.000194
21	0.000061	0.000123	0.000199
22	0.000063	0.000128	0.000206
23	0.000065	0.000132	0.000213
24	0.000067	0.000137	0.000221
25	0.000070	0.000143	0.000230
26	0.000073	0.000150	0.000241
27	0.000077	0.000156	0.000252
28	0.000081	0.000164	0.000265
29	0.000085	0.000174	0.000279
30	0.000092	0.000185	0.000295
31	0.000100	0.000199	0.000313
32	0.000110	0.000215	0.000333
33	0.000122	0.000234	0.000355
34	0.000135	0.000255	0.000375
35	0.000150	0.000278	0.000394
36	0.000165	0.000303	0.000416
37	0.000180	0.000326	0.000440
38	0.000196	0.000351	0.000467
39	0.000215	0.000380	0.000498
40	0.000235	0.000412	0.000532
41	0.000258	0.000448	0.000571
42	0.000284	0.000487	0.000614
43	0.000313	0.000533	0.000663
44	0.000345	0.000583	0.000718
45	0.000382	0.000641	0.000780
46	0.000423	0.000705	0.000850
47	0.000469	0.000777	0.000928
48	0.000521	0.000857	0.001015
49	0.000579	0.000949	0.001114
50	0.000645	0.001051	0.001225
51	0.000719	0.001166	0.001349
52	0.000802	0.001295	0.001489
53	0.000895	0.001442	0.001647
54	0.001001	0.001606	0.001824

Table A6. (continued)

Age x	Duration 0	Duration 1	Durations 2+
55	0.001118	0.001789	0.002022
56	0.001252	0.001996	0.002246
57	0.001401	0.002229	0.002497
58	0.001569	0.002490	0.002779
59	0.001757	0.002784	0.003096
60	0.001969	0.003115	0.003453
61	0.002207	0.003485	0.003853
62	0.002475	0.003902	0.004303
63	0.002775	0.004370	0.004809
64	0.003112	0.004896	0.005377
65	0.003491	0.005486	0.006015
66	0.003917	0.006149	0.006732
67	0.004395	0.006895	0.007538
68	0.004932	0.007732	0.008442
69	0.005536	0.008673	0.009458
70	0.006215	0.009730	0.010599
71	0.006979	0.010919	0.011880
72	0.007839	0.012255	0.013318
73	0.008805	0.013757	0.014931
74	0.009895	0.015447	0.016742
75	0.011124	0.017349	0.018774
76	0.012509	0.019491	0.021053
77	0.014073	0.021902	0.023609
78	0.015839	0.024618	0.026473
79	0.017825	0.027669	0.029684
80	0.020044	0.031080	0.033280
81	0.022504	0.034876	0.037307
82	0.025236	0.039102	0.041813
83	0.028279	0.043816	0.046854
84	0.031680	0.049086	0.052489
85	0.035478	0.054972	0.058783
86	0.039719	0.061543	0.065810
87	0.044448	0.068870	0.073645
88	0.049717	0.077035	0.082375
89	0.055581	0.086120	0.092090

Table A6. (continued)

Age x	Duration 0	Duration 1	Durations 2+
90	0.062098	0.096219	0.102889
91		0.107427	0.114874
92			0.128157
93			0.142850
94			0.159072
95			0.176942
96			0.196576
97			0.218089
98			0.241586
99			0.267157
100			0.295467
101			0.324026
102			0.351066
103			0.376663
104			0.400888
105			0.423806
106			0.445478
107			0.465958
108			0.485298
109			0.503543
110			0.520734
111			0.536905
112			0.552084
113			0.566290
114			0.579532
115			0.591804
116			0.603076
117			0.613278
118			0.622251
119			0.629516
120			1.000000

Table A7. Temporary Assurances, males, combined – TMC00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000193	0.000251	0.000294	0.000337	0.000381	0.000458
18	0.000194	0.000251	0.000295	0.000338	0.000381	0.000459
19	0.000195	0.000253	0.000297	0.000340	0.000384	0.000462
20	0.000196	0.000254	0.000298	0.000342	0.000386	0.000464
21	0.000197	0.000256	0.000300	0.000344	0.000388	0.000467
22	0.000199	0.000258	0.000302	0.000347	0.000391	0.000471
23	0.000200	0.000260	0.000305	0.000350	0.000395	0.000475
24	0.000202	0.000263	0.000308	0.000353	0.000399	0.000480
25	0.000204	0.000265	0.000311	0.000357	0.000403	0.000485
26	0.000207	0.000269	0.000316	0.000362	0.000409	0.000492
27	0.000211	0.000274	0.000321	0.000368	0.000415	0.000500
28	0.000214	0.000278	0.000326	0.000374	0.000422	0.000508
29	0.000220	0.000285	0.000334	0.000383	0.000432	0.000519
30	0.000227	0.000294	0.000344	0.000394	0.000444	0.000531
31	0.000237	0.000306	0.000357	0.000409	0.000460	0.000545
32	0.000250	0.000320	0.000373	0.000426	0.000479	0.000561
33	0.000264	0.000337	0.000391	0.000446	0.000501	0.000579
34	0.000280	0.000355	0.000412	0.000469	0.000526	0.000601
35	0.000297	0.000376	0.000435	0.000494	0.000553	0.000626
36	0.000315	0.000398	0.000459	0.000521	0.000583	0.000654
37	0.000336	0.000422	0.000487	0.000552	0.000617	0.000687
38	0.000359	0.000451	0.000519	0.000588	0.000657	0.000726
39	0.000385	0.000481	0.000554	0.000627	0.000699	0.000769

Table A7. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000413	0.000517	0.000594	0.000672	0.000749	0.000820
41	0.000445	0.000556	0.000639	0.000722	0.000805	0.000878
42	0.000481	0.000600	0.000689	0.000778	0.000867	0.000944
43	0.000521	0.000650	0.000746	0.000843	0.000939	0.001021
44	0.000566	0.000705	0.000810	0.000915	0.001019	0.001108
45	0.000616	0.000768	0.000882	0.000996	0.001111	0.001208
46	0.000672	0.000838	0.000963	0.001088	0.001213	0.001322
47	0.000735	0.000917	0.001054	0.001192	0.001329	0.001452
48	0.000804	0.001006	0.001157	0.001308	0.001460	0.001601
49	0.000882	0.001105	0.001272	0.001439	0.001606	0.001770
50	0.000968	0.001215	0.001401	0.001586	0.001772	0.001963
51	0.001064	0.001339	0.001545	0.001751	0.001958	0.002183
52	0.001170	0.001476	0.001706	0.001935	0.002165	0.002432
53	0.001287	0.001628	0.001885	0.002141	0.002398	0.002715
54	0.001415	0.001797	0.002084	0.002371	0.002658	0.003036
55	0.001557	0.001985	0.002306	0.002627	0.002949	0.003400
56	0.001713	0.002192	0.002552	0.002913	0.003273	0.003812
57	0.001882	0.002421	0.002825	0.003229	0.003633	0.004277
58	0.002068	0.002672	0.003126	0.003580	0.004034	0.004802
59	0.002271	0.002950	0.003460	0.003970	0.004479	0.005395

Table A7. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.002493	0.003256	0.003829	0.004402	0.004975	0.006064
61	0.002734	0.003591	0.004235	0.004880	0.005524	0.006816
62	0.002997	0.003960	0.004685	0.005409	0.006133	0.007662
63	0.003283	0.004367	0.005181	0.005995	0.006808	0.008613
64	0.003595	0.004813	0.005728	0.006642	0.007557	0.009679
65	0.003937	0.005305	0.006332	0.007360	0.008388	0.010875
66	0.004311	0.005847	0.007001	0.008156	0.009310	0.012214
67	0.004722	0.006447	0.007742	0.009038	0.010334	0.013712
68	0.005175	0.007111	0.008564	0.010018	0.011472	0.015385
69	0.005678	0.007848	0.009479	0.011109	0.012739	0.017252
70	0.006239	0.008671	0.010498	0.012325	0.014152	0.019333
71	0.006869	0.009592	0.011638	0.013684	0.015730	0.021649
72	0.007581	0.010628	0.012917	0.015206	0.017496	0.024224
73	0.008392	0.011799	0.014358	0.016918	0.019477	0.027084
74	0.009322	0.013128	0.015987	0.018846	0.021705	0.030255
75	0.010396	0.014644	0.017835	0.021026	0.024217	0.033767
76	0.011647	0.016383	0.019941	0.023500	0.027058	0.037652
77	0.013110	0.018386	0.022350	0.026313	0.030277	0.041942
78	0.014832	0.020703	0.025114	0.029524	0.033935	0.046672
79	0.016799	0.023326	0.028229	0.033132	0.038034	0.051882

Table A7. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.018962	0.026209	0.031653	0.037097	0.042542	0.057610
81	0.021217	0.029256	0.035294	0.041332	0.047370	0.063897
82	0.023580	0.032485	0.039174	0.045864	0.052553	0.070787
83	0.026091	0.035944	0.043346	0.050748	0.058150	0.078325
84	0.028833	0.039722	0.047901	0.056081	0.064260	0.086556
85	0.031822	0.043840	0.052867	0.061895	0.070922	0.095529
86	0.035074	0.048319	0.058269	0.068219	0.078169	0.105290
87	0.038604	0.053183	0.064134	0.075085	0.086037	0.115888
88	0.042429	0.058452	0.070488	0.082525	0.094561	0.127370
89	0.046563	0.064148	0.077357	0.090567	0.103776	0.139782
90	0.051022	0.070291	0.084765	0.099240	0.113714	0.153168
91		0.076901	0.092736	0.108572	0.124407	0.167571
92			0.101291	0.118587	0.135883	0.183029
93				0.129306	0.148166	0.199573
94					0.161276	0.217232
95						0.236024
96						0.255963
97						0.277048
98						0.299269
99						0.322606

Table A7. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.346759
101						0.370214
102						0.392528
103						0.413752
104						0.433932
105						0.453110
106						0.471326
107						0.488618
108						0.505018
109						0.520556
110						0.535256
111						0.549141
112						0.562225
113						0.574517
114						0.586017
115						0.596712
116						0.606569
117						0.615519
118						0.623412
119						0.629820
120						1.000000

Table A8. Temporary Assurances, males, smokers – TMS00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000318	0.000413	0.000484	0.000555	0.000627	0.000679
18	0.000319	0.000414	0.000486	0.000557	0.000629	0.000681
19	0.000320	0.000416	0.000488	0.000560	0.000631	0.000684
20	0.000322	0.000418	0.000490	0.000562	0.000634	0.000687
21	0.000323	0.000420	0.000492	0.000564	0.000637	0.000690
22	0.000325	0.000423	0.000496	0.000569	0.000641	0.000695
23	0.000328	0.000426	0.000499	0.000573	0.000646	0.000700
24	0.000331	0.000429	0.000503	0.000578	0.000652	0.000706
25	0.000334	0.000434	0.000508	0.000583	0.000658	0.000713
26	0.000338	0.000439	0.000515	0.000591	0.000666	0.000722
27	0.000343	0.000445	0.000522	0.000599	0.000676	0.000732
28	0.000348	0.000452	0.000530	0.000609	0.000687	0.000744
29	0.000357	0.000463	0.000542	0.000622	0.000702	0.000759
30	0.000368	0.000477	0.000558	0.000639	0.000721	0.000776
31	0.000385	0.000496	0.000579	0.000663	0.000746	0.000796
32	0.000405	0.000520	0.000606	0.000692	0.000778	0.000820
33	0.000429	0.000548	0.000637	0.000726	0.000815	0.000848
34	0.000455	0.000579	0.000671	0.000764	0.000856	0.000881
35	0.000485	0.000613	0.000710	0.000806	0.000903	0.000920
36	0.000517	0.000652	0.000754	0.000855	0.000956	0.000966
37	0.000554	0.000696	0.000803	0.000910	0.001014	0.001019
38	0.000595	0.000746	0.000859	0.000973	0.001080	0.001081
39	0.000641	0.000802	0.000924	0.001045	0.001154	0.001154

Table A8. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000693	0.000866	0.000996	0.001126	0.001238	0.001238
41	0.000753	0.000940	0.001080	0.001220	0.001336	0.001336
42	0.000820	0.001022	0.001175	0.001327	0.001449	0.001449
43	0.000897	0.001118	0.001284	0.001450	0.001581	0.001581
44	0.000983	0.001225	0.001407	0.001588	0.001732	0.001732
45	0.001080	0.001347	0.001547	0.001747	0.001907	0.001907
46	0.001191	0.001486	0.001707	0.001928	0.002109	0.002109
47	0.001315	0.001642	0.001887	0.002133	0.002340	0.002340
48	0.001454	0.001818	0.002091	0.002365	0.002605	0.002605
49	0.001610	0.002016	0.002322	0.002627	0.002908	0.002909
50	0.001784	0.002239	0.002581	0.002922	0.003250	0.003256
51	0.001977	0.002488	0.002871	0.003255	0.003632	0.003652
52	0.002192	0.002766	0.003196	0.003627	0.004056	0.004103
53	0.002429	0.003074	0.003559	0.004043	0.004528	0.004615
54	0.002691	0.003417	0.003962	0.004508	0.005053	0.005196
55	0.002978	0.003797	0.004411	0.005026	0.005640	0.005855
56	0.003293	0.004215	0.004908	0.005601	0.006293	0.006599
57	0.003637	0.004676	0.005457	0.006237	0.007018	0.007438
58	0.004011	0.005182	0.006062	0.006942	0.007822	0.008383
59	0.004417	0.005737	0.006729	0.007720	0.008712	0.009446

Table A8. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.004857	0.006344	0.007460	0.008577	0.009693	0.010637
61	0.005334	0.007006	0.008263	0.009520	0.010776	0.011971
62	0.005848	0.007730	0.009143	0.010556	0.011969	0.013462
63	0.006404	0.008517	0.010105	0.011692	0.013280	0.015124
64	0.007004	0.009376	0.011157	0.012939	0.014721	0.016974
65	0.007652	0.010311	0.012308	0.014306	0.016303	0.019029
66	0.008353	0.011330	0.013567	0.015804	0.018040	0.021307
67	0.009113	0.012443	0.014944	0.017445	0.019946	0.023826
68	0.009942	0.013660	0.016452	0.019245	0.022038	0.026607
69	0.010847	0.014993	0.018108	0.021222	0.024337	0.029670
70	0.011843	0.016459	0.019927	0.023395	0.026862	0.033036
71	0.012944	0.018077	0.021932	0.025787	0.029643	0.036728
72	0.014172	0.019869	0.024148	0.028427	0.032707	0.040768
73	0.015549	0.021863	0.026605	0.031347	0.036090	0.045179
74	0.017106	0.024091	0.029338	0.034584	0.039831	0.049983
75	0.018880	0.026594	0.032389	0.038184	0.043979	0.055205
76	0.020913	0.029418	0.035807	0.042196	0.048585	0.060865
77	0.023259	0.032620	0.039651	0.046683	0.053715	0.066988
78	0.025978	0.036262	0.043987	0.051712	0.059437	0.073593
79	0.029027	0.040304	0.048775	0.057247	0.065718	0.080703

Table A8. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.032296	0.044639	0.053912	0.063184	0.072457	0.088334
81	0.035596	0.049082	0.059212	0.069342	0.079473	0.096506
82	0.038938	0.053643	0.064689	0.075736	0.086782	0.105232
83	0.042378	0.058381	0.070403	0.082425	0.094447	0.114527
84	0.046030	0.063414	0.076472	0.089530	0.102588	0.124399
85	0.049900	0.068744	0.082900	0.097056	0.111212	0.134856
86	0.053987	0.074375	0.089691	0.105006	0.120321	0.145902
87	0.058292	0.080306	0.096842	0.113379	0.129916	0.157536
88	0.062813	0.086534	0.104353	0.122172	0.139992	0.169754
89	0.067547	0.093056	0.112218	0.131380	0.150542	0.182548
90	0.072489	0.099865	0.120429	0.140993	0.161558	0.195905
91		0.106952	0.128976	0.150999	0.173023	0.209808
92			0.137844	0.161382	0.184920	0.224234
93				0.172123	0.197227	0.239158
94					0.209919	0.254548
95						0.270369
96						0.286580
97						0.303139
98						0.319997
99						0.337105

Table A8. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.357329
101						0.379761
102						0.401123
103						0.421463
104						0.440820
105						0.459236
106						0.476745
107						0.493381
108						0.509174
109						0.524150
110						0.538332
111						0.551739
112						0.564383
113						0.576272
114						0.587403
115						0.597764
116						0.607319
117						0.616001
118						0.623663
119						0.629886
120						1.000000

Table A9. Temporary Assurances, males, non-smokers – TMN00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000159	0.000206	0.000242	0.000277	0.000313	0.000363
18	0.000160	0.000207	0.000243	0.000279	0.000314	0.000365
19	0.000161	0.000209	0.000245	0.000281	0.000317	0.000368
20	0.000163	0.000211	0.000248	0.000284	0.000320	0.000372
21	0.000164	0.000213	0.000250	0.000286	0.000323	0.000375
22	0.000166	0.000216	0.000253	0.000290	0.000327	0.000380
23	0.000168	0.000218	0.000256	0.000293	0.000331	0.000384
24	0.000170	0.000221	0.000260	0.000298	0.000336	0.000390
25	0.000173	0.000225	0.000264	0.000302	0.000341	0.000396
26	0.000176	0.000229	0.000268	0.000308	0.000347	0.000403
27	0.000180	0.000233	0.000274	0.000314	0.000354	0.000411
28	0.000184	0.000239	0.000280	0.000321	0.000363	0.000421
29	0.000189	0.000245	0.000287	0.000330	0.000372	0.000431
30	0.000196	0.000254	0.000297	0.000341	0.000384	0.000443
31	0.000206	0.000265	0.000310	0.000354	0.000399	0.000456
32	0.000217	0.000279	0.000325	0.000371	0.000417	0.000471
33	0.000231	0.000295	0.000343	0.000391	0.000439	0.000489
34	0.000245	0.000311	0.000361	0.000411	0.000461	0.000508
35	0.000261	0.000330	0.000382	0.000434	0.000486	0.000531
36	0.000278	0.000350	0.000405	0.000459	0.000514	0.000556
37	0.000297	0.000373	0.000430	0.000488	0.000545	0.000585
38	0.000317	0.000397	0.000458	0.000518	0.000579	0.000617
39	0.000339	0.000424	0.000489	0.000553	0.000617	0.000654

Table A9. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000364	0.000455	0.000523	0.000591	0.000659	0.000696
41	0.000391	0.000488	0.000561	0.000634	0.000707	0.000744
42	0.000422	0.000526	0.000604	0.000682	0.000760	0.000798
43	0.000455	0.000567	0.000652	0.000736	0.000820	0.000860
44	0.000492	0.000613	0.000704	0.000795	0.000886	0.000929
45	0.000533	0.000665	0.000763	0.000862	0.000961	0.001008
46	0.000579	0.000722	0.000830	0.000937	0.001045	0.001098
47	0.000629	0.000786	0.000903	0.001021	0.001139	0.001200
48	0.000685	0.000857	0.000985	0.001114	0.001243	0.001315
49	0.000747	0.000936	0.001078	0.001220	0.001362	0.001447
50	0.000816	0.001024	0.001180	0.001336	0.001493	0.001595
51	0.000892	0.001122	0.001294	0.001467	0.001640	0.001764
52	0.000975	0.001230	0.001422	0.001613	0.001805	0.001955
53	0.001067	0.001350	0.001563	0.001776	0.001989	0.002172
54	0.001169	0.001484	0.001721	0.001958	0.002195	0.002418
55	0.001281	0.001632	0.001897	0.002161	0.002425	0.002697
56	0.001403	0.001796	0.002092	0.002387	0.002682	0.003013
57	0.001538	0.001978	0.002308	0.002639	0.002969	0.003371
58	0.001687	0.002180	0.002550	0.002920	0.003290	0.003778
59	0.001850	0.002403	0.002818	0.003233	0.003648	0.004238

Table A9. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.002029	0.002650	0.003116	0.003582	0.004049	0.004760
61	0.002225	0.002923	0.003447	0.003972	0.004496	0.005351
62	0.002441	0.003227	0.003817	0.004407	0.004997	0.006021
63	0.002680	0.003564	0.004229	0.004893	0.005558	0.006781
64	0.002942	0.003939	0.004687	0.005436	0.006184	0.007640
65	0.003233	0.004356	0.005200	0.006044	0.006888	0.008614
66	0.003556	0.004823	0.005775	0.006727	0.007679	0.009717
67	0.003915	0.005345	0.006419	0.007493	0.008568	0.010965
68	0.004317	0.005931	0.007144	0.008357	0.009570	0.012378
69	0.004769	0.006592	0.007962	0.009331	0.010701	0.013977
70	0.005282	0.007341	0.008888	0.010434	0.011981	0.015786
71	0.005866	0.008192	0.009939	0.011686	0.013433	0.017832
72	0.006536	0.009164	0.011138	0.013111	0.015085	0.020145
73	0.007311	0.010280	0.012509	0.014739	0.016969	0.022759
74	0.008214	0.011567	0.014086	0.016606	0.019125	0.025712
75	0.009273	0.013061	0.015907	0.018753	0.021599	0.029048
76	0.010523	0.014803	0.018018	0.021233	0.024448	0.032813
77	0.012010	0.016844	0.020475	0.024106	0.027737	0.037060
78	0.013789	0.019247	0.023347	0.027447	0.031548	0.041849
79	0.015861	0.022023	0.026652	0.031281	0.035910	0.047245

Table A9. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.018195	0.025150	0.030374	0.035598	0.040822	0.053319
81	0.020709	0.028555	0.034449	0.040342	0.046236	0.060153
82	0.023428	0.032275	0.038921	0.045567	0.052213	0.067833
83	0.026091	0.035944	0.043346	0.050748	0.058150	0.076454
84	0.028833	0.039722	0.047901	0.056081	0.064260	0.086088
85	0.031822	0.043840	0.052867	0.061895	0.070922	0.095529
86	0.035074	0.048319	0.058269	0.068219	0.078169	0.105290
87	0.038604	0.053183	0.064134	0.075085	0.086037	0.115888
88	0.042429	0.058452	0.070488	0.082525	0.094561	0.127370
89	0.046563	0.064148	0.077357	0.090567	0.103776	0.139782
90	0.051022	0.070291	0.084765	0.099240	0.113714	0.153168
91		0.076901	0.092736	0.108572	0.124407	0.167571
92			0.101291	0.118587	0.135883	0.183029
93				0.129306	0.148166	0.199573
94					0.161276	0.217232
95						0.236024
96						0.255963
97						0.277048
98						0.299269
99						0.322606

Table A9. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.346759
101						0.370214
102						0.392528
103						0.413752
104						0.433932
105						0.453110
106						0.471326
107						0.488618
108						0.505018
109						0.520556
110						0.535256
111						0.549141
112						0.562225
113						0.574517
114						0.586017
115						0.596712
116						0.606569
117						0.615519
118						0.623412
119						0.629820
120						1.000000

Table A10. Temporary Assurances, females, combined – TFC00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000037	0.000056	0.000075	0.000093	0.000112	0.000179
18	0.000038	0.000057	0.000077	0.000096	0.000115	0.000184
19	0.000039	0.000059	0.000078	0.000098	0.000118	0.000188
20	0.000040	0.000061	0.000081	0.000101	0.000122	0.000194
21	0.000041	0.000062	0.000083	0.000104	0.000125	0.000199
22	0.000043	0.000064	0.000086	0.000108	0.000129	0.000206
23	0.000044	0.000066	0.000089	0.000111	0.000134	0.000213
24	0.000046	0.000069	0.000092	0.000115	0.000139	0.000221
25	0.000048	0.000072	0.000096	0.000120	0.000144	0.000230
26	0.000050	0.000075	0.000100	0.000126	0.000151	0.000241
27	0.000052	0.000079	0.000105	0.000132	0.000158	0.000252
28	0.000055	0.000083	0.000110	0.000138	0.000166	0.000265
29	0.000058	0.000087	0.000117	0.000146	0.000175	0.000279
30	0.000063	0.000094	0.000125	0.000156	0.000187	0.000295
31	0.000070	0.000103	0.000135	0.000168	0.000201	0.000313
32	0.000078	0.000113	0.000148	0.000183	0.000218	0.000333
33	0.000089	0.000126	0.000163	0.000201	0.000238	0.000355
34	0.000101	0.000141	0.000181	0.000220	0.000260	0.000380
35	0.000114	0.000157	0.000200	0.000243	0.000286	0.000408
36	0.000130	0.000176	0.000222	0.000268	0.000314	0.000439
37	0.000147	0.000196	0.000246	0.000296	0.000345	0.000473
38	0.000167	0.000220	0.000274	0.000328	0.000382	0.000512
39	0.000189	0.000248	0.000306	0.000364	0.000423	0.000556

Table A10. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000215	0.000278	0.000342	0.000405	0.000468	0.000604
41	0.000244	0.000313	0.000382	0.000452	0.000521	0.000659
42	0.000277	0.000353	0.000428	0.000504	0.000580	0.000720
43	0.000315	0.000397	0.000480	0.000563	0.000646	0.000788
44	0.000357	0.000448	0.000538	0.000629	0.000720	0.000864
45	0.000405	0.000505	0.000604	0.000704	0.000804	0.000949
46	0.000459	0.000569	0.000678	0.000788	0.000898	0.001044
47	0.000520	0.000641	0.000762	0.000883	0.001003	0.001150
48	0.000589	0.000722	0.000856	0.000989	0.001122	0.001269
49	0.000666	0.000813	0.000960	0.001108	0.001255	0.001401
50	0.000753	0.000916	0.001079	0.001242	0.001404	0.001550
51	0.000850	0.001030	0.001211	0.001391	0.001571	0.001716
52	0.000958	0.001158	0.001357	0.001557	0.001757	0.001901
53	0.001079	0.001300	0.001522	0.001743	0.001965	0.002109
54	0.001213	0.001459	0.001704	0.001950	0.002196	0.002341
55	0.001360	0.001633	0.001907	0.002180	0.002453	0.002600
56	0.001523	0.001827	0.002131	0.002434	0.002738	0.002890
57	0.001702	0.002039	0.002377	0.002714	0.003052	0.003213
58	0.001898	0.002273	0.002649	0.003025	0.003400	0.003576
59	0.002110	0.002528	0.002946	0.003364	0.003782	0.003980

Table A10. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.002340	0.002805	0.003271	0.003737	0.004202	0.004433
61	0.002586	0.003105	0.003623	0.004142	0.004661	0.004938
62	0.002849	0.003427	0.004005	0.004583	0.005161	0.005503
63	0.003126	0.003770	0.004414	0.005059	0.005703	0.006134
64	0.003416	0.004134	0.004853	0.005571	0.006290	0.006840
65	0.003714	0.004516	0.005317	0.006118	0.006919	0.007628
66	0.004017	0.004910	0.005804	0.006698	0.007591	0.008508
67	0.004317	0.005314	0.006311	0.007308	0.008305	0.009492
68	0.004606	0.005718	0.006830	0.007943	0.009055	0.010591
69	0.004908	0.006150	0.007391	0.008633	0.009874	0.011818
70	0.005270	0.006655	0.008041	0.009426	0.010811	0.013188
71	0.005762	0.007308	0.008854	0.010400	0.011946	0.014719
72	0.006384	0.008109	0.009835	0.011560	0.013286	0.016427
73	0.007125	0.009050	0.010976	0.012902	0.014827	0.018333
74	0.007951	0.010100	0.012249	0.014399	0.016548	0.020460
75	0.008873	0.011272	0.013670	0.016069	0.018467	0.022833
76	0.009902	0.012579	0.015255	0.017931	0.020608	0.025480
77	0.011049	0.014035	0.017022	0.020008	0.022995	0.028431
78	0.012327	0.015659	0.018991	0.022323	0.025655	0.031720
79	0.013751	0.017468	0.021185	0.024902	0.028619	0.035385

Table A10. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.015337	0.019483	0.023628	0.027774	0.031919	0.039466
81	0.017103	0.021726	0.026348	0.030971	0.035594	0.044009
82	0.019067	0.024221	0.029375	0.034528	0.039682	0.049064
83	0.021252	0.026996	0.032740	0.038484	0.044228	0.054684
84	0.023678	0.030078	0.036478	0.042878	0.049278	0.060928
85	0.026373	0.033501	0.040629	0.047757	0.054886	0.067862
86	0.029362	0.037299	0.045235	0.053171	0.061108	0.075555
87	0.032676	0.041508	0.050340	0.059171	0.068003	0.084081
88	0.036345	0.046168	0.055992	0.065816	0.075639	0.093522
89	0.040403	0.051323	0.062243	0.073163	0.084084	0.103963
90	0.044884	0.057016	0.069147	0.081279	0.093410	0.115495
91		0.063295	0.076763	0.090231	0.103698	0.128215
92			0.085148	0.100087	0.115026	0.142221
93				0.110921	0.127476	0.157615
94					0.141134	0.174502
95						0.192984
96						0.213160
97						0.235123
98						0.258956
99						0.284727

Table A10. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.312189
101						0.339060
102						0.364540
103						0.388697
104						0.411593
105						0.433285
106						0.453826
107						0.473266
108						0.491649
109						0.509014
110						0.525398
111						0.540829
112						0.555332
113						0.568922
114						0.581604
115						0.593370
116						0.604189
117						0.613992
118						0.622620
119						0.629613
120						1.000000

Table A11. Temporary Assurances, females, smokers – TFS00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000052	0.000078	0.000104	0.000130	0.000156	0.000250
18	0.000052	0.000079	0.000105	0.000132	0.000158	0.000253
19	0.000053	0.000080	0.000106	0.000133	0.000160	0.000256
20	0.000054	0.000081	0.000108	0.000135	0.000163	0.000260
21	0.000055	0.000082	0.000110	0.000138	0.000166	0.000265
22	0.000056	0.000084	0.000112	0.000141	0.000169	0.000270
23	0.000057	0.000086	0.000115	0.000144	0.000173	0.000276
24	0.000059	0.000088	0.000118	0.000148	0.000178	0.000284
25	0.000060	0.000091	0.000122	0.000153	0.000183	0.000293
26	0.000063	0.000094	0.000126	0.000158	0.000190	0.000303
27	0.000065	0.000098	0.000131	0.000164	0.000197	0.000315
28	0.000068	0.000102	0.000137	0.000171	0.000206	0.000329
29	0.000072	0.000108	0.000144	0.000180	0.000216	0.000345
30	0.000077	0.000116	0.000154	0.000192	0.000230	0.000364
31	0.000086	0.000126	0.000166	0.000207	0.000247	0.000385
32	0.000097	0.000140	0.000183	0.000226	0.000269	0.000411
33	0.000110	0.000156	0.000202	0.000248	0.000294	0.000440
34	0.000125	0.000175	0.000225	0.000274	0.000324	0.000474
35	0.000143	0.000197	0.000251	0.000305	0.000358	0.000513
36	0.000164	0.000223	0.000281	0.000340	0.000398	0.000558
37	0.000189	0.000253	0.000317	0.000381	0.000444	0.000610
38	0.000217	0.000287	0.000357	0.000427	0.000498	0.000669
39	0.000251	0.000328	0.000405	0.000483	0.000560	0.000738

Table A11. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000289	0.000375	0.000460	0.000546	0.000631	0.000816
41	0.000335	0.000430	0.000525	0.000619	0.000714	0.000906
42	0.000387	0.000493	0.000599	0.000705	0.000810	0.001009
43	0.000449	0.000567	0.000685	0.000803	0.000921	0.001127
44	0.000520	0.000652	0.000784	0.000916	0.001048	0.001261
45	0.000602	0.000751	0.000899	0.001047	0.001195	0.001415
46	0.000697	0.000864	0.001030	0.001197	0.001363	0.001589
47	0.000807	0.000994	0.001182	0.001369	0.001556	0.001788
48	0.000932	0.001143	0.001354	0.001565	0.001776	0.002013
49	0.001076	0.001314	0.001552	0.001789	0.002027	0.002269
50	0.001240	0.001508	0.001776	0.002044	0.002312	0.002558
51	0.001426	0.001729	0.002031	0.002334	0.002636	0.002886
52	0.001638	0.001979	0.002320	0.002661	0.003003	0.003257
53	0.001875	0.002260	0.002645	0.003030	0.003415	0.003674
54	0.002142	0.002577	0.003011	0.003446	0.003880	0.004146
55	0.002441	0.002931	0.003421	0.003911	0.004401	0.004676
56	0.002772	0.003325	0.003877	0.004430	0.004982	0.005272
57	0.003139	0.003762	0.004384	0.005007	0.005629	0.005941
58	0.003542	0.004243	0.004944	0.005646	0.006347	0.006691
59	0.003982	0.004771	0.005560	0.006349	0.007138	0.007530

Table A11. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.004459	0.005346	0.006234	0.007121	0.008009	0.008469
61	0.004972	0.005969	0.006966	0.007964	0.008961	0.009517
62	0.005518	0.006638	0.007758	0.008878	0.009997	0.010686
63	0.006094	0.007350	0.008606	0.009862	0.011118	0.011987
64	0.006692	0.008100	0.009507	0.010915	0.012323	0.013433
65	0.007305	0.008881	0.010457	0.012033	0.013609	0.015039
66	0.007921	0.009684	0.011446	0.013209	0.014971	0.016819
67	0.008525	0.010493	0.012462	0.014431	0.016400	0.018789
68	0.009096	0.011293	0.013490	0.015687	0.017884	0.020967
69	0.009683	0.012132	0.014581	0.017030	0.019479	0.023370
70	0.010373	0.013099	0.015826	0.018552	0.021279	0.026019
71	0.011298	0.014330	0.017362	0.020393	0.023425	0.028932
72	0.012458	0.015825	0.019192	0.022559	0.025926	0.032133
73	0.013818	0.017553	0.021288	0.025023	0.028758	0.035643
74	0.015308	0.019446	0.023584	0.027721	0.031859	0.039486
75	0.016937	0.021514	0.026092	0.030670	0.035248	0.043686
76	0.018714	0.023772	0.028830	0.033888	0.038946	0.048270
77	0.020649	0.026230	0.031812	0.037393	0.042974	0.053262
78	0.022754	0.028904	0.035054	0.041204	0.047354	0.058691
79	0.025038	0.031806	0.038573	0.045341	0.052108	0.064583

Table A11. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.027513	0.034949	0.042385	0.049821	0.057258	0.070965
81	0.030188	0.038348	0.046507	0.054667	0.062826	0.077867
82	0.033075	0.042015	0.050955	0.059895	0.068835	0.085314
83	0.036185	0.045965	0.055745	0.065526	0.075306	0.093334
84	0.039527	0.050210	0.060894	0.071577	0.082261	0.101954
85	0.043111	0.054763	0.066415	0.078068	0.089720	0.111199
86	0.046947	0.059636	0.072325	0.085014	0.097703	0.121093
87	0.051043	0.064839	0.078635	0.092431	0.106227	0.131658
88	0.055407	0.070382	0.085358	0.100333	0.115309	0.142914
89	0.060044	0.076274	0.092503	0.108732	0.124961	0.154877
90	0.064963	0.082521	0.100080	0.117638	0.135197	0.167563
91		0.089129	0.108094	0.127059	0.146023	0.180981
92			0.116549	0.136998	0.157446	0.195138
93				0.147457	0.169466	0.210036
94					0.182082	0.225672
95						0.242039
96						0.259122
97						0.276902
98						0.295354
99						0.314444

Table A11. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.336839
101						0.361264
102						0.384479
103						0.406538
104						0.427492
105						0.447389
106						0.466271
107						0.484178
108						0.501148
109						0.517211
110						0.532397
111						0.546727
112						0.560221
113						0.572889
114						0.584732
115						0.595738
116						0.605875
117						0.615073
118						0.623181
119						0.629760
120						1.000000

Table A12. Temporary Assurances, females, non-smokers – TFN00 five years select: values of $q_{[x-t]+t}$

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
17	0.000037	0.000056	0.000075	0.000093	0.000112	0.000179
18	0.000038	0.000057	0.000077	0.000096	0.000115	0.000184
19	0.000039	0.000059	0.000078	0.000098	0.000118	0.000188
20	0.000040	0.000061	0.000081	0.000101	0.000122	0.000194
21	0.000041	0.000062	0.000083	0.000104	0.000125	0.000199
22	0.000043	0.000064	0.000086	0.000108	0.000129	0.000206
23	0.000044	0.000066	0.000089	0.000111	0.000134	0.000213
24	0.000046	0.000069	0.000092	0.000115	0.000139	0.000221
25	0.000048	0.000072	0.000096	0.000120	0.000144	0.000230
26	0.000050	0.000075	0.000100	0.000126	0.000151	0.000241
27	0.000052	0.000079	0.000105	0.000132	0.000158	0.000252
28	0.000055	0.000083	0.000110	0.000138	0.000166	0.000265
29	0.000058	0.000087	0.000117	0.000146	0.000175	0.000279
30	0.000063	0.000094	0.000125	0.000156	0.000187	0.000295
31	0.000070	0.000103	0.000135	0.000168	0.000201	0.000313
32	0.000078	0.000113	0.000148	0.000183	0.000218	0.000333
33	0.000089	0.000126	0.000163	0.000201	0.000238	0.000355
34	0.000101	0.000140	0.000180	0.000220	0.000260	0.000375
35	0.000112	0.000153	0.000195	0.000237	0.000279	0.000394
36	0.000124	0.000168	0.000213	0.000257	0.000301	0.000416
37	0.000138	0.000185	0.000232	0.000278	0.000325	0.000440
38	0.000154	0.000203	0.000253	0.000303	0.000352	0.000467
39	0.000172	0.000224	0.000277	0.000330	0.000383	0.000498

Table A12. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
40	0.000191	0.000248	0.000304	0.000361	0.000417	0.000532
41	0.000214	0.000275	0.000335	0.000396	0.000457	0.000571
42	0.000239	0.000304	0.000370	0.000435	0.000500	0.000614
43	0.000268	0.000338	0.000409	0.000479	0.000550	0.000663
44	0.000300	0.000376	0.000453	0.000529	0.000605	0.000718
45	0.000337	0.000420	0.000502	0.000585	0.000668	0.000780
46	0.000378	0.000468	0.000559	0.000649	0.000739	0.000850
47	0.000425	0.000523	0.000622	0.000720	0.000819	0.000928
48	0.000477	0.000585	0.000692	0.000800	0.000908	0.001015
49	0.000536	0.000654	0.000773	0.000891	0.001009	0.001114
50	0.000602	0.000732	0.000862	0.000993	0.001123	0.001225
51	0.000676	0.000819	0.000963	0.001106	0.001249	0.001349
52	0.000759	0.000917	0.001076	0.001234	0.001392	0.001489
53	0.000852	0.001027	0.001202	0.001377	0.001552	0.001647
54	0.000956	0.001150	0.001343	0.001537	0.001731	0.001824
55	0.001070	0.001285	0.001500	0.001715	0.001930	0.002022
56	0.001198	0.001436	0.001675	0.001914	0.002152	0.002246
57	0.001338	0.001603	0.001869	0.002134	0.002399	0.002497
58	0.001492	0.001787	0.002082	0.002378	0.002673	0.002779
59	0.001660	0.001989	0.002318	0.002647	0.002976	0.003096

Table A12. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
60	0.001844	0.002210	0.002577	0.002944	0.003311	0.003453
61	0.002041	0.002451	0.002860	0.003269	0.003679	0.003853
62	0.002253	0.002710	0.003168	0.003625	0.004082	0.004303
63	0.002479	0.002990	0.003501	0.004012	0.004523	0.004809
64	0.002716	0.003288	0.003859	0.004430	0.005002	0.005377
65	0.002963	0.003602	0.004241	0.004880	0.005519	0.006015
66	0.003215	0.003930	0.004646	0.005361	0.006076	0.006732
67	0.003468	0.004269	0.005070	0.005871	0.006672	0.007538
68	0.003714	0.004611	0.005508	0.006405	0.007302	0.008442
69	0.003974	0.004979	0.005984	0.006989	0.007994	0.009458
70	0.004285	0.005411	0.006537	0.007663	0.008790	0.010599
71	0.004704	0.005967	0.007229	0.008491	0.009754	0.011880
72	0.005236	0.006651	0.008066	0.009481	0.010896	0.013318
73	0.005870	0.007456	0.009043	0.010629	0.012216	0.014931
74	0.006582	0.008361	0.010140	0.011919	0.013698	0.016742
75	0.007381	0.009376	0.011370	0.013365	0.015360	0.018774
76	0.008277	0.010514	0.012751	0.014988	0.017225	0.021053
77	0.009281	0.011790	0.014299	0.016807	0.019316	0.023609
78	0.010407	0.013220	0.016033	0.018846	0.021659	0.026473
79	0.011670	0.014824	0.017978	0.021132	0.024286	0.029684

Table A12. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
80	0.013083	0.016620	0.020156	0.023692	0.027229	0.033280
81	0.014667	0.018631	0.022595	0.026559	0.030523	0.037307
82	0.016438	0.020881	0.025324	0.029767	0.034210	0.041813
83	0.018420	0.023398	0.028377	0.033356	0.038334	0.046854
84	0.020635	0.026213	0.031790	0.037367	0.042945	0.052489
85	0.023109	0.029356	0.035602	0.041848	0.048094	0.058783
86	0.025872	0.032865	0.039858	0.046851	0.053843	0.065810
87	0.028952	0.036778	0.044603	0.052428	0.060254	0.073645
88	0.032384	0.041137	0.049890	0.058643	0.067396	0.082375
89	0.036204	0.045989	0.055774	0.065560	0.075345	0.092090
90	0.040449	0.051382	0.062315	0.073247	0.084180	0.102889
91		0.057367	0.069573	0.081780	0.093986	0.114874
92			0.077618	0.091236	0.104854	0.128157
93				0.101696	0.116875	0.142850
94					0.130147	0.159072
95						0.176942
96						0.196576
97						0.218089
98						0.241586
99						0.267157

Table A12. (continued)

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Duration 4	Durations 5+
100						0.295467
101						0.324026
102						0.351066
103						0.376663
104						0.400888
105						0.423806
106						0.445478
107						0.465958
108						0.485298
109						0.503543
110						0.520734
111						0.536905
112						0.552084
113						0.566290
114						0.579532
115						0.591804
116						0.603076
117						0.613278
118						0.622251
119						0.629516
120						1.000000

Table A13. Immediate Annuitants, males, lives – IML00: values of q_x

Age x	Duration 0+	Age x	Duration 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	0.630216
		120	1.000000

Table A14. Immediate Annuitants, females, lives – IFL00 one year select: values of $q_{[x-t]+t}$

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		0.629655
			120		1.000000

Table A15. Pensioners, Normal – PNML00, PNMA00, PNFL00 and PNFA00: values of q_x

	Males		Females	
Age x	Lives PNML00	Amounts PNMA00	Lives PNFL00	Amounts PNFA00
20	0.000464	0.000464	0.000194	0.000194
21	0.000467	0.000467	0.000199	0.000199
22	0.000471	0.000471	0.000206	0.000206
23	0.000475	0.000475	0.000213	0.000213
24	0.000479	0.000479	0.000221	0.000221
25	0.000485	0.000484	0.000230	0.000230
26	0.000491	0.000490	0.000240	0.000240
27	0.000498	0.000497	0.000252	0.000251
28	0.000506	0.000505	0.000264	0.000263
29	0.000515	0.000514	0.000278	0.000277
30	0.000526	0.000524	0.000294	0.000292
31	0.000539	0.000536	0.000312	0.000309
32	0.000554	0.000550	0.000332	0.000328
33	0.000571	0.000565	0.000354	0.000349
34	0.000590	0.000583	0.000378	0.000372
35	0.000613	0.000604	0.000405	0.000398
36	0.000639	0.000628	0.000436	0.000427
37	0.000669	0.000655	0.000470	0.000459
38	0.000704	0.000686	0.000509	0.000495
39	0.000744	0.000722	0.000551	0.000535
40	0.000790	0.000764	0.000599	0.000579
41	0.000844	0.000811	0.000652	0.000629
42	0.000906	0.000866	0.000712	0.000684
43	0.000978	0.000929	0.000778	0.000745
44	0.001061	0.001001	0.000852	0.000813
45	0.001156	0.001083	0.000935	0.000889
46	0.001267	0.001178	0.001028	0.000973
47	0.001395	0.001288	0.001131	0.001067
48	0.001542	0.001413	0.001247	0.001172
49	0.001713	0.001557	0.001376	0.001288
50	0.001910	0.001723	0.001520	0.001418
51	0.002137	0.001913	0.001681	0.001562
52	0.002400	0.002132	0.001861	0.001722
53	0.002704	0.002382	0.002062	0.001901
54	0.003055	0.002671	0.002286	0.002100

Table A15. (continued)

	Males		Females	
Age x	Lives PNML00	Amounts PNMA00	Lives PNFL00	Amounts PNFA00
55	0.003460	0.003002	0.002536	0.002321
56	0.003928	0.003382	0.002816	0.002567
57	0.004469	0.003818	0.003128	0.002841
58	0.005093	0.004320	0.003477	0.003145
59	0.005814	0.004895	0.003867	0.003485
60	0.006647	0.005556	0.004302	0.003862
61	0.007608	0.006315	0.004787	0.004282
62	0.008718	0.007186	0.005329	0.004749
63	0.009998	0.008185	0.005935	0.005268
64	0.011476	0.009332	0.006610	0.005846
65	0.012853	0.010403	0.007405	0.006537
66	0.014141	0.011401	0.008367	0.007386
67	0.015689	0.012589	0.009492	0.008375
68	0.017526	0.013996	0.010793	0.009518
69	0.019684	0.015654	0.012288	0.010833
70	0.022191	0.017595	0.013994	0.012335
71	0.025076	0.019857	0.015931	0.014043
72	0.028363	0.022477	0.018118	0.015979
73	0.032072	0.025495	0.020578	0.018166
74	0.036220	0.028951	0.023337	0.020627
75	0.040819	0.032886	0.026419	0.023390
76	0.045878	0.037340	0.029854	0.026484
77	0.051400	0.042351	0.033673	0.029942
78	0.057382	0.047953	0.037907	0.033799
79	0.063822	0.054179	0.042593	0.038093
80	0.070710	0.061052	0.047768	0.042863
81	0.078038	0.068592	0.053473	0.048156
82	0.085793	0.076701	0.059750	0.054019
83	0.093964	0.085390	0.066645	0.060502
84	0.102542	0.094774	0.074205	0.067662
85	0.111517	0.104850	0.082483	0.075556
86	0.120886	0.115610	0.091530	0.084246
87	0.130647	0.127035	0.101402	0.093799
88	0.140805	0.139096	0.112156	0.104282
89	0.151866	0.151755	0.123851	0.115676

Table A15. (continued)

	Males		Females	
Age x	Lives PNML00	Amounts PNMA00	Lives PNFL00	Amounts PNFA00
90	0.164961	0.164961	0.136499	0.127766
91	0.178655	0.178655	0.149922	0.140859
92	0.192770	0.192770	0.164355	0.155048
93	0.207228	0.207228	0.179891	0.170393
94	0.221944	0.221944	0.196580	0.186955
95	0.236827	0.236827	0.214469	0.204789
96	0.251782	0.251782	0.233598	0.223947
97	0.268234	0.268234	0.254172	0.244887
98	0.285990	0.285990	0.275007	0.266347
99	0.303475	0.303475	0.295354	0.287292
100	0.320697	0.320697	0.315225	0.307737
101	0.337664	0.337664	0.334634	0.327696
102	0.354385	0.354385	0.353573	0.347184
103	0.370869	0.370869	0.370869	0.366213
104	0.387125	0.387125	0.387125	0.384799
105	0.403165	0.403165	0.403165	0.402790
106	0.418999	0.418999	0.418999	0.418999
107	0.434641	0.434641	0.434641	0.434641
108	0.450104	0.450104	0.450104	0.450104
109	0.465405	0.465405	0.465405	0.465405
110	0.480562	0.480562	0.480562	0.480562
111	0.495600	0.495600	0.495600	0.495600
112	0.510546	0.510546	0.510546	0.510546
113	0.525437	0.525437	0.525437	0.525437
114	0.540323	0.540323	0.540323	0.540323
115	0.555271	0.555271	0.555271	0.555271
116	0.570389	0.570389	0.570389	0.570389
117	0.585858	0.585858	0.585858	0.585858
118	0.602053	0.602053	0.602053	0.602053
119	0.620322	0.620322	0.620322	0.620322
120	1.000000	1.000000	1.000000	1.000000

Table A16. Pensioners, Early – PEML00, PEMA00, PEFL00 and PEFA00: values of q_x

	Males		Females	
Age x	Lives PEML00	Amounts PEMA00	Lives PEFL00	Amounts PEFA00
50	0.007398	0.005583	0.006126	0.006126
51	0.007429	0.005646	0.005695	0.005527
52	0.007473	0.005724	0.005327	0.004932
53	0.007535	0.005820	0.005027	0.004540
54	0.007620	0.005939	0.004800	0.004300
55	0.007734	0.006085	0.004652	0.004180
56	0.007888	0.006265	0.004589	0.004159
57	0.008090	0.006484	0.004616	0.004226
58	0.008355	0.006750	0.004742	0.004376
59	0.008695	0.007074	0.004972	0.004608
60	0.009201	0.007565	0.005315	0.004923
61	0.009912	0.008211	0.005779	0.005328
62	0.010783	0.008954	0.006373	0.005829
63	0.011838	0.009805	0.007107	0.006437
64	0.013102	0.010778	0.007989	0.007163
65	0.014602	0.011887	0.009032	0.008021
66	0.016361	0.013150	0.010247	0.009025
67	0.018406	0.014587	0.011646	0.010193
68	0.020760	0.016219	0.013242	0.011542
69	0.023445	0.018069	0.015048	0.013089
70	0.026481	0.020166	0.017080	0.014853
71	0.029884	0.022538	0.019353	0.016853
72	0.033667	0.025218	0.021884	0.019107
73	0.037841	0.028240	0.024690	0.021635
74	0.042412	0.031642	0.027789	0.024454
75	0.047383	0.035463	0.031202	0.027583
76	0.052753	0.039746	0.034949	0.031042
77	0.058519	0.044532	0.039051	0.034851
78	0.064676	0.049866	0.043532	0.039036
79	0.071215	0.055789	0.048415	0.043625
80	0.078129	0.062343	0.053726	0.048657
81	0.085408	0.069565	0.059490	0.054179
82	0.093045	0.077487	0.065734	0.060256
83	0.101033	0.086134	0.072487	0.066970
84	0.109367	0.095521	0.079777	0.074431

Table A16. (continued)

	Males		Females	
Age x	Lives PEML00	Amounts PEMA00	Lives PEFL00	Amounts PEFA00
85	0.118047	0.105652	0.087635	0.082785
86	0.127076	0.116516	0.096091	0.092220
87	0.136461	0.128085	0.105176	0.102984
88	0.146216	0.140314	0.114922	0.114713
89	0.156362	0.153136	0.125360	0.125360
90	0.167078	0.166464	0.136703	0.136703
91	0.180188	0.180188	0.149922	0.149922
92	0.194176	0.194176	0.164355	0.164355
93	0.208276	0.208276	0.179891	0.179891
94	0.223303	0.223303	0.196580	0.196580
95	0.239168	0.239168	0.214469	0.214469
96	0.254898	0.254898	0.233598	0.233598
97	0.270499	0.270499	0.254172	0.254172
98	0.286266	0.286266	0.275007	0.275007
99	0.303475	0.303475	0.295354	0.295354
100	0.320697	0.320697	0.315225	0.315225
101	0.337664	0.337664	0.334634	0.334634
102	0.354385	0.354385	0.353573	0.353573
103	0.370869	0.370869	0.370869	0.370869
104	0.387125	0.387125	0.387125	0.387125
105	0.403165	0.403165	0.403165	0.403165
106	0.418999	0.418999	0.418999	0.418999
107	0.434641	0.434641	0.434641	0.434641
108	0.450104	0.450104	0.450104	0.450104
109	0.465405	0.465405	0.465405	0.465405
110	0.480562	0.480562	0.480562	0.480562
111	0.495600	0.495600	0.495600	0.495600
112	0.510546	0.510546	0.510546	0.510546
113	0.525437	0.525437	0.525437	0.525437
114	0.540323	0.540323	0.540323	0.540323
115	0.555271	0.555271	0.555271	0.555271
116	0.570389	0.570389	0.570389	0.570389
117	0.585858	0.585858	0.585858	0.585858
118	0.602053	0.602053	0.602053	0.602053
119	0.620322	0.620322	0.620322	0.620322
120	1.000000	1.000000	1.000000	1.000000

Table A17. Pensioners, Combined – PCML00, PCMA00, PCFL00 and PCFA00: values of q_x

	Males		Females	
Age x	Lives PCML00	Amounts PCMA00	Lives PCFL00	Amounts PCFA00
50	0.007398	0.005583	0.004552	0.003920
51	0.007429	0.005646	0.004583	0.003937
52	0.007473	0.005724	0.004615	0.003954
53	0.007535	0.005820	0.004646	0.003972
54	0.007620	0.005939	0.004579	0.003989
55	0.007734	0.006085	0.004454	0.004006
56	0.007888	0.006265	0.004393	0.004024
57	0.008090	0.006484	0.004402	0.004029
58	0.008355	0.006750	0.004488	0.004067
59	0.008695	0.007072	0.004656	0.004178
60	0.009129	0.007461	0.004916	0.004369
61	0.009674	0.007928	0.005275	0.004648
62	0.010352	0.008487	0.005741	0.005022
63	0.011186	0.009152	0.006326	0.005502
64	0.012201	0.009942	0.007039	0.006097
65	0.013423	0.010874	0.007892	0.006818
66	0.014879	0.011972	0.008897	0.007677
67	0.016596	0.013258	0.010069	0.008687
68	0.018603	0.014758	0.011420	0.009862
69	0.020925	0.016500	0.012969	0.011218
70	0.023589	0.018515	0.014730	0.012771
71	0.026617	0.020835	0.016725	0.014539
72	0.030030	0.023494	0.018971	0.016542
73	0.033846	0.026528	0.021491	0.018803
74	0.038079	0.029974	0.024309	0.021343
75	0.042740	0.033868	0.027449	0.024188
76	0.047836	0.038250	0.030938	0.027366
77	0.053371	0.043156	0.034805	0.030907
78	0.059345	0.048622	0.039082	0.034840
79	0.065754	0.054681	0.043800	0.039202
80	0.072594	0.061364	0.048996	0.044028
81	0.079857	0.068697	0.054708	0.049357
82	0.087535	0.076701	0.060974	0.055232
83	0.095619	0.085390	0.067836	0.061697
84	0.104102	0.094774	0.075339	0.068799

Table A17. (continued)

	Males		Females	
Age x	Lives PCML00	Amounts PCMA00	Lives PCFL00	Amounts PCFA00
85	0.112976	0.104850	0.083530	0.076588
86	0.122239	0.115610	0.092456	0.085118
87	0.131889	0.127035	0.102168	0.094442
88	0.141929	0.139096	0.112717	0.104618
89	0.152411	0.151755	0.124157	0.115706
90	0.164961	0.164961	0.136541	0.127766
91	0.178655	0.178655	0.149922	0.140859
92	0.192770	0.192770	0.164355	0.155048
93	0.207228	0.207228	0.179891	0.170393
94	0.221944	0.221944	0.196580	0.186955
95	0.236827	0.236827	0.214469	0.204789
96	0.251782	0.251782	0.233598	0.223947
97	0.268234	0.268234	0.254172	0.244887
98	0.285990	0.285990	0.275007	0.266347
99	0.303475	0.303475	0.295354	0.287292
100	0.320697	0.320697	0.315225	0.307737
101	0.337664	0.337664	0.334634	0.327696
102	0.354385	0.354385	0.353573	0.347184
103	0.370869	0.370869	0.370869	0.366213
104	0.387125	0.387125	0.387125	0.384799
105	0.403165	0.403165	0.403165	0.402790
106	0.418999	0.418999	0.418999	0.418999
107	0.434641	0.434641	0.434641	0.434641
108	0.450104	0.450104	0.450104	0.450104
109	0.465405	0.465405	0.465405	0.465405
110	0.480562	0.480562	0.480562	0.480562
111	0.495600	0.495600	0.495600	0.495600
112	0.510546	0.510546	0.510546	0.510546
113	0.525437	0.525437	0.525437	0.525437
114	0.540323	0.540323	0.540323	0.540323
115	0.555271	0.555271	0.555271	0.555271
116	0.570389	0.570389	0.570389	0.570389
117	0.585858	0.585858	0.585858	0.585858
118	0.602053	0.602053	0.602053	0.602053
119	0.620322	0.620322	0.620322	0.620322
120	1.000000	1.000000	1.000000	1.000000

Table A18. Widows – WL00 and WA00: values of q_x

Age x	Lives – WL00	Amounts – WA00
17	0.000458	0.000350
18	0.000630	0.000482
19	0.000800	0.000614
20	0.000970	0.000746
21	0.001139	0.000877
22	0.001308	0.001007
23	0.001475	0.001137
24	0.001642	0.001266
25	0.001808	0.001394
26	0.001973	0.001522
27	0.002137	0.001649
28	0.002300	0.001775
29	0.002462	0.001900
30	0.002623	0.002025
31	0.002784	0.002149
32	0.002943	0.002273
33	0.003101	0.002395
34	0.003258	0.002516
35	0.003414	0.002637
36	0.003568	0.002757
37	0.003722	0.002875
38	0.003874	0.002993
39	0.004024	0.003110
40	0.004173	0.003225
41	0.004321	0.003339
42	0.004467	0.003452
43	0.004611	0.003564
44	0.004753	0.003674
45	0.004893	0.003783
46	0.005031	0.003890
47	0.005167	0.003995
48	0.005300	0.004098
49	0.005429	0.004198
50	0.005556	0.004296
51	0.005678	0.004390
52	0.005794	0.004481
53	0.005904	0.004566
54	0.006002	0.004642

Table A18. (continued)

Age *x*	Lives – WL00	Amounts – WA00
55	0.006204	0.004793
56	0.006551	0.005053
57	0.006937	0.005345
58	0.007365	0.005673
59	0.007841	0.006042
60	0.008369	0.006457
61	0.008955	0.006922
62	0.009606	0.007445
63	0.010329	0.008033
64	0.011131	0.008693
65	0.012021	0.009434
66	0.013009	0.010266
67	0.014106	0.011200
68	0.015323	0.012249
69	0.016672	0.013427
70	0.018170	0.014749
71	0.019831	0.016233
72	0.021673	0.017897
73	0.023715	0.019765
74	0.025978	0.021860
75	0.028487	0.024209
76	0.031266	0.026842
77	0.034344	0.029793
78	0.037752	0.033099
79	0.041524	0.036801
80	0.045696	0.040944
81	0.050311	0.045580
82	0.055410	0.050764
83	0.061044	0.056555
84	0.067263	0.063023
85	0.074123	0.070238
86	0.081685	0.078281
87	0.090013	0.087238
88	0.099177	0.097200
89	0.109248	0.108267

Table A18. (continued)

Age *x*	Lives – WL00	Amounts – WA00
90	0.120611	0.120543
91	0.134138	0.134138
92	0.149167	0.149167
93	0.165747	0.165747
94	0.183995	0.183995
95	0.204028	0.204028
96	0.225957	0.225957
97	0.249882	0.249882
98	0.275188	0.275188
99	0.299847	0.299847
100	0.323553	0.323553
101	0.346342	0.346342
102	0.368246	0.368246
103	0.389297	0.389297
104	0.409526	0.409526
105	0.428961	0.428961
106	0.447629	0.447629
107	0.465556	0.465556
108	0.482765	0.482765
109	0.499277	0.499277
110	0.515113	0.515113
111	0.530290	0.530290
112	0.544821	0.544821
113	0.558719	0.558719
114	0.571989	0.571989
115	0.584629	0.584629
116	0.596628	0.596628
117	0.607950	0.607950
118	0.618511	0.618511
119	0.628030	0.628030
120	1.000000	1.000000

Table A19. Retirement Annuitants, males – RMD00, RMV00 and RMC00: values of q_x

Age x	Deferred – RMD00	Vested – RMV00	Combined – RMC00
17	0.000418		0.000418
18	0.000419		0.000419
19	0.000421		0.000421
20	0.000423		0.000423
21	0.000425		0.000425
22	0.000428		0.000428
23	0.000432		0.000432
24	0.000436		0.000436
25	0.000441		0.000441
26	0.000448		0.000448
27	0.000455		0.000455
28	0.000464		0.000464
29	0.000475		0.000475
30	0.000487		0.000487
31	0.000502		0.000502
32	0.000519		0.000519
33	0.000540		0.000540
34	0.000564		0.000564
35	0.000592		0.000592
36	0.000625		0.000625
37	0.000663		0.000663
38	0.000707		0.000707
39	0.000758		0.000758
40	0.000817		0.000817
41	0.000884		0.000884
42	0.000962		0.000962
43	0.001050		0.001050
44	0.001151		0.001151
45	0.001266		0.001266
46	0.001396		0.001396
47	0.001542		0.001542
48	0.001707		0.001707
49	0.001893		0.001893
50	0.002101	0.013435	0.002101
51	0.002333	0.012799	0.002333
52	0.002590	0.012220	0.002590
53	0.002877	0.011703	0.002878
54	0.003193	0.011254	0.003207

Table A19. (continued)

Age x	Deferred – RMD00	Vested – RMV00	Combined – RMC00
55	0.003542	0.010878	0.003578
56	0.003926	0.010583	0.003997
57	0.004347	0.010376	0.004468
58	0.004806	0.010264	0.004998
59	0.005307	0.010257	0.005594
60	0.005850	0.010364	0.006265
61	0.006437	0.010595	0.007018
62	0.007071	0.010960	0.007864
63	0.007752	0.011472	0.008813
64	0.008482	0.012145	0.009878
65	0.009261	0.012990	0.011072
66	0.010091	0.014025	0.012410
67	0.010970	0.015266	0.013907
68	0.011899	0.016729	0.015583
69	0.012877	0.018434	0.017456
70	0.013904	0.020402	0.019550
71	0.014977	0.022655	0.021887
72	0.016094	0.025217	0.024496
73	0.017253	0.028113	0.027403
74	0.018450	0.031370	0.030642
75	0.019682	0.035019	0.034248
76		0.039090	0.038257
77		0.043618	0.042712
78		0.048636	0.047656
79		0.054184	0.053139
80		0.060301	0.059211
81		0.067028	0.065928
82		0.074411	0.073350
83		0.082496	0.081540
84		0.091329	0.090563
85		0.100962	0.100491
86		0.111444	0.111353
87		0.122828	0.122828
88		0.135167	0.135167
89		0.148512	0.148512

Table A19. (continued)

Age x	Deferred – RMD00	Vested – RMV00	Combined – RMC00
90		0.162916	0.162916
91		0.178429	0.178429
92		0.195098	0.195098
93		0.212967	0.212967
94		0.232076	0.232076
95		0.252456	0.252456
96		0.274131	0.274131
97		0.297115	0.297115
98		0.321410	0.321410
99		0.347003	0.347003
100		0.371104	0.371104
101		0.392217	0.392217
102		0.412351	0.412351
103		0.431547	0.431547
104		0.449840	0.449840
105		0.467266	0.467266
106		0.483856	0.483856
107		0.499639	0.499639
108		0.514640	0.514640
109		0.528883	0.528883
110		0.542386	0.542386
111		0.555166	0.555166
112		0.567233	0.567233
113		0.578591	0.578591
114		0.589237	0.589237
115		0.599156	0.599156
116		0.608313	0.608313
117		0.616640	0.616640
118		0.623995	0.623995
119		0.629973	0.629973
120		1.000000	1.000000

Table A20. Retirement Annuitants, females – RFD00, RFV00 and RFC00: values of q_x

Age x	Deferred – RFD00	Vested – RFV00	Combined – RFC00
17	0.000120		0.000120
18	0.000131		0.000131
19	0.000142		0.000142
20	0.000153		0.000153
21	0.000166		0.000166
22	0.000180		0.000180
23	0.000195		0.000195
24	0.000212		0.000212
25	0.000230		0.000230
26	0.000249		0.000249
27	0.000270		0.000270
28	0.000293		0.000293
29	0.000317		0.000317
30	0.000344		0.000344
31	0.000373		0.000373
32	0.000404		0.000404
33	0.000438		0.000438
34	0.000475		0.000475
35	0.000515		0.000515
36	0.000558		0.000558
37	0.000605		0.000605
38	0.000656		0.000656
39	0.000711		0.000711
40	0.000770		0.000770
41	0.000835		0.000835
42	0.000905		0.000905
43	0.000981		0.000981
44	0.001064		0.001064
45	0.001153		0.001153
46	0.001250		0.001250
47	0.001355		0.001355
48	0.001469		0.001469
49	0.001592		0.001592
50	0.001726	0.006660	0.001726
51	0.001871	0.006319	0.001871
52	0.002028	0.006002	0.002028
53	0.002198	0.005713	0.002198
54	0.002383	0.005454	0.002383

Table A20. (continued)

Age x	Deferred – RFD00	Vested – RFV00	Combined – RFC00
55	0.002583	0.005230	0.002583
56	0.002800	0.005044	0.002800
57	0.003035	0.004900	0.003035
58	0.003289	0.004804	0.003291
59	0.003565	0.004761	0.003594
60	0.003864	0.004776	0.003937
61	0.004188	0.004857	0.004320
62	0.004540	0.005012	0.004748
63	0.004920	0.005247	0.005227
64	0.005333	0.005574	0.005763
65	0.005780	0.006001	0.006364
66	0.006264	0.006541	0.007040
67	0.006789	0.007206	0.007800
68	0.007357	0.008009	0.008655
69	0.007973	0.008968	0.009620
70	0.008640	0.010098	0.010710
71	0.009363	0.011420	0.011942
72	0.010146	0.012954	0.013336
73	0.010994	0.014724	0.014917
74	0.011913	0.016755	0.016769
75	0.012907	0.019076	0.019076
76		0.021719	0.021719
77		0.024718	0.024718
78		0.028111	0.028111
79		0.031941	0.031941
80		0.036252	0.036252
81		0.041094	0.041094
82		0.046523	0.046523
83		0.052596	0.052596
84		0.059378	0.059378
85		0.066938	0.066938
86		0.075349	0.075349
87		0.084691	0.084691
88		0.095048	0.095048
89		0.106508	0.106508

Table A20. (continued)

Age x	Deferred – RFD00	Vested – RFV00	Combined – RFC00
90		0.119162	0.119162
91		0.133107	0.133107
92		0.148441	0.148441
93		0.165261	0.165261
94		0.183665	0.183665
95		0.203745	0.203745
96		0.225588	0.225588
97		0.249270	0.249270
98		0.274853	0.274853
99		0.302378	0.302378
100		0.329779	0.329779
101		0.354898	0.354898
102		0.378758	0.378758
103		0.401415	0.401415
104		0.422923	0.422923
105		0.443333	0.443333
106		0.462689	0.462689
107		0.481035	0.481035
108		0.498410	0.498410
109		0.514847	0.514847
110		0.530376	0.530376
111		0.545024	0.545024
112		0.558808	0.558808
113		0.571742	0.571742
114		0.583827	0.583827
115		0.595052	0.595052
116		0.605387	0.605387
117		0.614760	0.614760
118		0.623018	0.623018
119		0.629717	0.629717
120		1.000000	1.000000

Table A21. Personal Pensioners, males – PPMD00, PPMV00 and PPMC00: values of q_x

Age x	Deferred – PPMD00	Vested – PPMV00	Combined – PPMC00
17	0.000429		0.000429
18	0.000431		0.000431
19	0.000434		0.000434
20	0.000437		0.000437
21	0.000440		0.000440
22	0.000445		0.000445
23	0.000450		0.000450
24	0.000456		0.000456
25	0.000463		0.000463
26	0.000472		0.000472
27	0.000482		0.000482
28	0.000494		0.000494
29	0.000508		0.000508
30	0.000524		0.000524
31	0.000544		0.000544
32	0.000566		0.000566
33	0.000592		0.000592
34	0.000623		0.000623
35	0.000658		0.000658
36	0.000698		0.000698
37	0.000744		0.000744
38	0.000798		0.000798
39	0.000859		0.000859
40	0.000928		0.000931
41	0.001007		0.001017
42	0.001097		0.001114
43	0.001199		0.001224
44	0.001313		0.001348
45	0.001442		0.001488
46	0.001587		0.001645
47	0.001749		0.001821
48	0.001929		0.002016
49	0.002130		0.002234
50	0.002353	0.007954	0.002475
51	0.002599	0.007834	0.002742
52	0.002870	0.007765	0.003036
53	0.003169	0.007744	0.003360
54	0.003496	0.007771	0.003716

Table A21. (continued)

Age x	Deferred – PPMD00	Vested – PPMV00	Combined – PPMC00
55	0.003854	0.007844	0.004107
56	0.004244	0.007963	0.004534
57	0.004668	0.008131	0.005002
58	0.005126	0.008347	0.005512
59	0.005622	0.008615	0.006068
60	0.006155	0.008938	0.006673
61	0.006727	0.009320	0.007332
62	0.007339	0.009767	0.008048
63	0.007992	0.010283	0.008826
64	0.008685	0.010877	0.009671
65	0.009420	0.011557	0.010588
66	0.010196	0.012333	0.011583
67	0.011012	0.013215	0.012664
68	0.011867	0.014218	0.013837
69	0.012761	0.015356	0.015110
70	0.013692	0.016646	0.016493
71	0.014657	0.018110	0.018045
72	0.015655	0.019769	0.019769
73	0.016682	0.021650	0.021650
74	0.017736	0.023784	0.023784
75	0.018812	0.026204	0.026204
76		0.028950	0.028950
77		0.032067	0.032067
78		0.035605	0.035605
79		0.039622	0.039622
80		0.044184	0.044184
81		0.049362	0.049362
82		0.055241	0.055241
83		0.061911	0.061911
84		0.069475	0.069475
85		0.078047	0.078047
86		0.087749	0.087749
87		0.098717	0.098717
88		0.111096	0.111096
89		0.125039	0.125039

Table A21. (continued)

Age x	Deferred – PPMD00	Vested – PPMV00	Combined – PPMC00
90		0.140708	0.140708
91		0.158268	0.158268
92		0.177883	0.177883
93		0.199712	0.199712
94		0.223903	0.223903
95		0.250578	0.250578
96		0.279832	0.279832
97		0.311710	0.311710
98		0.346205	0.346205
99		0.383234	0.383234
100		0.411401	0.411401
101		0.428757	0.428757
102		0.445378	0.445378
103		0.461290	0.461290
104		0.476516	0.476516
105		0.491078	0.491078
106		0.504996	0.504996
107		0.518288	0.518288
108		0.530971	0.530971
109		0.543056	0.543056
110		0.554557	0.554557
111		0.565480	0.565480
112		0.575828	0.575828
113		0.585602	0.585602
114		0.594793	0.594793
115		0.603382	0.603382
116		0.611334	0.611334
117		0.618586	0.618586
118		0.625008	0.625008
119		0.630239	0.630239
120		1.000000	1.000000

Table A22. Personal Pensioners, females – PPFD00, PPFV00 and PPFC00: values of q_x

Age x	Deferred – PPFD00	Vested – PPFV00	Combined – PPFC00
17	0.000061		0.000061
18	0.000069		0.000069
19	0.000078		0.000078
20	0.000087		0.000087
21	0.000098		0.000098
22	0.000110		0.000110
23	0.000123		0.000123
24	0.000138		0.000138
25	0.000154		0.000154
26	0.000172		0.000172
27	0.000192		0.000192
28	0.000214		0.000214
29	0.000238		0.000238
30	0.000265		0.000265
31	0.000294		0.000294
32	0.000326		0.000326
33	0.000361		0.000361
34	0.000399		0.000399
35	0.000442		0.000442
36	0.000488		0.000488
37	0.000538		0.000538
38	0.000593		0.000593
39	0.000652		0.000652
40	0.000717		0.000717
41	0.000788		0.000788
42	0.000864		0.000864
43	0.000947		0.000947
44	0.001037		0.001037
45	0.001133		0.001133
46	0.001238		0.001238
47	0.001351		0.001351
48	0.001472		0.001472
49	0.001602		0.001603
50	0.001743	0.004166	0.001750
51	0.001893	0.004184	0.001910
52	0.002054	0.004206	0.002084
53	0.002226	0.004233	0.002272
54	0.002410	0.004266	0.002476

Table A22. (continued)

Age x	Deferred – PPFD00	Vested – PPFV00	Combined – PPFC00
55	0.002606	0.004307	0.002697
56	0.002815	0.004358	0.002935
57	0.003038	0.004420	0.003193
58	0.003275	0.004496	0.003471
59	0.003526	0.004588	0.003772
60	0.003792	0.004701	0.004097
61	0.004074	0.004838	0.004448
62	0.004372	0.005004	0.004827
63	0.004687	0.005205	0.005236
64	0.005019	0.005449	0.005678
65	0.005368	0.005742	0.006155
66	0.005735	0.006096	0.006670
67	0.006121	0.006520	0.007227
68	0.006525	0.007028	0.007828
69	0.006948	0.007637	0.008478
70	0.007391	0.008363	0.009180
71	0.007853	0.009227	0.009939
72	0.008335	0.010254	0.010761
73	0.008837	0.011472	0.011653
74	0.009358	0.012913	0.012913
75	0.009900	0.014614	0.014614
76		0.016617	0.016617
77		0.018970	0.018970
78		0.021728	0.021728
79		0.024952	0.024952
80		0.028711	0.028711
81		0.033083	0.033083
82		0.038153	0.038153
83		0.044016	0.044016
84		0.050776	0.050776
85		0.058546	0.058546
86		0.067447	0.067447
87		0.077611	0.077611
88		0.089172	0.089172
89		0.102274	0.102274

Table A22. (continued)

Age x	Deferred – PPFD00	Vested – PPFV00	Combined – PPFC00
90		0.117061	0.117061
91		0.133677	0.133677
92		0.152262	0.152262
93		0.172948	0.172948
94		0.195849	0.195849
95		0.221061	0.221061
96		0.248647	0.248647
97		0.278633	0.278633
98		0.311000	0.311000
99		0.345673	0.345673
100		0.374418	0.374418
101		0.395216	0.395216
102		0.415057	0.415057
103		0.433979	0.433979
104		0.452018	0.452018
105		0.469207	0.469207
106		0.485576	0.485576
107		0.501153	0.501153
108		0.515964	0.515964
109		0.530030	0.530030
110		0.543369	0.543369
111		0.555998	0.555998
112		0.567925	0.567925
113		0.579155	0.579155
114		0.589684	0.589684
115		0.599495	0.599495
116		0.608555	0.608555
117		0.616795	0.616795
118		0.624076	0.624076
119		0.629994	0.629994
120		1.000000	1.000000

APPENDIX B

VALUES OF MORTALITY RATES FOR THE EXTENSIONS TO YOUNGER AGES OF THE "00" SERIES PENSIONER BASE TABLES

Non-adopted extensions to the Early and Combined Pensioner basic tables for the 1999-2002 experience. The original "00" Series table names are shown as an aid to readers, but the rates presented here below age 50 are not officially adopted extensions to those tables.

Table B1. Pensioners, Early – non-adopted extensions to the PEML00, PEMA00, PEFL00 and PEFA00 tables: values of q_x

	Males		Females	
Age x	Lives PEML00	Amounts PEMA00	Lives PEFL00	Amounts PEFA00
20	0.007332	0.005350	0.003854	0.003726
21	0.007332	0.005350	0.003939	0.003815
22	0.007332	0.005350	0.004024	0.003905
23	0.007332	0.005350	0.004109	0.003994
24	0.007332	0.005350	0.004194	0.004083
25	0.007332	0.005350	0.004279	0.004173
26	0.007332	0.005350	0.004364	0.004262
27	0.007332	0.005350	0.004449	0.004352
28	0.007332	0.005350	0.004534	0.004441
29	0.007332	0.005350	0.004620	0.004531
30	0.007332	0.005351	0.004705	0.004620
31	0.007332	0.005351	0.004790	0.004709
32	0.007332	0.005351	0.004875	0.004799
33	0.007332	0.005352	0.004960	0.004888
34	0.007332	0.005353	0.005045	0.004978
35	0.007332	0.005354	0.005130	0.005067
36	0.007332	0.005355	0.005215	0.005156
37	0.007332	0.005357	0.005300	0.005246
38	0.007332	0.005360	0.005385	0.005335
39	0.007332	0.005363	0.005470	0.005424
40	0.007332	0.005368	0.005555	0.005514
41	0.007333	0.005373	0.005640	0.005603
42	0.007333	0.005381	0.005725	0.005692
43	0.007335	0.005390	0.005810	0.005782
44	0.007336	0.005402	0.005895	0.005871
45	0.007339	0.005417	0.005980	0.005960
46	0.007344	0.005437	0.006065	0.006049
47	0.007351	0.005462	0.006150	0.006139
48	0.007361	0.005494	0.006235	0.006228
49	0.007376	0.005534	0.006319	0.006317
50	0.007398	0.005583	0.006126	0.006126

Table B2. Pensioners, Combined – non-adopted extensions to the PCML00, PCMA00, PCFL00 and PCFA00 tables: values of q_x

	Males		Females	
Age x	Lives PCML00	Amounts PCMA00	Lives PCFL00	Amounts PCFA00
20	0.007332	0.005350	0.003612	0.003401
21	0.007332	0.005350	0.003643	0.003418
22	0.007332	0.005350	0.003674	0.003435
23	0.007332	0.005350	0.003706	0.003453
24	0.007332	0.005350	0.003737	0.003470
25	0.007332	0.005350	0.003768	0.003487
26	0.007332	0.005350	0.003800	0.003505
27	0.007332	0.005350	0.003831	0.003522
28	0.007332	0.005350	0.003862	0.003539
29	0.007332	0.005350	0.003894	0.003556
30	0.007332	0.005351	0.003925	0.003574
31	0.007332	0.005351	0.003956	0.003591
32	0.007332	0.005351	0.003988	0.003608
33	0.007332	0.005352	0.004019	0.003626
34	0.007332	0.005353	0.004051	0.003643
35	0.007332	0.005354	0.004082	0.003660
36	0.007332	0.005355	0.004113	0.003678
37	0.007332	0.005357	0.004145	0.003695
38	0.007332	0.005360	0.004176	0.003712
39	0.007332	0.005363	0.004207	0.003729
40	0.007332	0.005368	0.004239	0.003747
41	0.007333	0.005373	0.004270	0.003764
42	0.007333	0.005381	0.004301	0.003781
43	0.007335	0.005390	0.004333	0.003799
44	0.007336	0.005402	0.004364	0.003816
45	0.007339	0.005417	0.004395	0.003833
46	0.007344	0.005437	0.004427	0.003851
47	0.007351	0.005462	0.004458	0.003868
48	0.007361	0.005494	0.004489	0.003885
49	0.007376	0.005534	0.004521	0.003902
50	0.007398	0.005583	0.004552	0.003920

APPENDIX C

FORMULAE FOR THE "00" SERIES BASE TABLES

In this Appendix the formulae used for the calculation of the adjusted values of μ_x are described in detail. While these can of course be derived from the descriptions provided earlier in this report, the nature of the various constraints and adjustments made means that this is not always straightforward. It is hoped, therefore, that readers will find this section useful, for example for programming purposes where graduation formulae may be preferable to a printed list of rates.

For each "00" Series table, the formulae used at different age ranges are given. The ages at which the formulae change are not necessarily integer ages. In the tables below these are shown to two decimal places, but are also given to eight decimal places in footnotes for those readers requiring greater accuracy.

Two main types of formula were used:

Gompertz-Makeham formulae
These are the usual GM(r,s) formulae as described in Paragraphs 1.2.1-1.2.3 above. For ease of reference, the Chebyshev polynomials used to build up the GM formula for different orders of r and s are as follows:

Order	Polynomial
1	1
2	t
3	$2t^2 - 1$
4	$4t^3 - 3t$
5	$8t^4 - 8t^2 + 1$

and age (x) is adjusted via the transform $t = \frac{x-70}{50}$.

Thus, for example, a GM(2,3) formula would take the form:

$$a_1 + a_2t + \exp\{b_1 + b_2t + b_3(2t^2 - 1)\}$$

The descriptions below set out the order (i.e. values of r and s), and the values of each of the parameters (e.g. for a GM(2,3) formula the values of a_1, a_2, b_1, b_2 and b_3 are given).

Blending formulae

These are the formulae for blending the graduated rates into an arbitrary value, described in Paragraph 1.2.5 above. In most cases this is used to blend the rates at the oldest ages into an arbitrary value of $\mu_{120} = 1$, however the method has also been used in a similar way at the youngest ages for some of the tables. This can be generalised:

$$\mu_x = \frac{(a_H - x)^c}{(a_H - a_L)^c} \times \mu_{a_L} + \left(1 - \frac{(a_H - x)^c}{(a_H - a_L)^c}\right) \times \mu_{a_H}$$

where

x = age
a_L = lower age at which blending begins
μ_{a_L} = value of μ_x at the lower age
a_H = upper age at which blending begins
μ_{a_H} = value of μ_x at the upper age
c = "curvature" parameter

The descriptions below show the age ranges where such blending methods have been used, together with the values of the parameters. Note that these age ranges do not necessarily always equal the a_L and a_H lower and upper ages used in the calculations.

Derivation of rates of q_x

The formulae given below are used to calculate values of μ_x. Values of q_x are then derived as described in Paragraph 1.2.6 above, i.e. using the formula:

$$q_x = 1 - e^{-\int_0^1 \mu_{x+t}\mathrm{d}t}$$

where the following approximate integration formula was used to evaluate the integral:

$$\int_0^1 \mu_{x+t}\mathrm{d}t \approx \left[7\mu_x + 32\mu_{x+1/4} + 12\mu_{x+1/2} + 32\mu_{x+3/4} + 7\mu_{x+1}\right]/90$$

and rounded to six decimal places.

AMC00 and TMC00 ultimate

Age range	Formula type	Parameters	
17-100	GM(1,3)	$100\times a_1$	0.044726
		b_1	–4.594470
		b_2	5.890200
		b_3	–0.575750
100-120	Blend	a_L	100
		μ_{a_L}	0.407367[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

AMN00 and TMN00 ultimate

Age range	Formula type	Parameters	
17-84.77[a]	GM(1,3)	$100\times a_1$	0.034421
		b_1	–4.259447
		b_2	6.275162
		b_3	–0.033485
84.77[a]-100	GM(1,3)	$100\times a_1$	0.044726
		b_1	–4.594470
		b_2	5.890200
		b_3	–0.575750
100-120	Blend	a_L	100
		μ_{a_L}	0.407367[b]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 84.76994454

[b] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

AMS00 and TMS00 ultimate

Age range	Formula type	Parameters	
17-100	GM(1,3)	$100 \times a_1$	0.067019
		b_1	–4.492762
		b_2	5.578582
		b_3	–1.023187
100-120	Blend	a_L	100
		μ_{a_L}	0.424205[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

AFC00 and TFC00 ultimate

Age range	Formula type	Parameters	
17-100	GM(1,2)	$100 \times a_1$	0.014423
		b_1	–4.389068
		b_2	5.584346
100-120	Blend	a_L	100
		μ_{a_L}	0.354144[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

AFN00 and TFN00 ultimate

Age range	Formula type	Parameters	
17-33.91[a]	GM(1,2)	$100\times a_1$	0.014423
		b_1	–4.389068
		b_2	5.584346
33.91[a]-100	GM(1,2)	$100\times a_1$	0.022054
		b_1	–4.621657
		b_2	5.850592
100-120	Blend	a_L	100
		μ_{a_L}	0.329351[b]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 33.91233156
[b] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

AFS00 and TFS00 ultimate

Age range	Formula type	Parameters	
17-100	GM(1,3)	$100\times a_1$	0.023434
		b_1	–4.435892
		b_2	5.487066
		b_3	–0.736004
100-120	Blend	a_L	100
		μ_{a_L}	0.391812[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

For select durations, due to the method of rolling averages there is no simple formula that can be reproduced here. Readers are referred to the relevant section for the derivation of these rates.

IML00 ultimate

Age range	Formula type	Parameters	
60-100	GM(1,3)	$100\times a_1$	0.494978
		b_1	–6.069074
		b_2	8.266671
		b_3	–1.514280
100-120	Blend	a_L	100
		μ_{a_L}	0.509003[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

IFL00 ultimate

Age range	Formula type	Parameters	
60-100	GM(1,3)	$100\times a_1$	0.275363
		b_1	–8.233861
		b_2	10.673350
		b_3	–2.908070
100-120	Blend	a_L	100
		μ_{a_L}	0.364942[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

IFL00 select (duration 0)

Age range	Formula type	Parameters
60-100	GM(1,3)×0.84	As for IFL00 ultimate

RMD00 ultimate

Age range	Formula type	Parameters	
17-75	GM(1,3)	$100\times a_1$	0.041244
		b_1	–5.954870
		b_2	3.983058
		b_3	–1.616713

RMV00 ultimate

Age range	Formula type	Parameters	
50-100	GM(2,2)	$100\times a_1$	–1.881491
		$100\times a_2$	–6.446652
		b_1	–3.260284
		b_2	4.292047
100-120	Blend	a_L	100
		μ_{a_L}	0.446567[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

RMC00 ultimate

Age range	Formula type	Parameters	
17-53.47[a]	GM(1,3)	$100\times a_1$	0.041244
		b_1	–5.954870
		b_2	3.983058
		b_3	–1.616713
53.47[a]-86.61[b]	GM(1,3)	$100\times a_1$	0.037871
		b_1	–4.289179
		b_2	5.834998
		b_3	–0.286044
86.61[b] -100	GM(2,2)	$100\times a_1$	–1.881491
		$100\times a_2$	–6.446652
		b_1	–3.260284
		b_2	4.292047
100-120	Blend	a_L	100
		μ_{a_L}	0.446567[c]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 53.46524670
[b] Value to 8 d.p. = 86.61028358
[c] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

RFD00 ultimate

Age range	Formula type	Parameters	
17-75	GM(0,2)	b_1	–4.787615
		b_2	4.035249

RFV00 ultimate

Age range	Formula type	Parameters	
50-100	GM(2,2)	$100\times a_1$	–0.617486
		$100\times a_2$	–2.807680
		b_1	–4.152614
		b_2	5.410052
100-120	Blend	a_L	100
		μ_{a_L}	0.380881[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

RFC00 ultimate

Age range	Formula type	Parameters	
17-58.65[a]	GM(0,2)	b_1	–4.787615
		b_2	4.035249
58.65[a]-74.34[b]	GM(1,3)	$100\times a_1$	–0.005052
		b_1	–3.512802
		b_2	5.364421
		b_3	1.068144
74.34[b] -100	GM(2,2)	$100\times a_1$	–0.617486
		$100\times a_2$	–2.807680
		b_1	–4.152614
		b_2	5.410052
100-120	Blend	a_L	100
		μ_{a_L}	0.380881[c]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 58.65143920
[b] Value to 8 d.p. = 74.34059080
[c] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

PPMD00 ultimate

Age range	Formula type	Parameters	
17-75	GM(1,3)	$100\times a_1$	0.042022
		b_1	–5.894375
		b_2	3.659673
		b_3	–1.542952

PPMV00 ultimate

Age range	Formula type	Parameters	
50-100	GM(0,4)	b_1	–1.805621
		b_2	1.817239
		b_3	2.323129
		b_4	–0.750000
100-120	Blend	a_L	100
		μ_{a_L}	0.514915[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

PPMC00 ultimate

Age range	Formula type	Parameters	
17-40.00[a]	GM(1,3)	$100\times a_1$	0.042022
		b_1	–5.894375
		b_2	3.659673
		b_3	–1.542952
40.00[a]-71.66[b]	GM(1,4)	$100\times a_1$	0.042428
		b_1	–4.527817
		b_2	6.335509
		b_3	–0.359870
		b_4	0.600000
71.66[b] -100	GM(0,4)	b_1	–1.805621
		b_2	1.817239
		b_3	2.323129
		b_4	–0.750000
100-120	Blend	a_L	100
		μ_{a_L}	0.514915[c]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 39.99742748
[b] Value to 8 d.p. = 71.65844361
[c] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

PPFD00 ultimate

Age range	Formula type	Parameters	
17-75	GM(0,3)	b_1	–5.619389
		b_2	3.099457
		b_3	–0.684653

PPFV00 ultimate

Age range	Formula type	Parameters	
50-100	GM(1,3)	$100\times a_1$	0.410381
		b_1	–6.745098
		b_2	9.343251
		b_3	–1.200000
100-120	Blend	a_L	100
		μ_{a_L}	0.452021[a]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

PPFC00 ultimate

Age range	Formula type	Parameters	
17-49.51[a]	GM(0,3)	b_1	–5.619389
		b_2	3.099457
		b_3	–0.684653
49.51[a]-73.93[b]	GM(1,4)	$100\times a_1$	0.010000
		b_1	–4.845442
		b_2	4.792242
		b_3	–0.107757
		b_4	0.250000
73.93[b] -100	GM(1,3)	$100\times a_1$	0.410381
		b_1	–6.745098
		b_2	9.343251
		b_3	–1.200000
100-120	Blend	a_L	100
		μ_{a_L}	0.452021[c]
		a_H	120
		μ_{a_H}	1
		c	1.25

[a] Value to 8 d.p. = 49.51315145
[b] Value to 8 d.p. = 73.92679675
[c] Value shown to 6 d.p., but unrounded value of μ_{100} used in calculations

PCMA00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
50-97	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
97-120	Blend	a_L	97
		μ_{a_L}	0.300087[a]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PEMA00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
50-59.90[a]	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
59.90[a]-94	GM(1,4)	$100\times a_1$	–0.136071
		b_1	–2.410636
		b_2	0.481060
		b_3	1.470896
		b_4	–1.565250
94-98.49[b]	Blend	a_L	94
		μ_{a_L}	0.242468[c]
		a_H	120
		μ_{a_H}	1
		c	0.7
98.49[b]-120	Blend	a_L	97
		μ_{a_L}	0.300087[d]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 59.89826692
[b] Value to 8 d.p. = 98.49297471
[c] Value shown to 6 d.p., but unrounded value of **PEMA00** μ_{94} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PNMA00 ultimate

Age range	Formula type	Parameters	
20-65	GM(1,2)	$100\times a_1$	0.044442
		b_1	–3.955698
		b_2	6.938504
65-81.99[a]	GM(1,3)	$100\times a_1$	0.592331
		b_1	–7.397703
		b_2	9.134072
		b_3	–2.868544
81.99[a]-97	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
97-120	Blend	a_L	97
		μ_{a_L}	0.300087[b]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 81.99281568

[b] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PCML00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	GM(1,4)	$100\times a_1$	0.735863
		b_1	–9.258547
		b_2	13.714773
		b_3	–5.064792
		b_4	1.565239
50-89.77[a]	GM(1,4)	$100\times a_1$	0.735863
		b_1	–9.258547
		b_2	13.714773
		b_3	–5.064792
		b_4	1.565239
89.77[a]-97	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
97-120	Blend	a_L	97
		μ_{a_L}	0.300087[b]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 89.76864889
[b] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PEML00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	GM(1,4)	$100\times a_1$	0.735863
		b_1	–9.258547
		b_2	13.714773
		b_3	–5.064792
		b_4	1.565239
50-60.02[a]	GM(1,4)	$100\times a_1$	0.735863
		b_1	–9.258547
		b_2	13.714773
		b_3	–5.064792
		b_4	1.565239
60.02[a]-90.67[b]	GM(1,4)	$100\times a_1$	0.673320
		b_1	–8.903854
		b_2	13.353462
		b_3	–4.913046
		b_4	1.645541
90.67[b]-94	GM(1,4)	$100\times a_1$	–0.136071
		b_1	–2.410636
		b_2	0.481060
		b_3	1.470896
		b_4	–1.565250
94-98.49[c]	Blend	a_L	94
		μ_{a_L}	0.242468[d]
		a_H	120
		μ_{a_H}	1
		c	0.7
98.49[c]-120	Blend	a_L	97
		μ_{a_L}	0.300087[e]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 60.01931404
[b] Value to 8 d.p. = 90.66680236
[c] Value to 8 d.p. = 98.49297471
[d] Value shown to 6 d.p., but unrounded value of **PEMA00** μ_{94} used in calculations
[e] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PNML00 ultimate

Age range	Formula type	Parameters	
20-65	GM(1,2)	$100\times a_1$	0.044516
		b_1	–3.706861
		b_2	7.228252
65-89.33[a]	GM(1,4)	$100\times a_1$	0.802951
		b_1	–10.196636
		b_2	15.407579
		b_3	–5.859048
		b_4	1.872415
89.33[a]-97	GM(1,3)	$100\times a_1$	0.536403
		b_1	–6.688640
		b_2	8.359170
		b_3	–2.286393
97-120	Blend	a_L	97
		μ_{a_L}	0.300087[b]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 89.32632110

[b] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PCFA00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	Blend	a_L	16
		μ_{a_L}	0.00332832
		a_H	57
		μ_{a_H}	0.004040[b]
		c	1
50-57	Blend	a_L	16
		μ_{a_L}	0.00332832
		a_H	57
		μ_{a_H}	0.004040[b]
		c	1
57-97	GM(2,2)	$100\times a_1$	–1.286105
		$100\times a_2$	–3.607197
		b_1	–3.693170
		b_2	4.602553
97-105.60[a]	Blend	a_L	97
		μ_{a_L}	0.266517[c]
		a_H	120
		μ_{a_H}	1
		c	0.9
105.60[a]-120	Blend	a_L	97
		μ_{a_L}	0.300087[d]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 105.60318598
[b] Value shown to 6 d.p., but unrounded value of **PCFA00** μ_{57} used in calculations
[c] Value shown to 6 d.p., but unrounded value of **PCFA00** μ_{97} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PEFA00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	Blend	a_L	16
		μ_{a_L}	0.00332832
		a_H	50
		μ_{a_H}	0.006382[e]
		c	1
50-51.03[a]	GM(2,2)	$100\times a_1$	–3.047197
		$100\times a_2$	–6.446960
		b_1	–3.065582
		b_2	3.595655
51.03[a] -88.37[b]	GM(0,5)	b_1	7.065115
		b_2	–5.594119
		b_3	15.031700
		b_4	–3.988009
		b_5	3.700078
88.37[b] -90.50[c]	GM(2,2)	$100\times a_1$	–3.047197
		$100\times a_2$	–6.446960
		b_1	–3.065582
		b_2	3.595655
90.50[c] -97	GM(2,2)	$100\times a_1$	–1.594305
		$100\times a_2$	–4.144155
		b_1	–3.511518
		b_2	4.377971
97-102.87[d]	Blend	a_L	97
		μ_{a_L}	0.279135[f]
		a_H	120
		μ_{a_H}	1
		c	0.9

PEFA00 ultimate (continued)

Age range	Formula type	Parameters	
102.87[d] -120	Blend	a_L	97
		μ_{a_L}	0.300087[g]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 51.02764759
[b] Value to 8 d.p. = 88.36865665
[c] Value to 8 d.p. = 90.49504212
[d] Value to 8 d.p. = 102.87498528
[e] Value shown to 6 d.p., but unrounded value of **PEFL00** μ_{50} used in calculations
[f] Value shown to 6 d.p., but unrounded value of **PCFL00** μ_{97} used in calculations
[g] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PNFA00 ultimate

Age range	Formula type	Parameters	
20-65	GM(1,2)	$100\times a_1$	0.014225
		b_1	–4.574768
		b_2	5.357102
65-89.37[a]	GM(2,2)	$100\times a_1$	–0.873144
		$100\times a_2$	–2.532105
		b_1	–3.894701
		b_2	4.973934
89.37[a]-97	GM(2,2)	$100\times a_1$	–1.286105
		$100\times a_2$	–3.607197
		b_1	–3.693170
		b_2	4.602553
97-105.60[b]	Blend	a_L	97
		μ_{a_L}	0.266517[c]
		a_H	120
		μ_{a_H}	1
		c	0.9
105.60[b]-120	Blend	a_L	97
		μ_{a_L}	0.300087[d]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 89.37174387
[b] Value to 8 d.p. = 105.60318598
[c] Value shown to 6 d.p., but unrounded value of **PCFA00** μ_{97} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PCFL00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	Blend	a_L	16
		μ_{a_L}	0.00347646
		a_H	54
		μ_{a_H}	0.004673[b]
		c	1
50-54	Blend	a_L	16
		μ_{a_L}	0.00347646
		a_H	54
		μ_{a_H}	0.004673[b]
		c	1
54-97	GM(2,2)	$100\times a_1$	–1.594305
		$100\times a_2$	–4.144155
		b_1	–3.511518
		b_2	4.377971
97-102.87[a]	Blend	a_L	97
		μ_{a_L}	0.279135[c]
		a_H	120
		μ_{a_H}	1
		c	0.9
102.87[a]-120	Blend	a_L	97
		μ_{a_L}	0.300087[d]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 102.87498528
[b] Value shown to 6 d.p., but unrounded value of **PCFL00** μ_{54} used in calculations
[c] Value shown to 6 d.p., but unrounded value of **PCFL00** μ_{97} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PEFL00 ultimate

Age range	Formula type	Parameters	
20-50 (Non-adopted extension)	Blend	a_L	16
		μ_{a_L}	0.00347646
		a_H	50
		μ_{a_H}	0.006382[c]
		c	1
50-90.50[a]	GM(2,2)	$100\times a_1$	–3.047197
		$100\times a_2$	–6.446960
		b_1	–3.065582
		b_2	3.595655
90.50[a]-97	GM(2,2)	$100\times a_1$	–1.594305
		$100\times a_2$	–4.144155
		b_1	–3.511518
		b_2	4.377971
97-102.87[b]	Blend	a_L	97
		μ_{a_L}	0.279135[d]
		a_H	120
		μ_{a_H}	1
		c	0.9
102.87[b]-120	Blend	a_L	97
		μ_{a_L}	0.300087[e]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 90.49504212
[b] Value to 8 d.p. = 102.87498528
[c] Value shown to 6 d.p., but unrounded value of **PEFL00** μ_{50} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCFL00** μ_{97} used in calculations
[e] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

PNFL00 ultimate

Age range	Formula type	Parameters	
20-65	GM(1,2)	$100\times a_1$	0.014382
		b_1	–4.429354
		b_2	5.535225
65-90.49[a]	GM(2,2)	$100\times a_1$	–1.407288
		$100\times a_2$	–3.778481
		b_1	–3.602183
		b_2	4.552974
90.49[a]-97	GM(2,2)	$100\times a_1$	–1.594305
		$100\times a_2$	–4.144155
		b_1	–3.511518
		b_2	4.377971
97-102.87[b]	Blend	a_L	97
		μ_{a_L}	0.279135[c]
		a_H	120
		μ_{a_H}	1
		c	0.9
102.87[b]-120	Blend	a_L	97
		μ_{a_L}	0.300087[d]
		a_H	120
		μ_{a_H}	1
		c	0.8

[a] Value to 8 d.p. = 90.49278772
[b] Value to 8 d.p. = 102.87498528
[c] Value shown to 6 d.p., but unrounded value of **PCFL00** μ_{97} used in calculations
[d] Value shown to 6 d.p., but unrounded value of **PCMA00** μ_{97} used in calculations

WA00 ultimate

Age range	Formula type	Parameters	
17-55	Blend	a_L	16
		μ_{a_L}	0.000150
		a_H	55
		μ_{a_H}	0.004684[a]
		c	1.15
55-98	GM(1,2)	$100 \times a_1$	0.269451
		b_1	–4.468221
		b_2	5.839618
98-120	Blend	a_L	98
		μ_{a_L}	0.304481[b]
		a_H	120
		μ_{a_H}	1
		c	1.1

[a] Value shown to 6 d.p., but unrounded value of **WA00** μ_{55} used in calculations
[b] Value shown to 6 d.p., but unrounded value of **WA00** μ_{98} used in calculations

WL00 ultimate

Age range	Formula type	Parameters	
17-55	Blend	a_L	16
		μ_{a_L}	0.000200
		a_H	55
		μ_{a_H}	0.006060[b]
		c	1.15
55-90.33[a]	GM(1,2)	$100\times a_1$	0.307161
		b_1	–4.235211
		b_2	5.258961
90.33[a]-98	GM(1,2)	$100\times a_1$	0.269451
		b_1	–4.468221
		b_2	5.839618
98-120	Blend	a_L	98
		μ_{a_L}	0.304481[c]
		a_H	120
		μ_{a_H}	1
		c	1.1

[a] Value to 8 d.p. = 90.32833648
[b] Value shown to 6 d.p., but unrounded value of **WL00** μ_{55} used in calculations
[c] Value shown to 6 d.p., but unrounded value of **WA00** μ_{98} used in calculations

CORRIGENDA

C.M.I.R. **17**, 73 Table 5.1
The central exposed value at durations 5+ for females, 1991-94 should read 1,068,159.7 not 2,004,000.2.

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