

**Principal Civil  
Service Pension  
Scheme**

**Analysis of  
Scheme  
Experience  
between 1 April  
1999 and 31  
March 2003**

**14 November  
2003**

*Prepared for*  
**Civil Service  
Pensions**

*Prepared by*  
**Richard Mulcahy**  
**Jonathan Teasdale**

---

Argentina	Channel Islands	Greece	Japan	Poland	Sweden
Australia	Chile	Hong Kong	Malaysia	Puerto Rico	Switzerland
Austria	China	Hungary	Mauritius	Singapore	Thailand
Belgium	Czech Republic	India	Mexico	South Africa	United Kingdom
Brazil	France	Ireland	Netherlands	South Korea	United States
Canada	Germany	Italy	Philippines	Spain	Venezuela

This report and any enclosures or attachments are prepared on the understanding that it is solely for the benefit of the addressee(s). Unless we provide express prior written consent this report should not be disclosed to or discussed with anyone else and, in providing this report, we do not accept or assume any responsibility for any other purpose or to anyone other than the addressee(s) of this report.

Copyright © 2005 Hewitt Bacon & Woodrow Limited. All rights reserved.

Member of the General Insurance Standards Council.

# Overview of Results

---

## Principal finding from experience investigation

The main findings of our experience analysis over the period 1 April 1999-31 March 2003 were as follows:

- The mortality of the Scheme's pensioners was lighter than expected (for both normal and ill-health retirements)
- The mortality of active members in service was much lighter than expected, particularly at older ages
- Age retirement patterns of active members were broadly in line with those expected
- Rates of ill-health retirement of non-Prison Officers were significantly lower than expected
- Rates of voluntary withdrawal from active service were generally greater than expected (particularly at older ages), although rates were lower than expected at younger ages for men and women in Bands 3 and 4
- Rates of promotional salary increases were broadly in line with those expected at most ages, although there were a few ages/categories where experience was rather different to that expected.

## Detailed results

The detailed results of our analysis are set out in the attached graphs.

# Contents

---

Introduction	1
Introduction	1
Data and process	1
Overall approach to setting assumptions	1
Results of Investigation - Mortality	2
Approach to analysis	2
Pensioner mortality: Normal health - males	2
Pensioner mortality: Normal health - females	4
Pensioner mortality: Ill-health - males	5
Pensioner mortality: Ill-health - females	5
Spouses and dependants	6
Mortality before retirement: Males	6
Mortality before retirement: Females	7
Results of Investigation – Age Retirement Patterns	8
Age retirement	8
Age retirement: Males – Band 1	8
Age retirement: Males – Band 2	9
Age retirement: Males – Band 3	9
Age retirement: Males – Band 4	9
Age retirement: Males - Prison Officers	10
Age retirement: Females – Band 1	10
Age retirement: Females – Band 2	10
Age retirement: Females – Band 3	11
Age retirement: Females – Band 4	11
Age retirement: Females – Prison Officers	11
Results of Investigation – Ill-health Retirements	12
Ill-health retirements: Males – non Prison Officers	12
Ill-health retirements: Males – Prison Officers	13
Ill-health retirements: Females – non Prison Officers	14
Ill-health retirements: Females – Prison Officers	15
Results of Investigation - Withdrawals	16

Withdrawals from active service	16
Withdrawals: Males – Band 1	17
Withdrawals: Males – Band 2	17
Withdrawals: Males – Band 3	18
Withdrawals: Males – Band 4	18
Withdrawals: Males – Prison Officers	18
Withdrawals: Females – Band 1	19
Withdrawals: Females – Band 2	20
Withdrawals: Females – Band 3	21
Withdrawals: Females – Band 4	21
Withdrawals: Females – Prison Officers	21
Results of Investigation – Promotional Salary Increases	22
Promotional salary increases	22
Comments on results	22
Promotional salary increases: Males – Band 1	23
Promotional salary increases: Males – Band 2	23
Promotional salary increases: Males – Band 3	23
Promotional salary increases: Males – Band 4	24
Promotional salary increases: Males – Prison Officers	24
Promotional salary increases: Females – Band 1	24
Promotional salary increases: Females – Band 2	25
Promotional salary increases: Females – Band 3	25
Promotional salary increases: Females – Band 4	25
Promotional salary increases: Females – Prison Officers	26
Results of Investigation – Marriage/Dependency Rates	27
Introduction	27
Proposed assumptions	27

# Introduction

---

## Introduction

We have carried out an investigation into the demographic experience of the PCSPS during the four-year period from 1 April 1999 to 31 March 2003.

This investigation forms part of our review of the Accruing Superannuation Liability Charges (ASLCs) as at 31 March 2003. The purpose of the review is to compare the actual experience of the PCSPS with the expected experience over the same period on the basis of the assumptions adopted at the last ASLC review.

---

## Data and process

The process followed and data adopted are as described in our separate report on the ASLC review as at 31 March 2003.

We have analysed separately the following experience items:

- Mortality in retirement (analysed separately for men and women, normal and ill-health retirements, and spouses)
- Mortality before retirement (analysed for men and women)
- Age retirement patterns (analysed for men and women, the four pay bands and Prison Officers)
- Rates of ill-health retirement (analysed for men and women and separately for Prison Officers)
- Rates of withdrawal (analysed as for age retirements)
- Promotional salary increases (analysed as for age retirements)

The results are set out in the graphs which follow.

In addition, we have reviewed the allowance for rates of marriage, and re-marriages incidence of unmarried dependants and age differences between partners.

---

## Overall approach to setting assumptions

In reaching our decisions on assumptions we have taken the view that the assumptions as a whole should represent a “best estimate” of expected future experience having regard to expected future changes (e.g improving life expectancy) where relevant. In particular, we have not built in intentional margins of prudence to the assumptions.

---

# Results of Investigation - Mortality

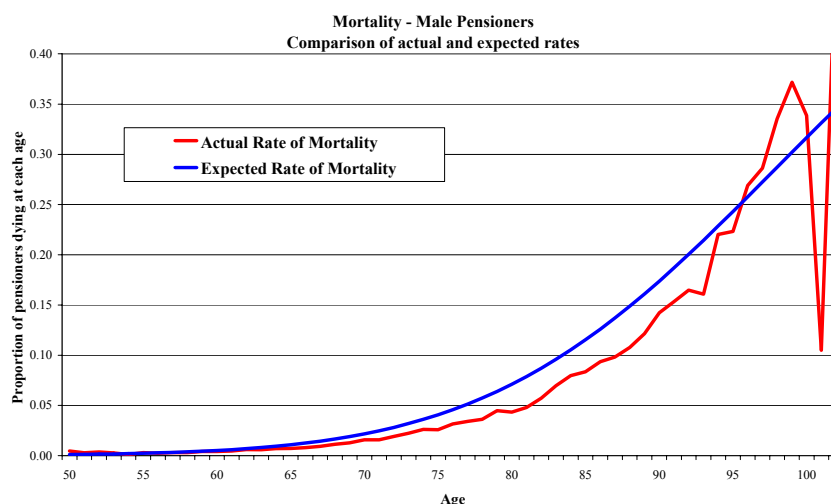
## Approach to analysis

In carrying out our analysis of mortality experience, we have compared the actual number of deaths at each age with those expected under the standard tables underlying those adopted by GAD in 1999. The GAD used PMA92/PFA92 (calendar year 2006) tables, which are the mortality values expected to apply in the year 2006, allowing for expected improvements in mortality from 1992 until 2006. Using tables relating to a future calendar year is a proxy for using tables appropriate to year of birth for each individual and projecting improvement in mortality until year of death (which may be before or after 2006, but averaging out at 2006), and we understand that this is the reason that this basis was chosen by GAD in its 1999 valuation.

Clearly, it is not appropriate to compare actual deaths in the period 1 April 1999 to 31 March 2003 with those expected on a calendar year 2006 basis. The “equivalent” year of birth mortality table to the calendar year 2006 table is the standard PMA92/PFA92 (year of birth) table with individuals assumed to suffer mortality rates for individuals born three years before the PCSPS members actually were born. We have, therefore, deemed it appropriate to compare actual deaths with those expected on the basis of mortality projected to calendar year 1996 which implicitly assumes that the average pensions of PCSPS members are the same as those of the individuals whose data was used in the compilation of the P92 tables.

Similarly, when testing the appropriateness of new mortality tables we have followed a consistent approach.

## Pensioner mortality: Normal health - males



The mortality experience of male pensioners who retired in normal health was lighter than expected over the period 1 April 1999 to 31 March 2003 on the basis of the assumptions adopted by GAD in 1999, as indicated by the graph above.

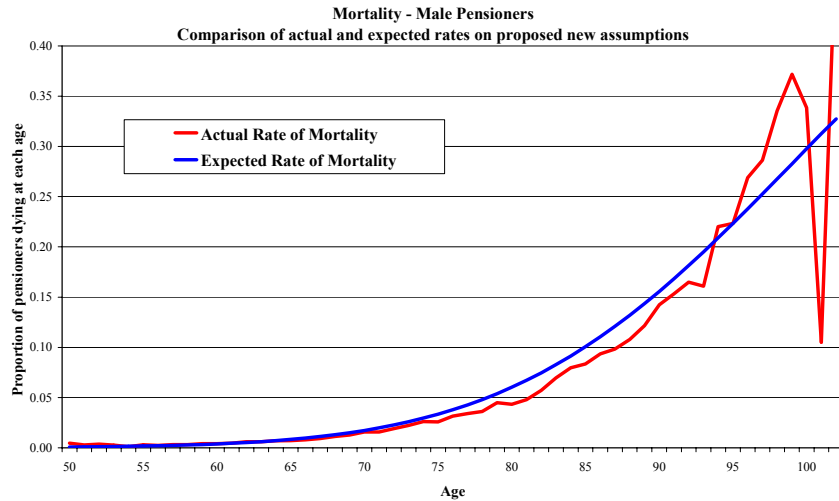
The above experience suggests that the allowance for mortality should be strengthened. The graph below shows what the expected experience would have been if standard table PMA C2010 rated down by one year had been used. The improved “fit” of the graph on the next page suggests that this represents a step towards the actual experience over the period without moving the whole way.

Adopting a consistent approach for future pensioners, taking into account future

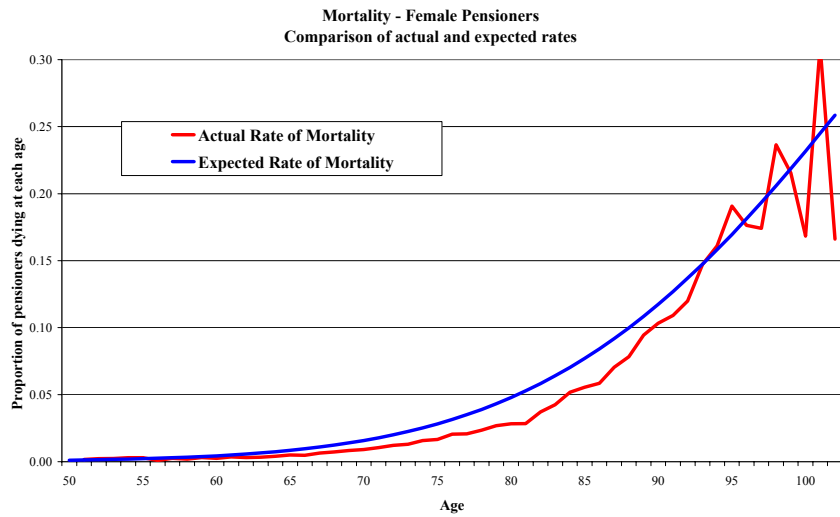
improvements in mortality already projected under the P92 tables, would suggest adopting tables appropriate for calendar year 2026, also rated down by one year.

However, we have also considered what allowance to make (if any) for the further improvement expected to mortality in future. In particular, we have considered the CMIBs most recently published work in progress in relation to the “cohort effect” (which indicated that the rates of longevity improvement for certain groups (or cohorts) of people were better than projected under the P92 tables).

Having regard to this work and the allowances for mortality improvements already reflected in the assumptions, we believe that it would be appropriate to retain the differential age rating adopted by GAD in 1999 for future pensioners. The tables for future pensioners would therefore be rated down by two years (rather than by one year)

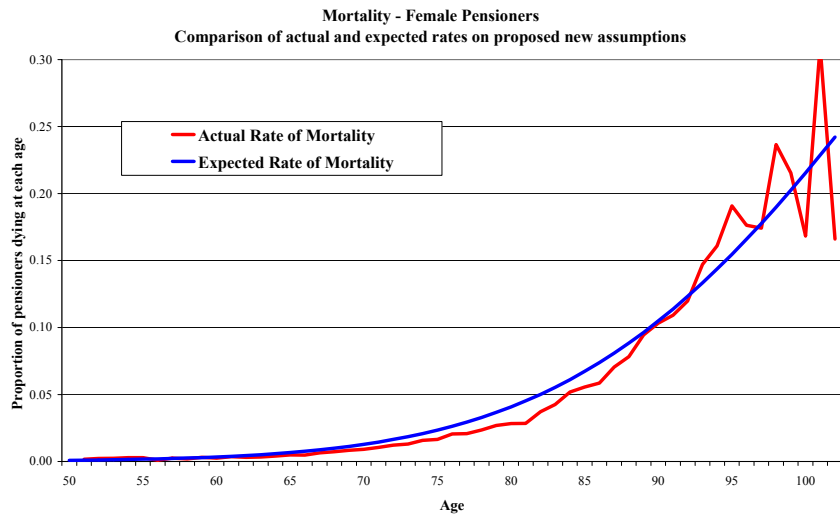


**Pensioner mortality:  
Normal health -  
females**



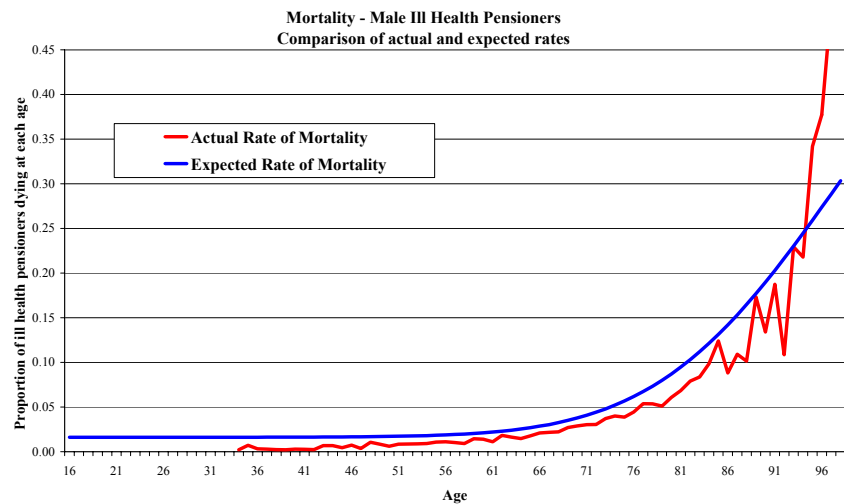
As for male normal health pensioners, actual experience of female normal health pensioners over the period was lighter than expected (see graph above).

Our proposed revised assumption is PFA92C2010 rated down by one year – the effect of adopting this assumption is shown below alongside the actual experience over the last four years. Consistent changes should be made to the assumption for future pensioners.



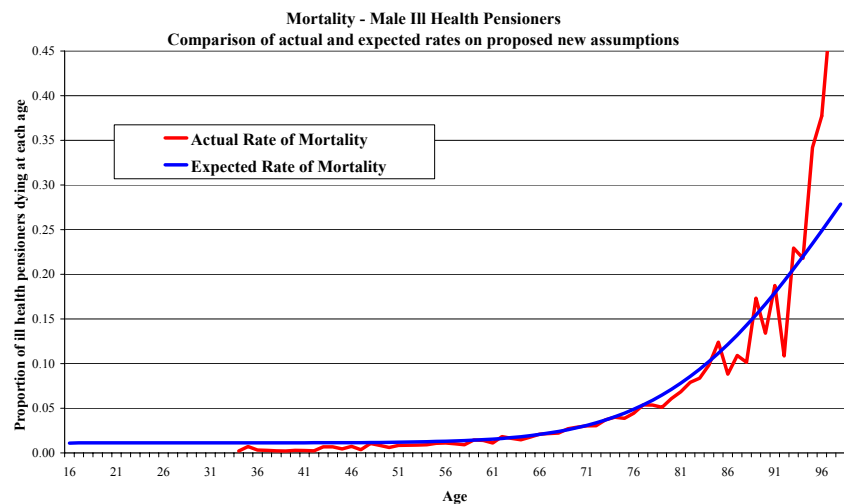


**Pensioner mortality:  
Ill-health - males**

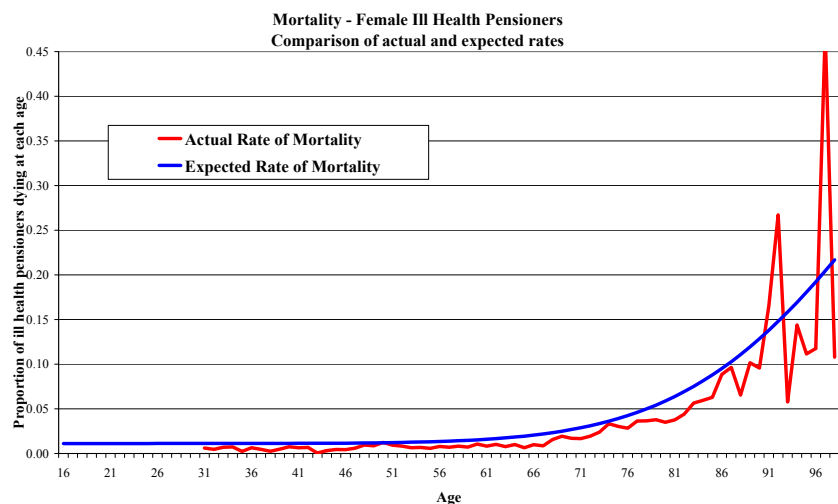


The above graph indicates that the mortality of male ill-health pensioners was lighter than expected over the period.

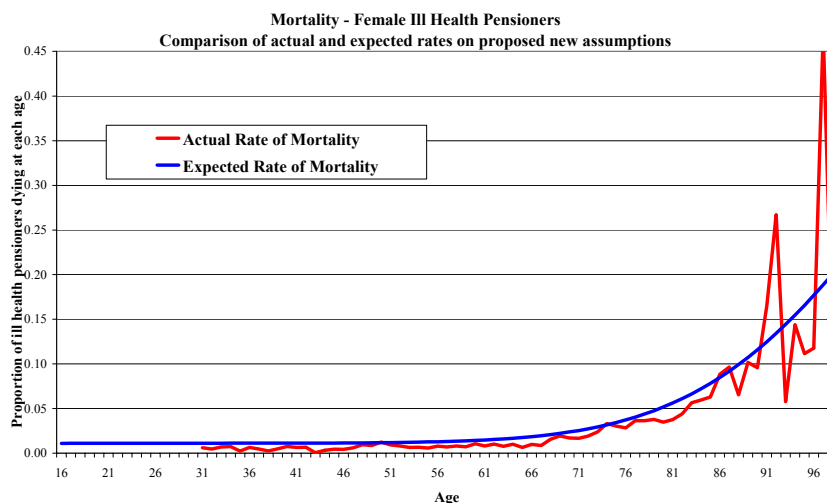
The graph below shows the effect of adopting our proposed new assumptions, which have been adjusted in a manner consistent with the changes for male normal health pensioners.



**Pensioner mortality:  
Ill-health - females**



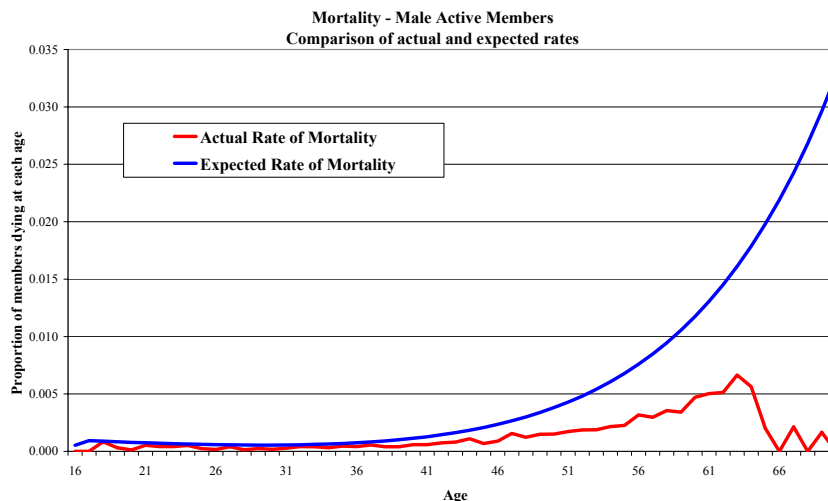
The two graphs in this section show the expected mortality of female ill-health pensioners assuming the existing table (above) and the proposed new table (below) compared with actual experience over the period. The proposed new assumption has been adjusted consistently with the changes for normal health pensioners.



### Spouses and dependants

No movements data in respect of spouses or dependants over the period was available. In the absence of this information, we have assumed that mortality assumptions for these categories of members should be changed consistently with the changes for the categories described above.

### Mortality before retirement: Males

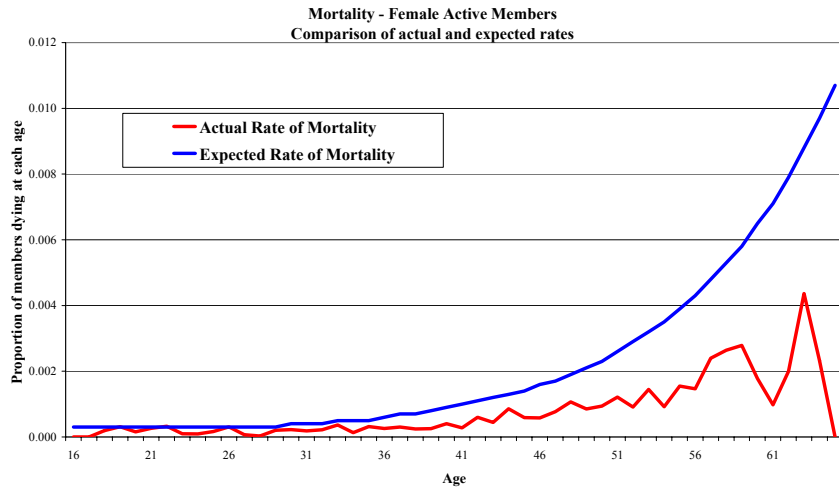


The graph above shows a comparison of the actual rates of mortality before retirement for active males with the rates expected under the existing assumptions. No movements data was available in relation to deaths of deferred pensioners before retirement, so our analysis is based solely on the experience of actives.

The graph illustrates that the mortality experience of active males was lighter than that assumed in 1999, particularly at older ages. However, we do not believe that it is necessary to modify the current assumption because the relatively small number of deaths (relative to other movements) means this assumption makes relatively little difference to the results of the calculations.

Retaining the current assumption would be expected to err slightly on the side of optimism and we would expect it to be reviewed again at the next ASLC review.

**Mortality before retirement:  
Females**



The position for female pre-retirement mortality is very similar to that for males, as suggested by the graph. We have therefore retained the existing assumption for females.

# Results of Investigation – Age Retirement Patterns

## Age retirement

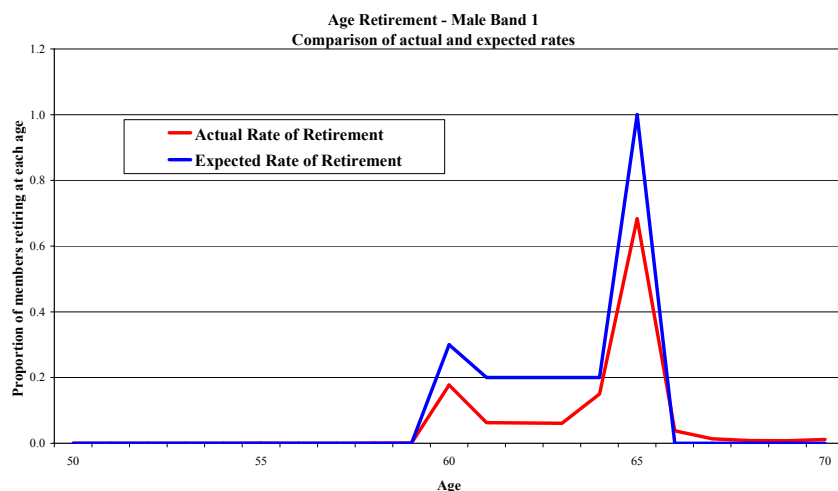
The graphs which follow illustrate the actual pattern of age retirements over the period compared with the pattern expected under the existing assumptions.

The experience has been broadly as expected for most categories except that:

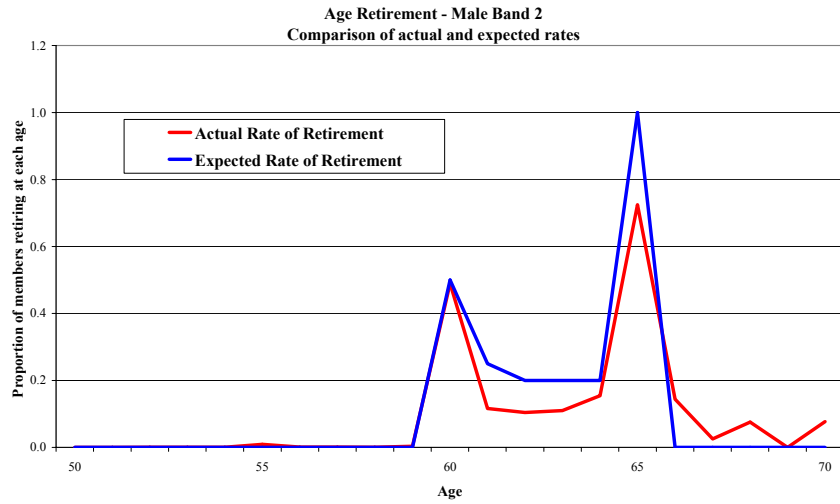
- For Band 3 males and females, the actual rates of retirement after age 60 and before age 65 have been somewhat lower than assumed.
- For Band 4 males and females, there is evidence of retirements being delayed after age 60 (rather than all being at age 60 as assumed)
- For female Prison Officers, there is some evidence of retirements after age 60 although there is relatively little data in support of this.

We are comfortable that the retirement assumptions for Band 1 and 2 males and females are appropriate. We are also comfortable that the assumptions for Band 3 and 4 (males and females) and Prison Officers should be retained, despite evidence of some deviation from the assumptions over the period. We believe that, overall, the assumptions remain appropriate.

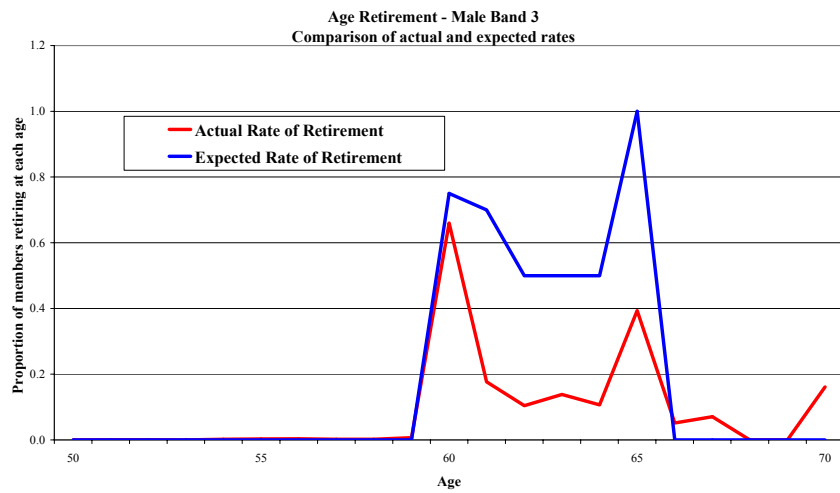
## Age retirement: Males – Band 1



**Age retirement:  
Males – Band 2**



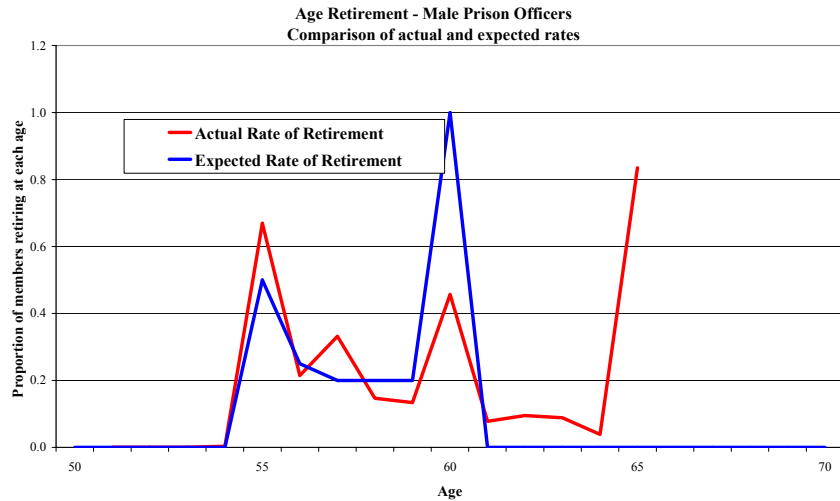
**Age retirement:  
Males – Band 3**



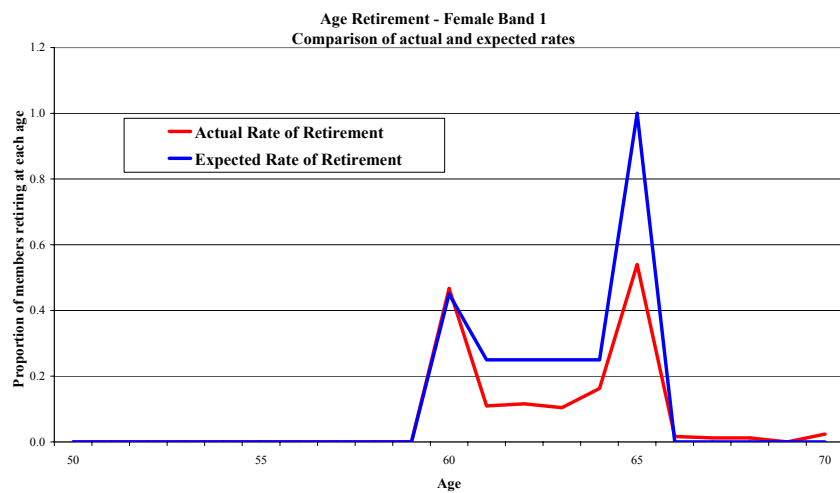
**Age retirement:  
Males – Band 4**



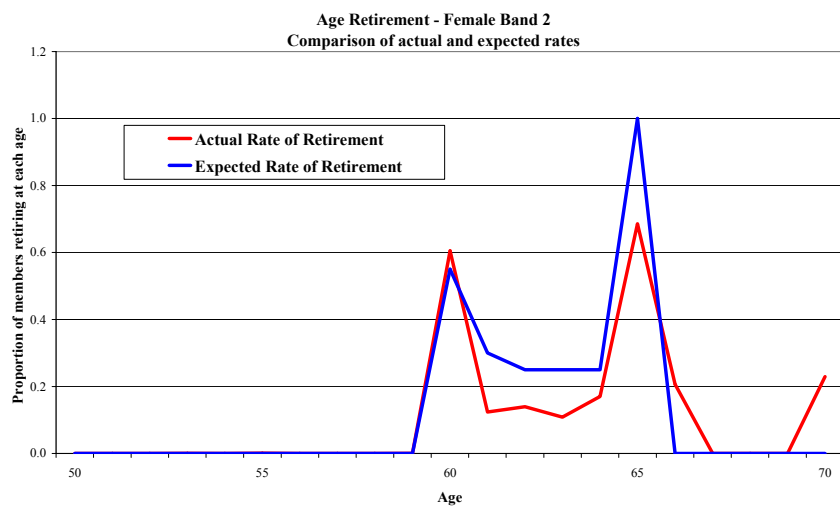
**Age retirement:  
Males - Prison  
Officers**



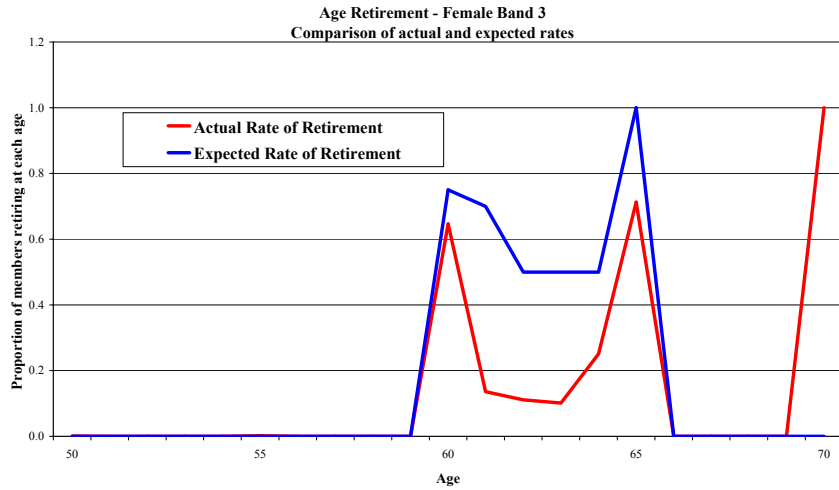
**Age retirement:  
Females – Band 1**



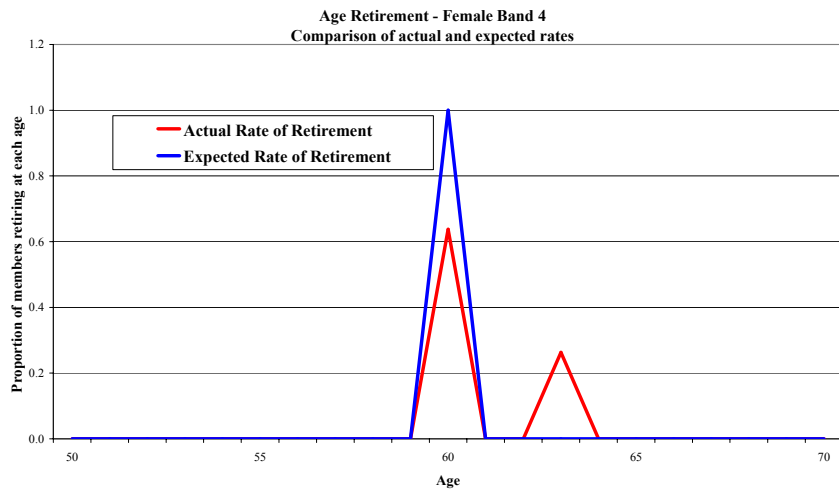
**Age retirement:  
Females – Band 2**



**Age retirement:  
Females – Band 3**



**Age retirement:  
Females – Band 4**

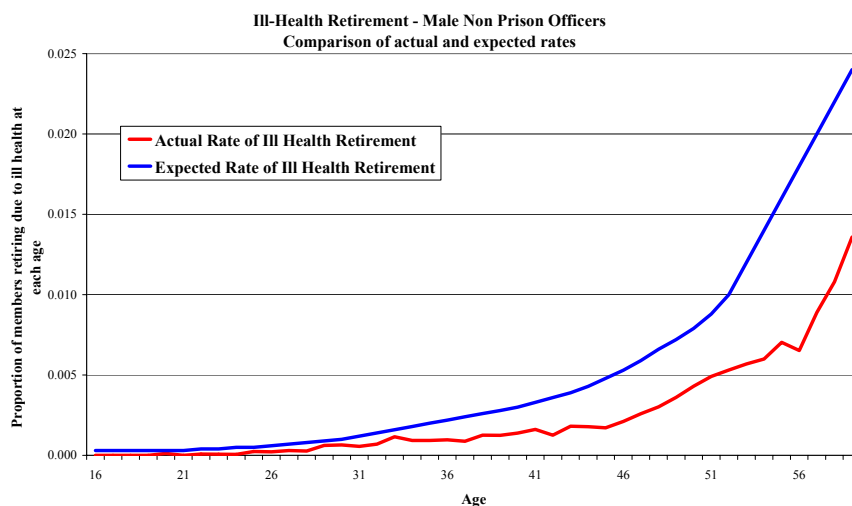


**Age retirement:  
Females – Prison  
Officers**



# Results of Investigation – Ill-health Retirements

## Ill-health retirements: Males – non Prison Officers

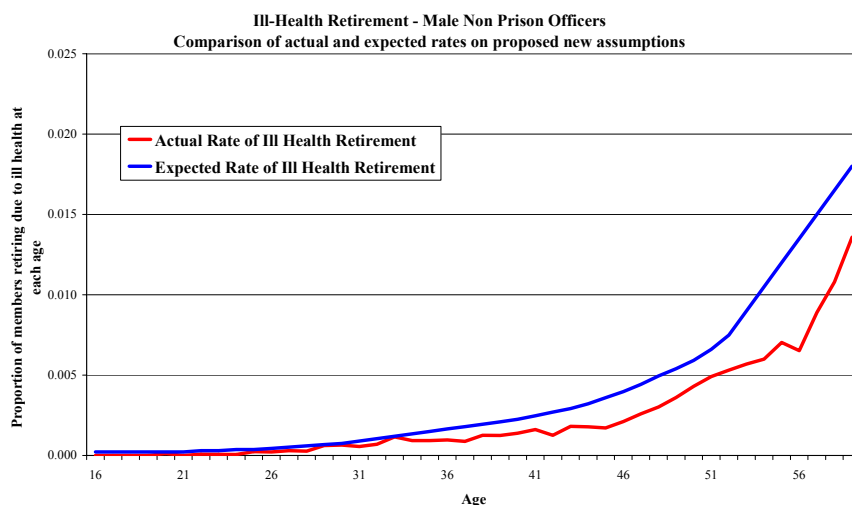


The graph above shows a comparison of the actual rates of ill health retirement for active males (except Prison Officers) with the rates expected under the existing assumptions over the period.

The graph illustrates that the rates of ill health retirement have been significantly lighter than expected over the period, especially at older ages.

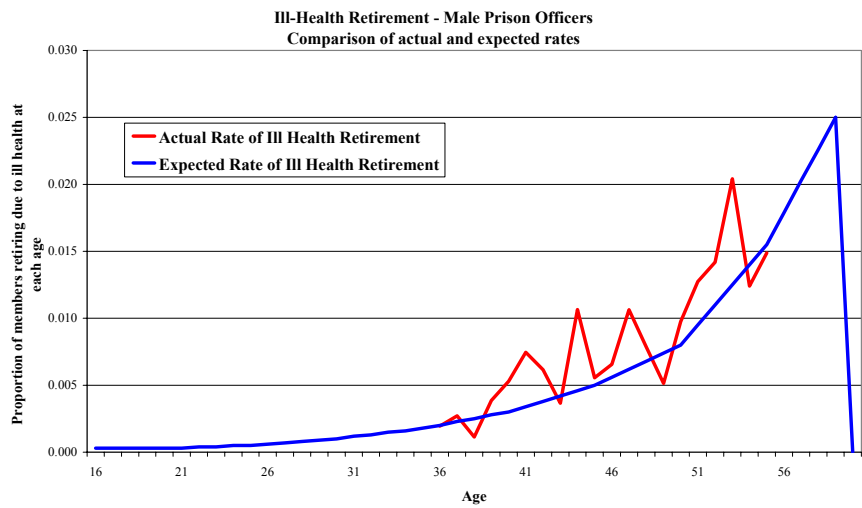
In light of this, we believe that the assumed rates of ill health retirement for males should be reduced in future by around 25%.

A comparison of the actual experience over the period with expected experience under the new assumption is shown below. It can be seen that the actual and expected rates have converged, although there is still a small margin of prudence implied in the expected rates.



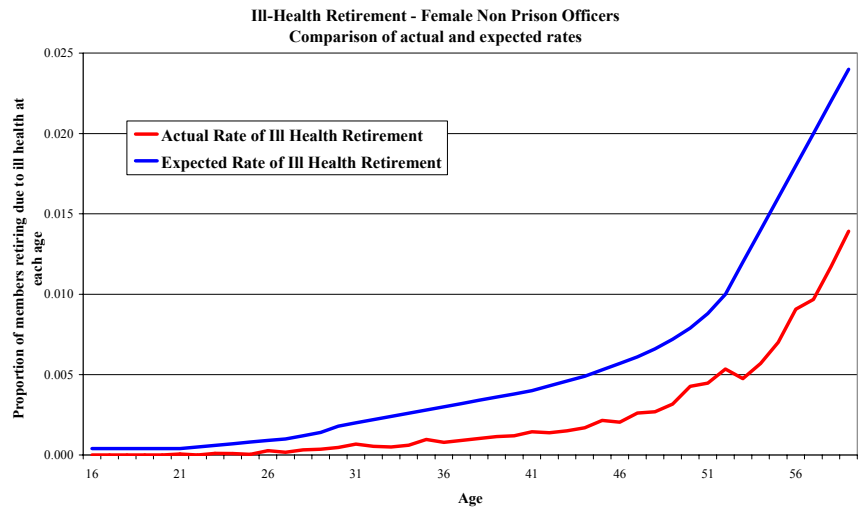


## Ill-health retirements: Males – Prison Officers



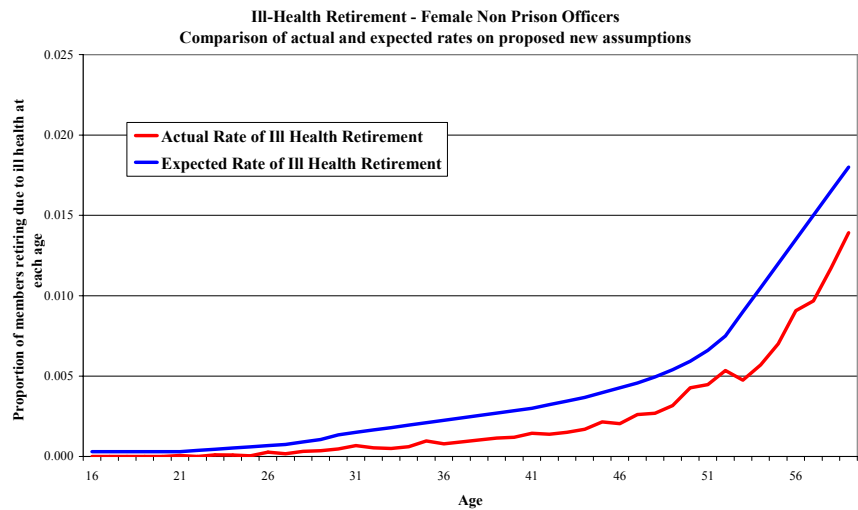
The graph above shows that the ill-health retirement experience of male Prison Officers has been broadly as expected over the period. We would therefore propose to retain the current assumptions.

## Ill-health retirements: Females – non Prison Officers

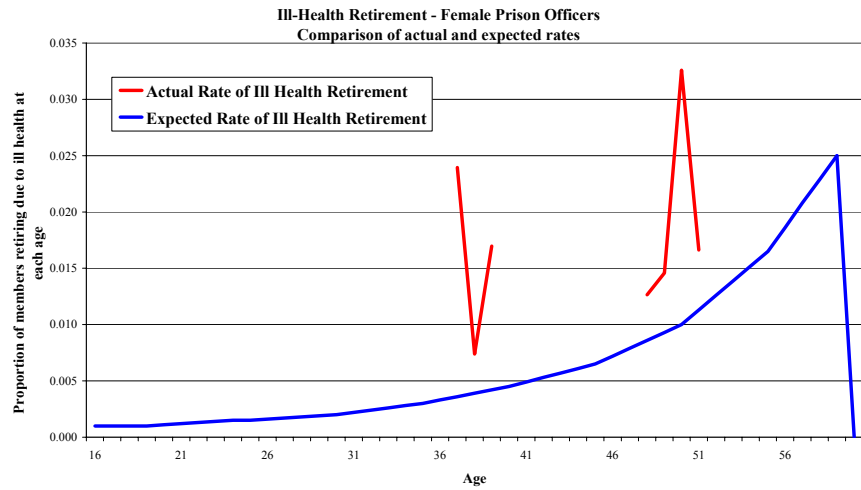


As for active males, the actual ill-health retirement experience of active female has been lighter than expected over the period as shown in the graph above.

We have proposed that a scaling factor of 75% should also be applied to the existing rates for women. The impact of the new assumption is shown below.



### Ill-health retirements: Females – Prison Officers



The ill-health retirement experience of female Prison Officers shown in the above graph reflects the relatively small size of that particular population and provides little useful information.

In the absence of strong evidence to the contrary, we propose to retain the existing assumptions.

---

## Results of Investigation - Withdrawals

---

### Withdrawals from active service

For the 1999, ASLC review, GAD adopted tables of voluntary withdrawal rates which had a select period (i.e. the rates of withdrawal varied by length of service as well as by age).

Our preference is to use a single table of “ultimate” withdrawal rates, derived from GAD’s existing select rates. We have therefore constructed tables which represent weighted averages of the rates under GAD’s select tables, and have used these tables to compare expected and actual experience over the period.

The effect of replacing select withdrawal rates with our simplified ultimate rates will be to overstate (slightly) the cost of benefits for members with very short service and to understate (slightly) the cost of benefits for members with longer service compared with the previous approach. However, we believe that the effect of the simplification will be to leave the total value placed on benefits broadly unchanged.

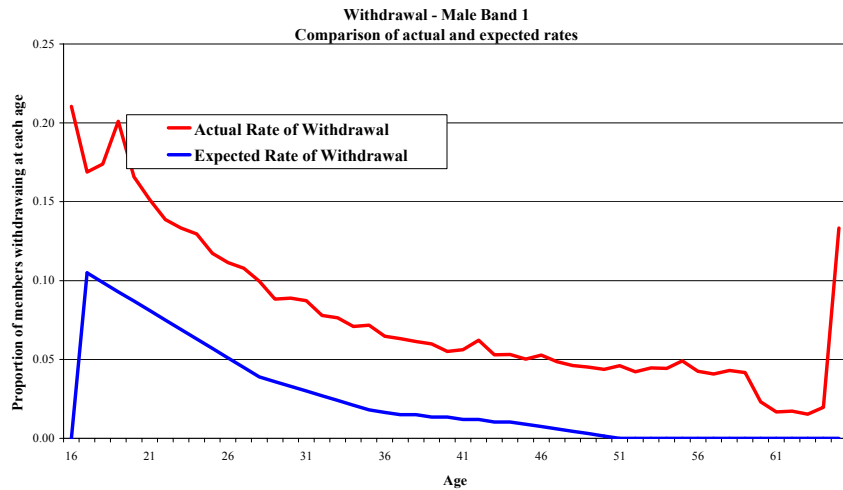
The graphs which follow illustrate the actual pattern of voluntary withdrawals from service of active members over the period compared with the rates expected under the current assumptions (as simplified).

The position for most categories is that actual rates of withdrawal have been higher than expected overall (particularly at older ages), but lower than expected at younger ages (except for Prison Officers and Band 1 females).

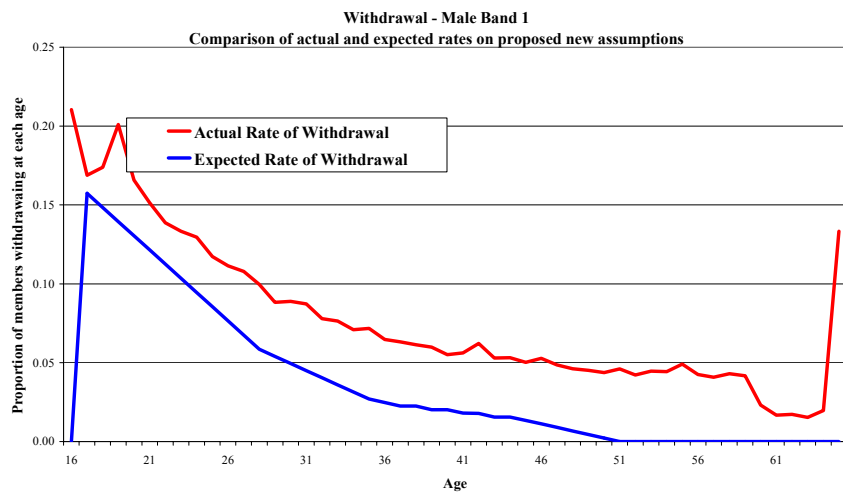
We do not believe there is a compelling case for updating the current assumptions, except as follows:

- For Male Band 1 members, the actual rates of withdrawal were significantly higher than expected at all ages. We have therefore applied a scaling factor of 150% to the existing rates.
- For female Band 2 members, the actual rates of withdrawal were significantly lower than expected at younger ages (more so than for other categories). We have therefore decided to adopt the existing female Band 3 rates for this category.

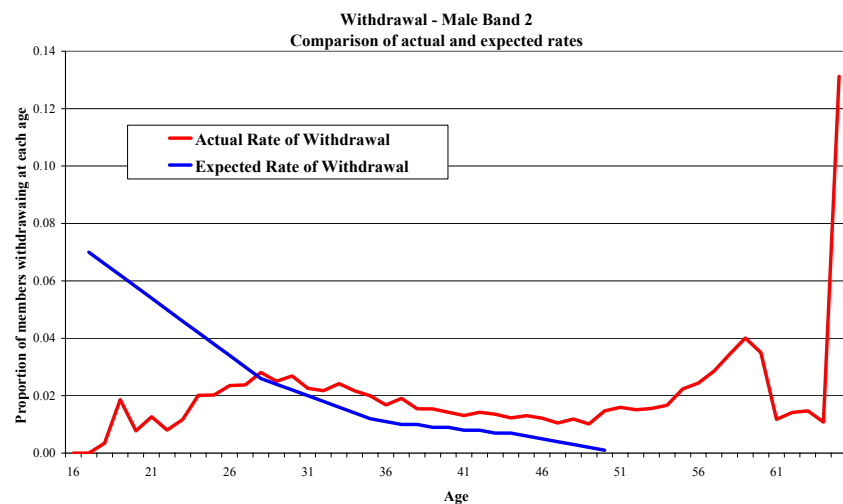
## Withdrawals: Males – Band 1



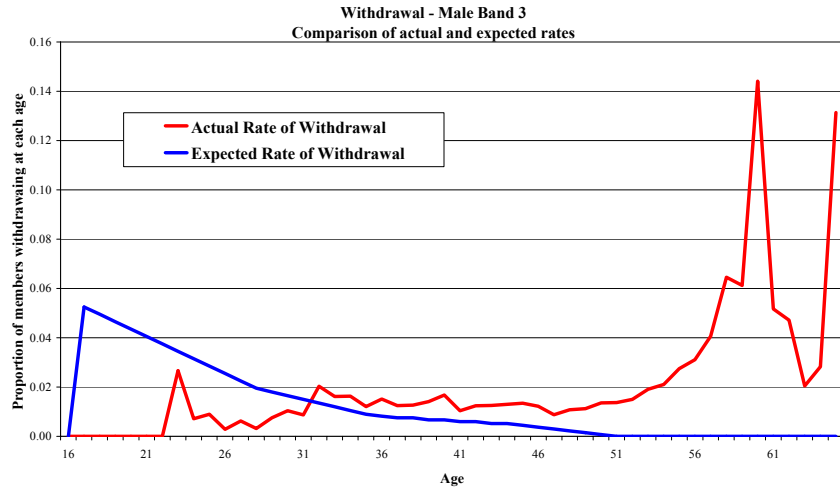
The graphs above and below show the effect of the changes described at the start of this section.



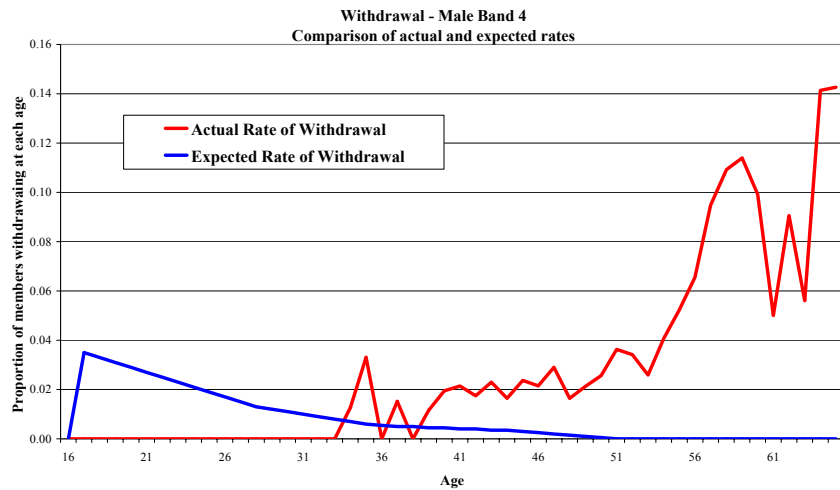
## Withdrawals: Males – Band 2



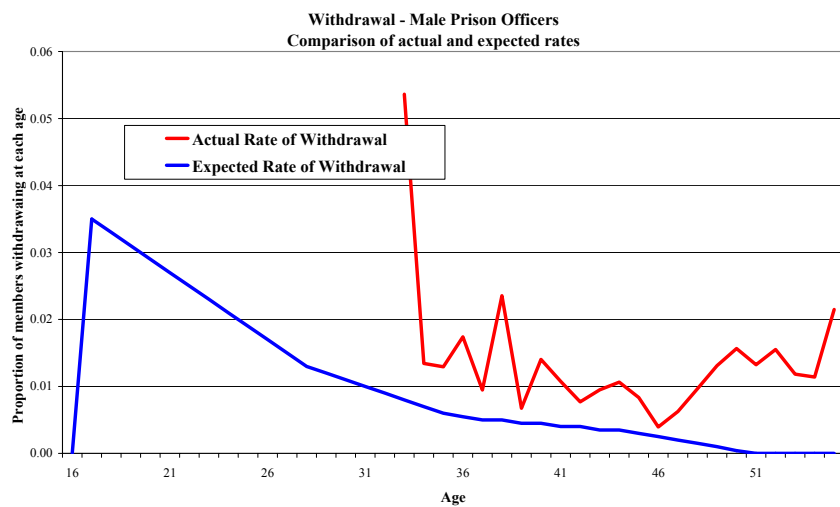
**Withdrawals:  
Males – Band 3**



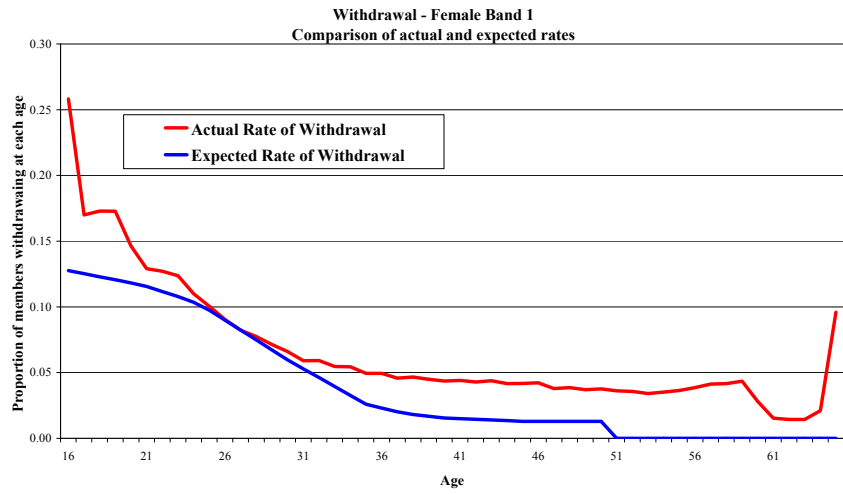
**Withdrawals:  
Males – Band 4**



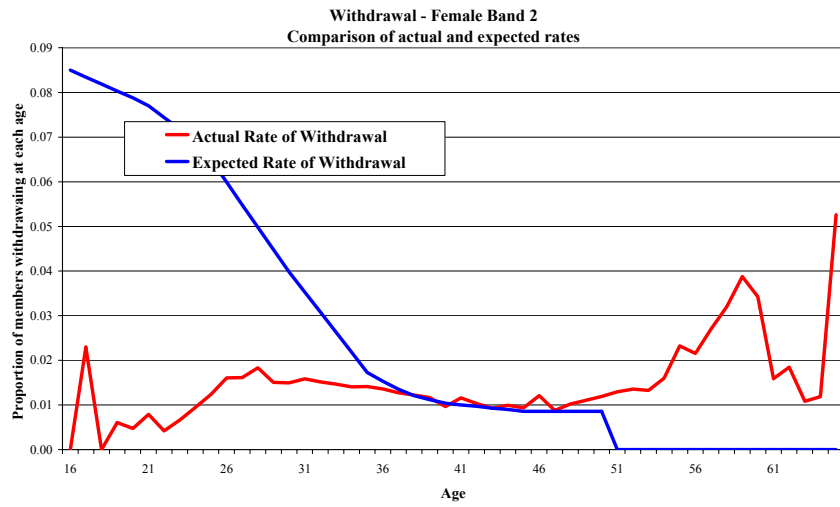
**Withdrawals:  
Males – Prison  
Officers**



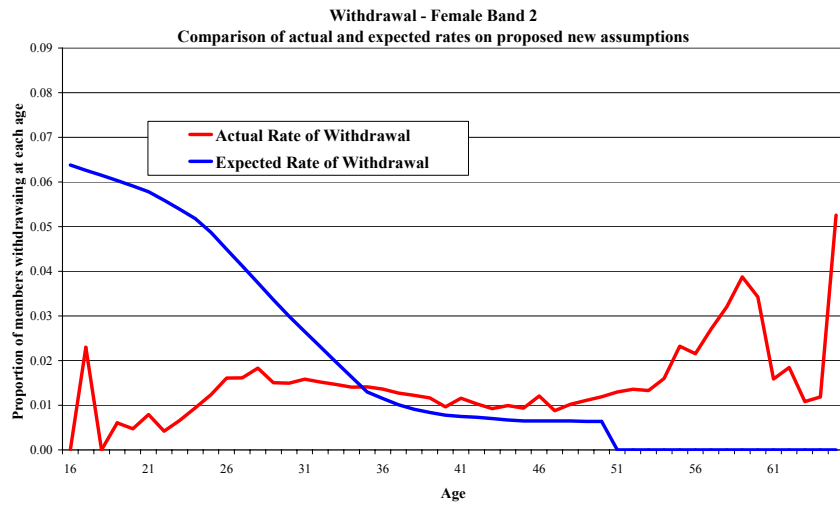
## Withdrawals: Females – Band 1



**Withdrawals:  
Females – Band 2**

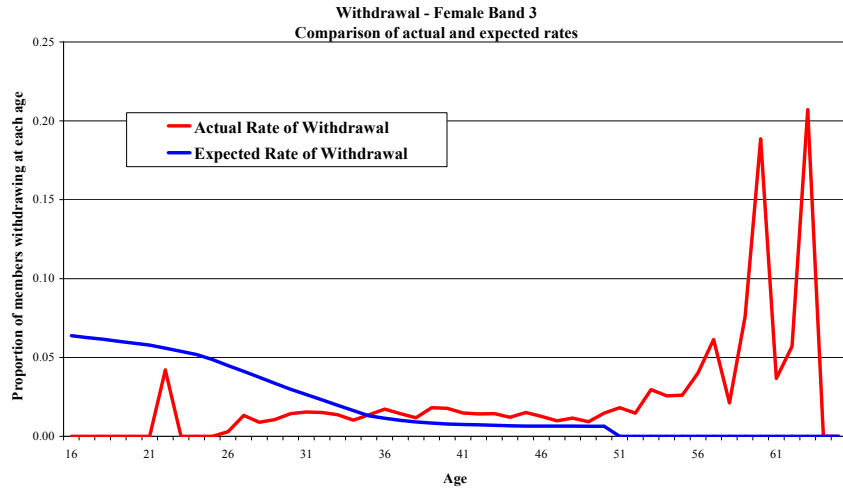


The graphs above and below show the effect of the changes described at the start of this section.

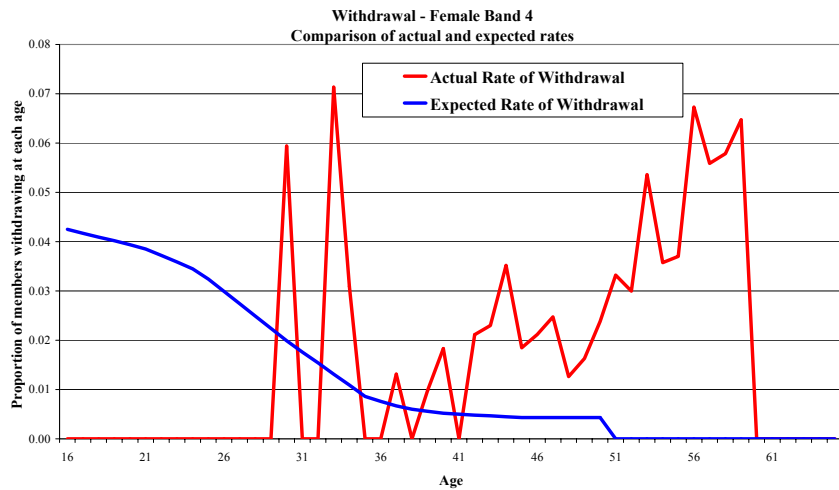




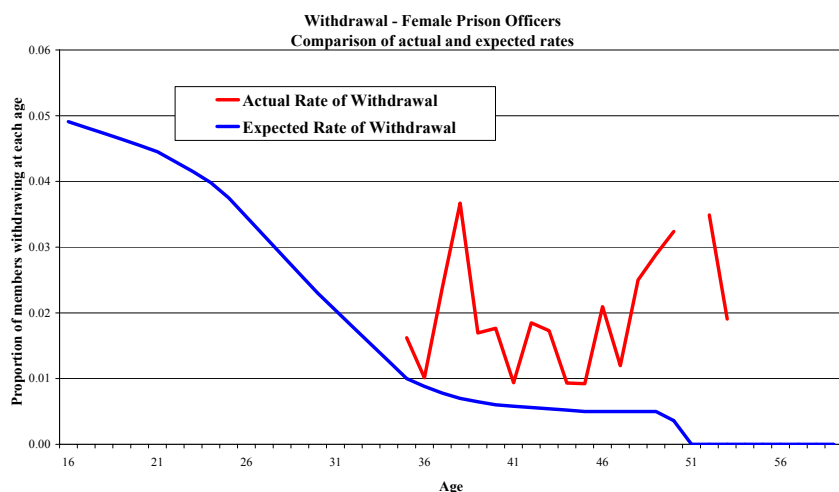
**Withdrawals:  
Females – Band 3**



**Withdrawals:  
Females – Band 4**



**Withdrawals:  
Females – Prison  
Officers**



# Results of Investigation – Promotional Salary Increases

---

## Promotional salary increases

Increases to members' pay can be classified as "general" increases (related to underlying wage inflation for all workers) and "promotional" or "experience" increases (related to individual performance).

We were supplied with details of rates of "headline" (i.e. general) pay increases over the period since the last ASLC review, and also details of further earnings growth over and above the headline rate. The further earnings growth was related to reallocation of savings on the total pay bill between other staff (e.g. when members leave). Some of this may have related to promotional increases and some to general increases.

In order to analyse the actual rate of promotional salary increases against those expected, we have proceeded as follows:

- Firstly, we have identified the members who were present throughout the period in question
- We have then attempted to "strip out" the general salary increases by removing the headline increases referred to above. Given the uncertainty over the treatment of the reallocation of the total pay bill, we have also calculated alternative figures which strip out the total earnings growth.
- The residual increases to salary after making these adjustments were then compared with the promotional salary increases expected under GAD's 1999 assumptions.

The results are set out in the graphs shown later in this section.

---

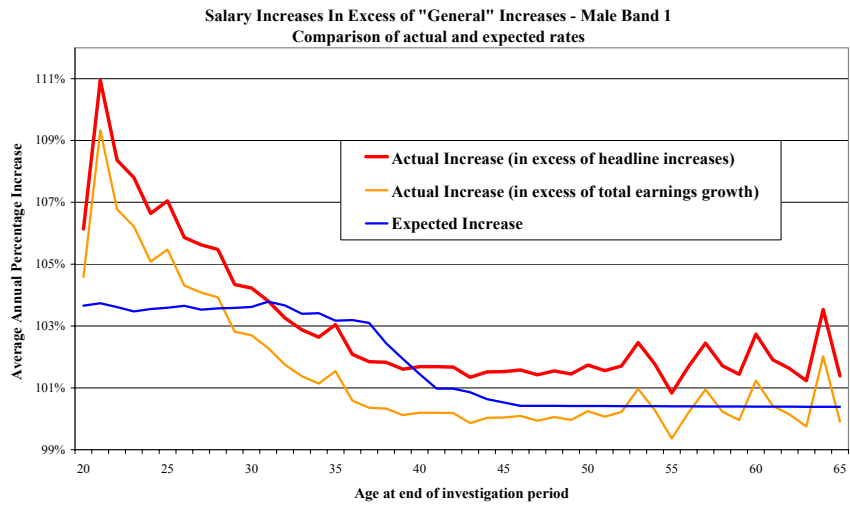
## Comments on results

As can be seen from the graphs which follow, there were some apparently large differences between actual and expected rates of promotional salary increases over the period typically at younger ages. However, the amount of data covering these younger ages is relatively limited and we believe less weight should be given to this part of the experience than to older ages, where the fit appears to be much better.

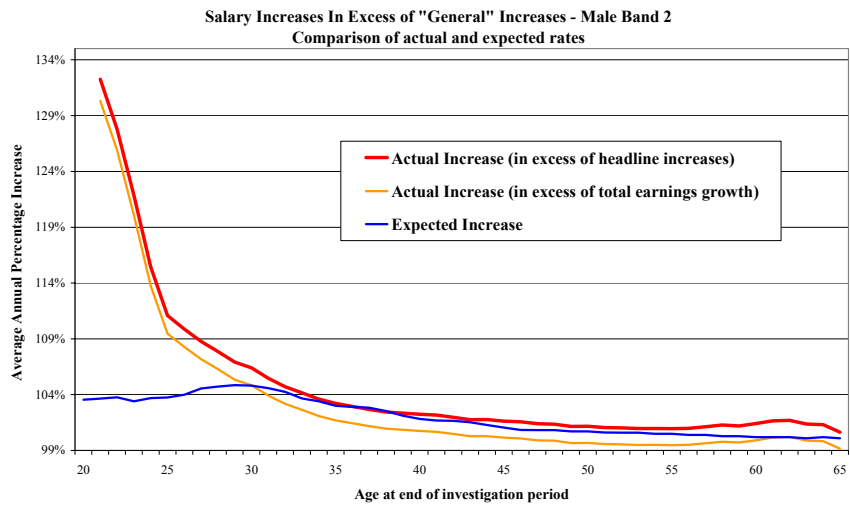
The actual experience also appears to be somewhat different to that expected for Band 4 and Prison Officers. However, as for the younger ages, the data for these categories is relatively sparse compared with the other categories.

Given the shortcomings in the available data and the lack of credibility in the areas described above, the overall pattern and shape of promotional salary increases appears to be reasonably consistent with the existing assumptions. In the absence of compelling data to the contrary, we believe that it is appropriate to retain the existing assumptions.

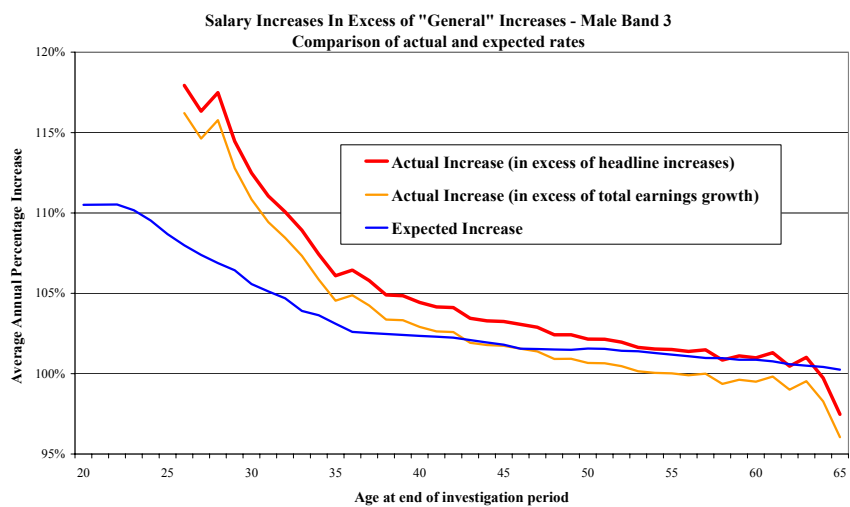
**Promotional salary increases:  
Males – Band 1**



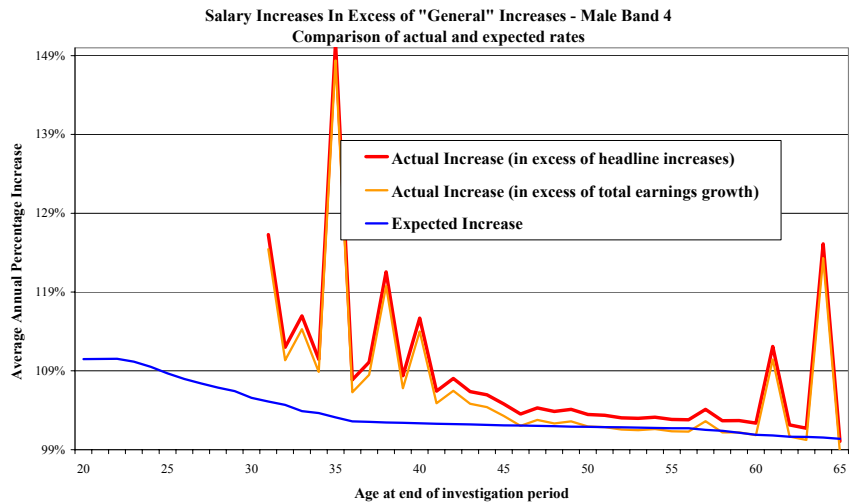
**Promotional salary increases:  
Males – Band 2**



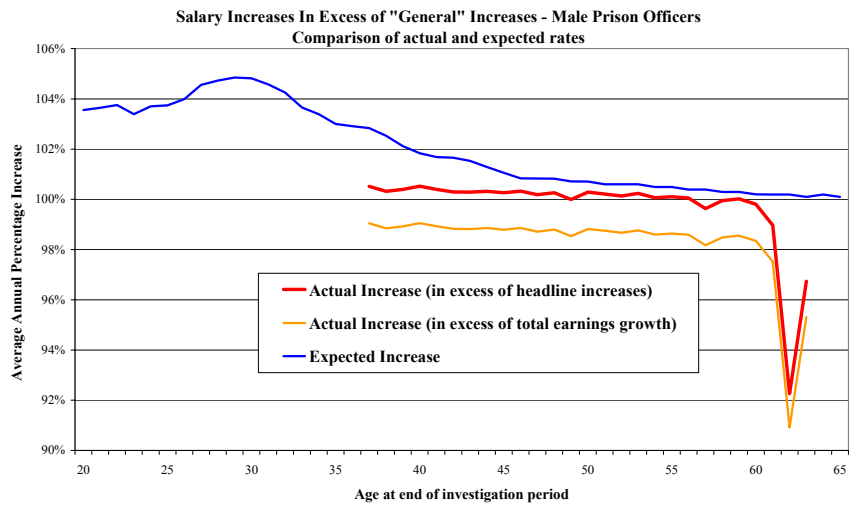
**Promotional salary increases:  
Males – Band 3**



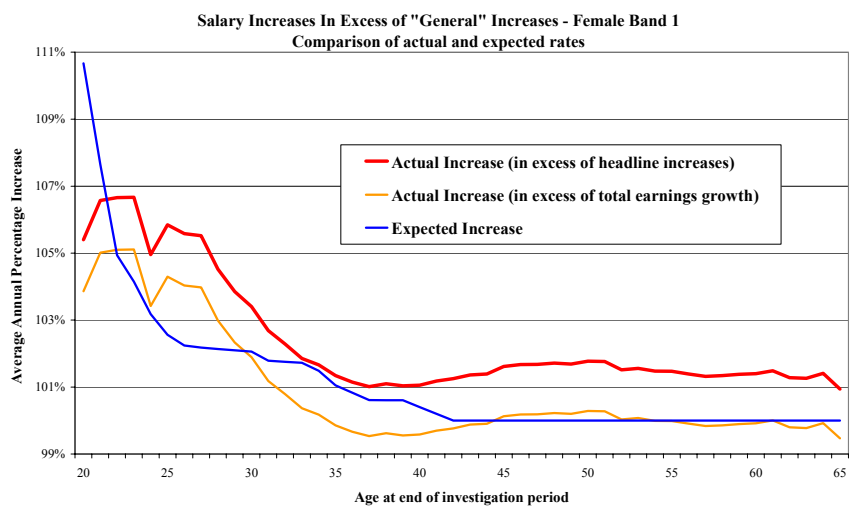
**Promotional salary increases:  
Males – Band 4**



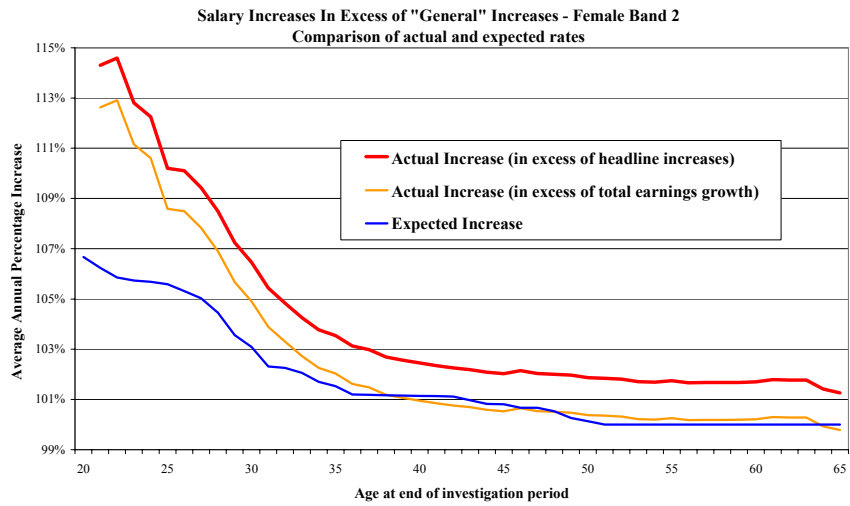
**Promotional salary increases:  
Males – Prison Officers**



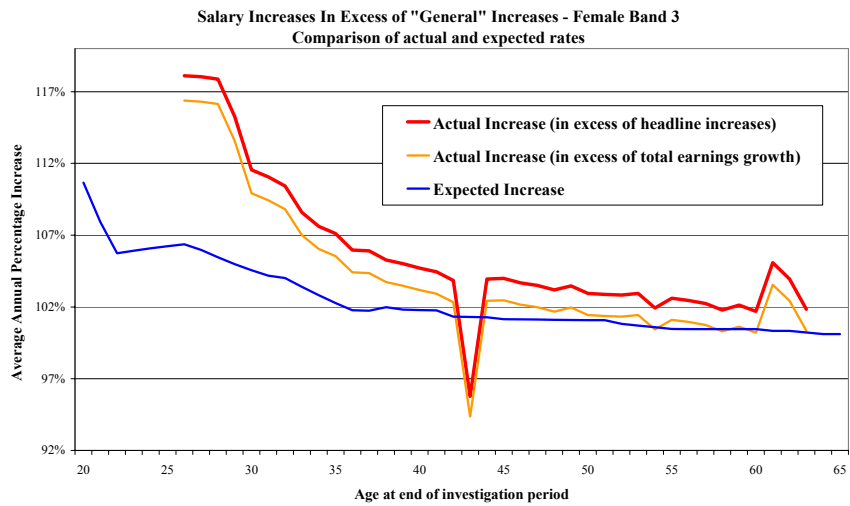
**Promotional salary increases:  
Females – Band 1**



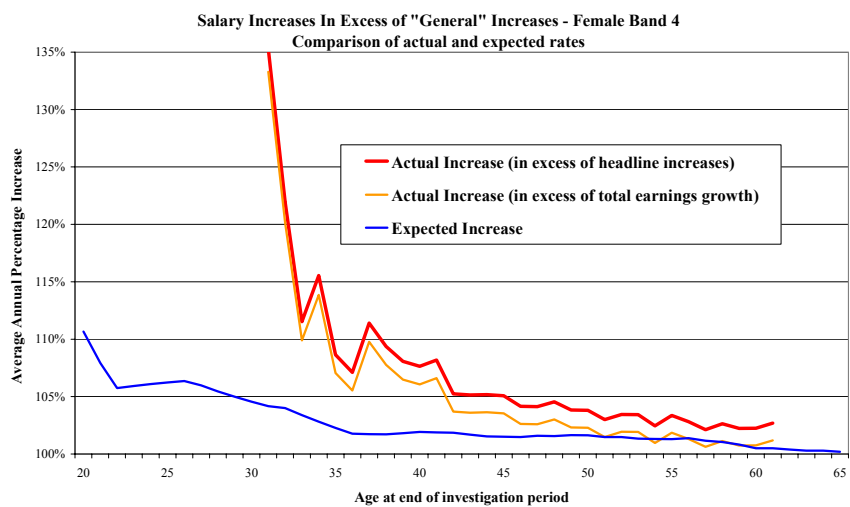
**Promotional salary increases:  
Females – Band 2**



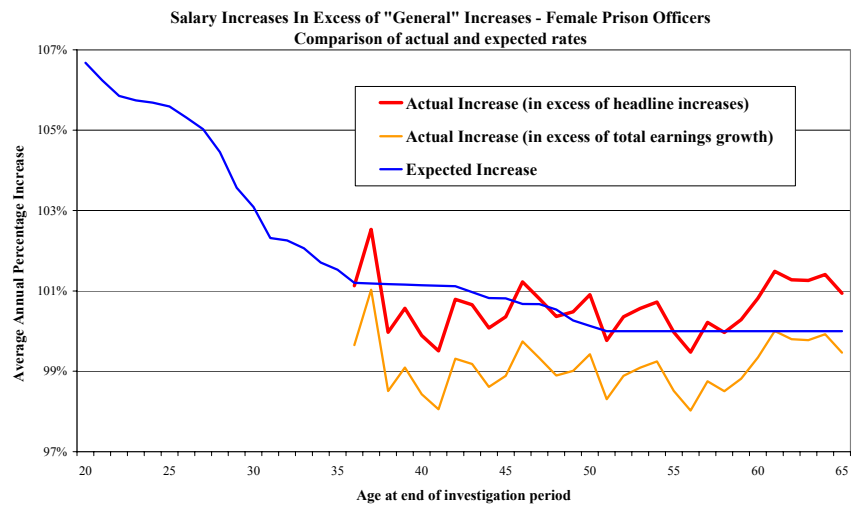
**Promotional salary increases:  
Females – Band 3**



**Promotional salary increases:  
Females – Band 4**



**Promotional salary  
increases:  
Females – Prison  
Officers**



# Results of Investigation – Marriage/Dependency Rates

---

## Introduction

The membership and experience data provided for the ASLC review did not contain detailed information about individual members' marital statuses or existence of other dependants.

We have therefore had regard to statistical information available in the public domain, as well as the relevant assumptions adopted by GAD for the 1999 ASLC review which we understand were derived from the experience of ex-civil servants, other groups of public service employees and life office pensioners.

---

## Proposed assumptions

The approach adopted by GAD in 1999 was very detailed, and included assumptions on proportions married, rates of re-marriage of spouses and age differences between member and spouse at every age.

Our preference is to adopt a simpler approach, as follows:

- A fixed age difference at all ages
- A fixed proportion married for non-pensioners before retirement (or earlier exit), but retaining variable proportions married for pensioners.
- Implicit allowance for re-marriage of spouses by making an adjustment (reduction) to the fixed proportion married assumption.

We have derived the following assumptions which we believe to be similar in overall effect to the existing assumptions:

- Husbands assumed to be 4 years older than their wives
- 65% of men and 50% of women assumed to be married at retirement

In addition, separate assumptions are required for members of the Classic Plus and Premium sections, in respect of whom death benefits may be paid to dependants other than a legal spouse and cessation of spouse's pension on remarriage does not apply.

Our proposed assumptions for these members are as follows:

- Men assumed to be 4 years older than their dependant(s) and women assumed to be 4 years younger than their dependant(s)
  - Proportion of deaths giving rise to dependants' benefits are 90% for men and 75% for women.
-