Presented to the Institute of Actuaries Students’ Society

on 2nd November 1976

PENSIONS FOR WIDOWS AND WIDOWERS

by

A. S. Kipling  MA, FFA

and

R. J. Wood  BSc, FIA
PENSIONS FOR WIDOWS AND WIDOWERS


Presented to the Institute of Actuaries Students Society
on Tuesday 2nd November 1976

1. INTRODUCTION

1.1 This paper deals with some of the principal problems associated with the provision of pensions for widows and widowers under insured schemes approved under the new code. While a life office view - not, we hasten to add, that of our own office but a notional one - is expressed we would nevertheless expect that the comments and conclusions would have a wider application. The views expressed are largely our own but we are indebted to Mr. F.R. Copping for his assistance in some areas.

1.2 Provision of widows' pensions under occupational schemes has expanded considerably in the last 15-20 years. During the boom years of the sixties the opportunity was taken to increase fringe benefits and the introduction of widows' pensions was a common feature of occupational pension scheme improvements during that period. Beyond that there were legislative obligations to provide such benefits. In order to contract out of the State Graduated Scheme established in 1961 a scheme did not require to provide other than an equivalent single life pension but the later earnings related State schemes - Crossman, Joseph and finally the Castle scheme - all required private schemes to provide widows' pensions to obtain a contracting out certificate.

1.3 Prior to September 1975 widowers' pensions could only be provided under an approved scheme if it could be shown that the husband of a female member was a dependant of that member. Since that time there has been no such restriction and the IR treat the provision of widowers' benefits in exactly the same way as widow's pensions. Some schemes have introduced the benefit although the recent economic climate has not been a favourable one for increasing fringe benefits. While there is no requirement to provide such benefits to obtain a contracting out certificate under the Castle scheme there may be a substantial increase in the number of schemes providing widowers' pensions when the economy returns to a more even keel.

1.4 It was against the background of 1.2 and 1.3 and in particular certain new problems introduced by legislation that we felt the present an appropriate time to look at the problems afresh.
2. FORM OF THE BENEFIT

2.1 A member of an occupational pension scheme who asks "Does my scheme provide widows' and widowers' benefits?", and is answered in the affirmative should not let the matter rest there. Leaving aside the probability that the scheme only provides for surrender of part of a member's own personal pension to provide such benefits there are many possible variations as can be seen from the following paragraphs.

2.2 Benefit may only be provided on death in service or on death after retirement. Not all schemes give cover during both periods.

2.3 The benefit may be dynamic, i.e. increase at a regular rate after payment commences, or it may be at a constant level.

2.4 The benefit may cease on re-marriage or be payable throughout life irrespective of marital status.

2.5 For benefits arising on death after retirement during a guaranteed period associated with payment of the member's pension provision may be made for payment of the benefit to be deferred to the end of that period as opposed to the more normal method of immediate commencement of payments.

2.6 The amount of benefit may be subject to reduction if the member's spouse is more than a given number of years younger than the member.

2.7 For death-after-retirement benefits the benefit may only be available for spouses of members at date of retirement i.e any marriages after that date by any members, whether single or married at that date, would not give rise to any benefit.

3. UNDERWRITING

Death in Service Benefits

3.1 In general the benefit is converted into an equivalent lump sum for purposes of assessing free cover. The factor used will normally be the same irrespective of age but will be calculated on a conservative basis.

3.2 Consideration has to be given to two areas of selection against the office. The first is the case where a member is very much older than his or her partner. This problem has usually been dealt with by imposing reductions as mentioned in 2.6 above. The second is the treatment of 'death-bed' marriages i.e a member in extreme ill-health may go through with a marriage which immediately qualifies the partner for a benefit. A similar situation arises where the lump sum death benefit under a scheme is a higher multiple of salary for a married than a single member.
3.3 Regarding the second problem raised in 3.2 some schemes may exclude payment of benefit where death occurs within a short period, say 6 months of marriage. The practicable expedient of only allowing entry on a particular day of the year, i.e. the scheme anniversary, more or less achieves this. This is suitable for a scheme which only covers married members and under which premiums are charged individually. For schemes which cover all members irrespective of marital status the protection to the office must take the form of excluding deaths occurring within a short period of marriage.

In order to contract out of the Castle scheme all members have to be covered for the benefit at all times and an office has to decide whether to adjust rates accordingly or investigate whether this additional risk can be met out of existing margins in the rate without reducing these to an unacceptable level.

Death after Retirement Benefits

3.4 If a scheme provides only widows' and/or widowers' pensions an untied cash option should not be allowed as there is an obvious danger of the office being left with only the ill-health pensioners on the guaranteed terms.

3.5 Where the benefits are provided in association with non-commutable pensions for members then an untied cash option can be offered provided members' pensions are at least equal to spouses' benefits and there is no question of a member's pension being bought from another source with the spouse's benefit being left with the office.

3.6 There can be problems where, as will usually be the case, members' pensions are commutable even if the level of benefits before any such commutation satisfies the condition in 3.5. Leaving aside the possibility that the rules could require commutation to be restricted so that the reduced member's pension was not less than the spouse's benefit (such a step is likely to be opposed by brokers and employers) it may be necessary either to offer no guaranteed terms in respect of spouses' benefits or to restrict these terms to the purchase of benefits up to the level of the reduced members' pensions.

3.7 Another underwriting feature already referred to is the practice of reducing the spouse's benefit where the spouse is exceptionally young.

4. PREMIUMS

4.1 The paragraphs below show formulae for without profit single and annual premium rates per unit of pension. The formulae produce net premiums which would be loaded for expenses at a level appropriate for the office concerned. A contingency margin might also be introduced depending on the degree of caution exercised in the choice of the various elements in the premium basis.

4.2 For functions involving mortality - whether that of member or spouse - the tables used would be those considered suitable for the office's group pension business portfolio as a whole. We do not think there can be serious objection to assuming that the mortality of members' spouses will be the same as that of occupational pension scheme members of the same sex.
4.3 Death in service pensions - single premiums:

Considering members aged \( x \) exact the rate for one year's cover may be represented by

\[
\sqrt[1/2]{x} \cdot h(x) \cdot q_x \cdot B(x)
\]

where \( h(x) \) is the average proportion married at death of members aged \( x \) at the beginning of the year. If the rates only applied to married members it would be usual to take a small margin by assuming \( h(x) = 1 \).

\( B(x) \) is the present value of the benefit at the date of death (assumed to be mid-way through the year on average) and is given by

\[
\frac{1}{2} \left[ \sum_{r} h_r \cdot \ddot{a}_r + \sum_{r+1} f_r \cdot \ddot{a}_r \right]
\]

where \( h_r \) is the proportion of spouses of members aged \( x \) nearest, \( r \), and \( f_r \) has a similar meaning for members aged \( x + 1 \) and summation is over all relevant values of \( r \).

The set of \( p \) values for a given age of member will be referred to hereinafter as the "\( p \) distribution" for that age.

The rate of interest assumed in evaluating the items \( \sqrt[1/2]{x} \) and \( \ddot{a}_r \) would be based on current market rates if the premium table was not guaranteed to remain in force for a period of years.

The use of \( \ddot{a}_r \) in the expression for \( B(x) \) is only appropriate if the pension is payable for the lifetime of the spouse - where the benefit ceases on remarriage lower values would apply.

4.4 The corresponding net annual premium rate, \( AP \), is given by the equation

\[
AP \cdot AN(x) \cdot D_x = \sum_{t=0}^{n-1} h(x + t) \cdot c_{x+t} \cdot B(x + t)
\]

The value of \( AP \) will depend on whether the scheme covers all members irrespective of marital status or whether only married members can enter the scheme. In the second case the rate will vary according to whether (i) only the spouse at entry is covered or (ii) the spouse at entry and any future spouses are to be covered.

\( AN(x) \) would be a temporary annuity on the life of the member to Normal Pension Age (\( x + n \)) for the all member situation or for married members case (ii). For married members case (i) it would be necessary to allow for the cessation of premiums in the event of divorce or prior death of spouse.

\( h(x + t) \) and \( B(x + t) \) have corresponding meanings to \( h(x) \) and \( B(x) \) in 4.3 and would vary according to the category covered.

4.5 Death-after-retirement Pensions:

For a member aged \( x \) exact retiring at age \( M \) the formula for the net premium, \( P \), would be

\[
P \cdot AN(x) \cdot D_x = h(M) \cdot D_M \cdot B(M)
\]
For single premium rates \( AN(x) = 1 \). For annual premium rates \( AN(x) \) would be determined according to the category of member covered on the lines described in 4.4.

\( h(M) \) is the proportion married at retirement and would also vary according to the category of member covered.

\( E(M) \) is a weighted average reversionary annuity value (deferred if necessary) on the life of the spouse. If the deferred period is nil, only the eligible spouse at retirement is to benefit, divorce is ignored and the benefit does not cease on remarriage \( B(M) \) is given by

\[
\sum_{y} x_{y} \left( \bar{a}_{y} - \bar{a}_{M,y} \right)
\]

A suitable long term rate of interest would be assumed. If the corresponding single premium rates were based on current market rates of interest it would be necessary to adjust the annual premium rates for short durations to avoid anomalies.

4.6 Where benefits are secured by a Deposit administration type policy the formula in 4.5 would not apply but if the terms on which the benefits can be purchased on retirement are guaranteed the office would still have to estimate the value of the expression \( h(M) B(M) \).

5. EVALUATION OF \( B \) and \( h \)

5.1 In this section and in sections 6 and 7 it is assumed that
(i) benefit payments do not cease on remarriage and (ii), for death after retirement benefits, only the spouse at retirement is eligible and divorce after retirement is ignored. In these circumstances the annuity values in the expression for \( B \) (immediate or reversionary as the case may be) present no problem as they depend only on mortality and interest.

Section 8 and Appendix III deal with the adjustment to \( B \) if restriction (ii) above does not apply. We have not attempted to calculate the amount by which \( B \) could be reduced if benefit payments cease on remarriage.

5.2 There are practical advantages in equating the values of \( B \) to \( \bar{a}_{y} \) for death in service rates and to \( \bar{a}_{y} - \bar{a}_{M,y} \) for death after retirement rates where \( y \) is the average age of spouse - not it may be noted the arithmetical average age but a weighted average age which is a function of the mortality and interest basis used. The difference between \( x \) and \( y \) will be referred to as the 'age disparity' of member and spouse or, more simply, the 'age gap'.

5.3 Assuming suitable \( p \) distributions and the associated proportions married were available a distinction can be drawn between

(a) single premium death in service rates for which no estimation need be involved i.e the age gap and proportion married for each age of member can be obtained directly from the statistics and the rates table only guaranteed for a short period of years or not at all, and
the other rates for which some attempt must be made to estimate age gaps and proportions married applying at future attained ages. Strictly speaking separate tables of rates are required for each generation but it would be desirable from a practical point of view if a table independent of generation could be justified.

5.4 The basic problem however is that, for the class of life with which we are concerned viz. members of insured occupational pension schemes, no published data exists in relation to age gaps and proportions married.

It is likely that the approach of most life offices to this problem has been to use proportions married and age disparities based on published statistics for these items in respect of the population as a whole. Official reports during the last 20 years involving projections of the cost of State widows' benefits have incorporated an assumption that wives are on average 3 years younger than their husbands. The consistent use of the 3 years age gap in these reports is of some importance since it implies that male $p$ distributions are expected to be relatively stable in future. However, in addition to the class of life question, the following points have to be borne in mind when considering the suitability of the official age gap assumption for life office rates purposes:-

(i) The primary purpose of the official projections is to compare the income and outgo of the National Insurance Fund as a whole. The estimates are based on assumptions as to future experience of a large number of factors (the age gap assumption being of minor financial significance compared with some others) and the assumptions are based on past experience.

A life office while basing calculations on past experience would wish to be in a position to consider the effect on age disparity and proportions married of future variations in marriage and divorce experience so as to assess the extent to which margins should be incorporated in the rates charged. Official reports provide no assistance in this area.

(ii) The first paragraph of (i) underlines the inherent cross-subsidy nature of the State Scheme. On the other hand a life office should, so far as is possible, underwrite each class of benefit on terms which are not prejudicial to the security of other classes.

(iii) If State Scheme estimates are not fulfilled contribution and benefit levels can be adjusted. A life office which under-estimates rates may rectify the situation by subsequently changing its tariff but in "perfect market" conditions any losses (actual or potential) incurred while an inadequate scale is in operation cannot be recovered. The most that can be achieved
by a change of tariff is adequate underwriting of future benefits. This stresses the need for adequate margins. Put another way the State is not concerned with maintaining bonuses or paying a dividend. For life offices surplus is highly geared i.e. an underestimate of outgo which represents a small percentage of the life Fund has a disproportionate (greater) effect on surplus.

5.5 Official reports have not included an estimated wife/husband age disparity. If $y$ is the average age of wives of husbands aged $x$ it would be incorrect to automatically conclude that $x$ was the average age of husbands of wives aged $y$; in statistical terms, where two variables $x$ and $y$ are related in such a way that the value of one corresponding to a given value of the other is expressed in terms of a probability distribution or function the two regression lines ($x$ on $y$ and $y$ in $x$) are not the same.

5.6 All the above considerations led us to the conclusion that it was desirable to construct a computer model which would

(a) produce male and female $p$ distributions on reasonable assumptions regarding future marriage and divorce experience and

(b) indicate what limiting $p$ distributions would arise if extreme assumptions were made regarding these elements.

6. THE MODEL FOR $p$ distributions

6.1 Specification

(a) For a generation of either sex the input consists of the following for all relevant ages -

(i) an independent mortality rate for that sex
(ii) " " " " " " the opposite sex
(iii) " " first marriage rate
(iv) " " divorce rate
(v) " " remarriage rate for divorcees
(vi) " " remarriage rate for widowed persons of that sex
(vii) a pm distribution - defined as the proportionate distribution by age of spouses on marriage.

(b) Dependent rates of decrement (death, first marriage, divorce, widowhood and remarriage) are calculated using the independent rates specified in (a) and starting with a suitable radix of single persons at the youngest age at which marriage can occur a 'service table' is constructed which for each attained age splits the survivors into four categories - Single, Married, Divorced and Widowed.
The marriage decrements occurring at a given attained age \( y \) for any of the unmarried categories are sub-divided into groups according to nearest age of spouse on the basis of the \( pm \) distribution appropriate to that attained age. On transfer to the Married category the \( pm \) distribution at age \( y + 1 \) is obtained by amalgamating each of these groups with the survivors to age \( y + 1 \) of the corresponding groups of married lives aged \( y \). In calculating these survivors death and divorce decrements are assumed to be dependent on attained age \( y \) only and the same rate of decrement is applied to all groups but widowhood decrements take into account the \( pm \) distribution at age \( y \).

\[(c) \] It will be noted that while there is a facility for varying the marriage rates applying to the three unmarried categories the \( pm \) distribution is only dependent on sex and age attained.

6.2 As \( pm \) distributions were only required for ages up to the normal retirement ages (65 for males and 60 for females) we assumed \( A_{49}/52 \) ultimate rated down by one year for items (i) and (ii) in paragraph 6.1(a).

For items (iii) - (vii) it was decided to base these on data published in recent Registrar General's Annual Reviews for England and Wales and the 1971 census tables for England and Wales.

The latest Review available was for 1972. The number of divorces recorded in that year was approximately double the number for 1971 which in turn was 25% higher than the number for 1970 (no doubt related to the fact that the effective date of the Divorce Reform Act 1969 was 1st January 1971). To put the matter in perspective the 'all ages' divorce rate for 1972 was less than 1% but nevertheless it was decided to base the estimated independent divorce rates on the combined data for 1970, 1971 and 1972. The Reviews tabulate rates in age groups; rates for individual ages were produced by interpolation.

A combination of the data from the 1970-1972 Reviews was also used to estimate \( pm \) distributions for each age. For ages up to 24 the distributions of spouse by age are published for individual ages. For higher ages this data is given for 5 year age groups and \( pm \) distributions for individual ages were obtained by interpolation.

Crude rates of marriage and remarriage were derived as described in Appendix III. These rates were plotted and smoothed manually - not by the mathematical process described in Appendix III.

6.3 The estimates for items (iii) - (vi) can be objected to on two grounds viz. they relate not to the insured class but the general population and they are a cross section of the rates applying to living generations and as such may be unsuitable for a given individual generation. As regards the first we have no evidence that the rates applying to the insured classes are significantly dissimilar to those applying to the population as a whole. The second objection can be met by showing that, broadly speaking,
over many years population rates of marriage and divorce have
varied very little. This answers the problem posed in
paragraph 5.3(b) - our conclusion is that a cross-generation
table can be justified.

The reasonable estimates of the input items are shown in
Appendix I for specimen ages and the resulting p distributions
and proportions married are shown in Appendix II. These
results are discussed in Section 7.

6.4 As has already been mentioned adequate margins are essential and
it was hoped that the model could be used to indicate the order
of margin necessary by varying the values of the three relevant
factors - marriage rates, divorce rates and pm distributions -
and comparing the resultant p distributions with those produced
on the 'reasonable estimate' basis. It is clear that p
distributions representing very large age gaps can be produced
if the model is regarded purely in mathematical terms but it is
equally clear that the results produced by a particular pattern
of factors should be weighted by the probability of that pattern
occurring. These probabilities cannot be calculated
mathematically and a subjective element is therefore unavoidable.
There are an infinite number of possible patterns but for
practical reasons they could be divided into a finite number of
groups or types which would be represented by an average pattern.

Large age gaps can be produced if, for example,

(i) first marriage rates are low at the younger ages and high
at later ages. Such a situation would represent a major
revolution in social habits and the present trend is in
the opposite direction - a recent Govt. Actuary's report
(Cmnd 5143 (1972)) indicates that there has been a
tendency for first marriages to occur earlier in life and
as regards estimated proportions married for males states
"These allow for increases which are expected in future
particularly at the younger ages".

(ii) divorce rates at the 'middle' ages say 30-40 are high and
remarriage rates of divorced persons are also high. There
has been a distinct trend towards higher divorce rates in
the last 10 years and while it is possible that the rates
could go much higher one has to bear in mind that, if, as
is likely, the sex ratio of live births and the pm
distributions for first marriages remain at their present
levels the pm distributions applying to marriages at ages
over 30 will not be so dispersed as those assumed in our
'reasonable estimate' basis. This is because the necessary
supply of younger lives will not be available. Divorcees
will be involved in a "change your partners" situation which
is not likely to affect the p distribution to any great
extent.

Examples (i) and (ii) illustrate the problems involved in choosing
suitable alternative patterns of factors. The results of some
alternative bases are given in Section 7.
7. MODEL RESULTS AND RECOMMENDATIONS

1. The p distributions in Appendix II have the "bell" shape so often encountered in statistics. We felt justified in assuming the distributions to be approximately Normal for the statistical tests applied in paragraph 3.

The dispersion of the distributions increases with increase in age and they also become more left-handed skew in relation to the member's attained age as that age increases i.e the "juniority" of the spouse which is defined as (member age - spouse age) increases as the member's age increases. The latter can be confirmed by examining the trend of average age of spouse shown in the extreme right hand columns. Two average ages are shown - an arithmetic mean \( \mu = \frac{\sum p_k \cdot r}{\sum p_k} \) and a weighted mean obtained by solving the equation

\[
\sum p_k \cdot r \cdot a_{x_{t+l}} = \sum p_k \cdot a_{x_{t+l}}
\]

(except that for age 65 males and 60 females the weights were reversionary annuities) where annuity values were calculated using 8½% interest and a(55) ult. mortality (true ages for males, + 1 year for females). For wives of male members the arithmetic mean is always lower than the weighted mean. This is not a general result - the relationship between these items is dependent to some extent on the actuarial basis assumed for the annuity values - and it may be noted that for husbands of female members the arithmetic mean, while lower at all other ages, is higher than the weighted mean at age 60.

For each sex the proportion married increases as the member's age increases until about middle age but decreases thereafter. At the younger ages the proportion married is about .05 higher for female members but this situation is reversed at the older ages.

2(a) Our recommendations are given below. In making these we have borne in mind the need for adequate margins and where the experience for the two sexes is sufficiently similar we have chosen a uniform basis.

As a difference in age gap of 1 year alters the rate by the order of 1% it is clear that the decision on proportion married is more important than the decision on age gap.

(b) Death in service benefits:

Proportion married: For single premium rates we would use the factors shown in Appendix II rounded up to the higher 5% i.e the proportions would be dependent on age group. For each age group the factor would be the same for both sexes, being the higher of the two, and would range from .75 to .90.

Age Gap: For both sexes the financial significance of the benefit is much greater at the older active service ages. Our recommendation is based on the data for the ages within 10 years of retirement. Rounding the juniority up this produces + 4 years for male members and - 2 years for females i.e wives of male members would be assumed to be 4 years younger and husbands of female members 2 years older than their respective spouses.

(c) Death after Retirement Benefits

Proportion Married: .85 for males and .80 for females.
Age Gap: Assume wives of male members to be 4 years younger and husbands of female members to be 1 year older than their respective spouses.

Given that there is a distribution of spouses by age and that the older spouses will die earlier than the younger the arithmetical mean juniority will increase in the period after retirement. As we based our recommendations on a weighted average age (or the arithmetic mean if this produced a higher result) we had covered this point. Investigation showed that use of an arithmetic mean only leads to significant error if the interest rate employed is low.

(d) The program was run on two alternative bases

(i) doubling the standard rates of divorce, marriage and re-marriage at ages above 25

and

(ii) assuming 100% of the population was married at age 25 and zero divorce and re-marriage thereafter.

Under (i) the proportions married were reduced slightly and the juniority increased by about \( \frac{1}{2} \) a year.

Under (ii) proportions married were increased slightly, but within our rounding margin, and the juniority was reduced by about \( \frac{1}{4} \) years.

Neither result justifies any alteration to the above recommendations.

3. An office will of course only cover a sample of the total insured scheme population and it is necessary to consider what steps to take to eliminate the adverse effects of selection and random error. We do not think that selection against the office is likely to arise in a group scheme context. As regards random fluctuations we can set our "levels of confidence" to any required degree of strictness. Let us assume that an office covers 10,000 males for widows' benefits. For the 1% of the population p distribution with the lowest ages the standard deviation of the corresponding sample proportion is approximately .001. Thus we can be 99% confident that the sample proportion will not exceed 1.26%. An excess proportion for one group of ages must be counter-balanced by a shortfall in others and if the extremely conservative assumption is made that the shortfall occurs at the highest ages we can estimate the loss in these circumstances as

\[ .0026 (LTC - AC) + .0026 (AC - HTC) = .0026 (LTC - HTC) \]

where LTC = True Cost for the Lowest Age Group, HTC = True Cost for the Highest Age Group and AC = The Average Cost.

LTC and HTC can be expressed in terms of AC and the loss can be over-estimated by maximising LTC and minimising HTC. Basing LTC on age 16 and HTC on age 85 we obtain LTC = 1.3 AC on HTC = .4 AC and the loss is .0026 x .9 x AC = .00234 AC. In view of the margins taken we can state that we are 99 + % confident that any loss will not exceed .25% of the expected cost and comparing this with the margins in the premium rates leads to the conclusion that, if adverse selection can be ignored, no further steps need to be taken to cover losses due to random fluctuations in the proportion of high juniority wives. For
the same sample size similar results apply for female members. However some offices have just begun to underwrite widowers' benefits and for these it would be appropriate to base confidence levels on a lower sample size. If this is taken to be 100 the tests described above show that we can be 99% certain that the actual cost will not exceed the estimated by more than 3%. We would not consider this risk of loss unacceptable if it was expected that the portfolio would expand in due course.

4. From paragraphs 2 and 3 it will be clear that we do not consider it essential that an office should reduce individual pensions where the juniority of the spouse is very high. Until recently most offices would have operated a system of adjustments for such cases the rationale being

(i) the proportions at the extremes of the p distribution are statistically unreliable and in addition there is a risk of adverse selection at the young end.

(ii) standard rates can apply to a middle section of the distribution incorporating an age gap adjustment derived from that section. Lives in the extremities can be underwritten separately but a margin can be taken if standard terms are extended to the older spouses end of the distribution and this step has the further advantage of increasing the number covered by standard terms.

Two common systems for widows' benefits have involved reducing benefits for wives who are 7 years or 10 years younger than the male members. Appendix III shows that these systems would cover 85% and 92% of the population.

8. DEATH AFTER RETIREMENT - PENSIONS FOR ULTIMATE BENEFICIARY

1. Up to this point we have assumed that only the spouse at retirement is eligible for benefit. Prior to the enactment of the Social Security Act 1973 few insured schemes would have been on any other basis. However that Act embodied the Joseph State Reserve Scheme proposals and had the Reserve Scheme come into being from the Appointed day (6.4.75) a contracted out occupational pension scheme would have been required inter alia to pay widows' benefits to any widow who survived a male pensioner even if the marriage took place after retirement and even if the male member had been unmarried at that date. Although the Reserve Scheme was cancelled its replacement - the Castle Scheme which is due to commence on 6.4.78 - has the same feature so that the provision of benefit to the ultimate beneficiary has continued to be of importance. We shall refer to this form of benefit as an 'ultimate' widow's pension and 'ultimate' widower's pension will have a similar meaning.

2. An examination of post-retirement proportions married for the population as a whole and those which would apply to the insured population if there was no divorce or remarriage after retirement indicated that the additional cost of providing benefits on an ultimate basis was small. In these circumstances an office need not produce a new ultimate annuity table but can express the cost as a percentage of the non-ultimate single life annuity.
As the cost for married and unmarried members may differ substantially it was desirable to estimate the costs separately.

3. To estimate costs a computer program was written which calculated the present value at retirement of providing pensions to spouses married after retirement. For males who are married at retirement future divorce and widowhood decrements were accumulated in separate Divorce and Widowhood tables which were themselves subject to marriage and death decrements. The former were accumulated in a Remarried table which was subject to decrement of divorce, widowhood and death. The latter gave rise to the liabilities to be valued and the first and second decrements were re-entered in the Divorce and Widowhood tables and so on. A similar process was carried out for unmarried males and females.

4. As for the p distribution model in Section 6 we needed to estimate suitable rates of decrement i.e. mortality, widowhood, divorce, marriage and re-marriage. Independent rates of mortality and widowhood presented no problem as there are available suitable annuitant tables for the class of life involved. Independent divorce rates were estimated as described in Section 6 and marriage and re-marriage rates as described in Appendix III.

5. The costs produced were compared with

(i) Unmarried - single life annuity guaranteed 5 years
(ii) Married - reversionary annuity payable for life

The annuities in both (i) and (ii) were payable monthly in advance and for (ii) wives of male members were assumed to be $3\frac{1}{2}$ years younger and husbands of female members $1\frac{1}{2}$ years older than their respective spouses.

The results (costs expressed as percentages of (i) or (ii) as appropriate) were as follows

(a) Unmarried Males: For retirement ages 60-70 inclusive, between 0.4% and 0.5% with lower percentages applying for ages outside that range.
(b) Married Males: For retirement ages 45-70 inclusive, between 0.75% and 0.85%.
(c) Unmarried Females: For retirement ages 45-70 inclusive, from 0.05% to 0.15%.
(d) Married Females: For retirement ages 45-65 inclusive from 0.4% to 0.70%.

The program was run on two alternative bases - one assuming nil divorce and the other assuming rates of divorce, marriage and re-marriage to be twice the standard level. The results produced were not materially different from those given above.

It would seem reasonable to use .5% for unmarried classes and 1% for the married classes bearing in mind the difficulty involved in estimating future experience in this area.
1. An outline of the State benefits is given in Appendix IV.

2. The main contracting-out requirements are: -

(i) Widows' (but not widowers') pensions must be provided on death in service, death after retirement and on death after leaving service but before retirement. In the latter two cases the benefit must be on an "ultimate" basis (see paragraphs 3 and 5).

(ii) Cover must commence immediately on a male member's marriage with limited protection in "death bed" marriage cases (see paragraph 4).

(iii) There are restrictions on the use of adjustments for excessive age disparity. These can only apply to benefit in excess of GMP if the beneficiary (who may for that part of the benefit be someone other than the widow) is more than 10 years younger than the member and the reduction in benefit cannot exceed 2½% for each year of juniority in excess of 10.

3. Widows' pensions - Amount and conditions of payment:

The requisite minimum benefit is 1/160th of the member's average annual (revalued) or final salary (in the case of death in service last salary) for each year of contracted-out service in the scheme. There is an overriding guaranteed minimum pension (GMP) which is half of any GMP of the member. The pension must be paid for any period during which the widow receives widowed mother's allowance, widow's pension or a Category B retirement pension under the State scheme. The widows' benefit must be in pension form except that, where the member dies before age 65 that part of the benefit in excess of the widows' GMP can be paid in the form of an equivalent lump sum.

While the benefit under a contracted-out scheme need not be paid while a widow's allowance is being paid, can cease when any State widow's pension or widowed mother's allowance ceases (for example, on re-marriage before age 60) and, as regards that part in excess of GMP, can cease on remarriage after age 60 it is unlikely to be practicable for an office to allow employers to take advantage of these particular aspects of the partnership.

The minimum benefit is based on accrued service and will be very small in the early years. Present voluntary pay policy apart it would be desirable, under a 'good' occupational scheme, to pay a benefit based on total potential service.

4. The only protection afforded to an office as regards 'death bed' marriages is the provision that any benefit in excess of GMP can be cancelled if the relevant marriage took place after termination of service and not more than 6 months before the member's death. There is therefore no protection at all for death in service cover, for which there is the further disadvantage that in effect offices will have to waive medical evidence up to the requisite minimum level.

The requirement for cover to commence immediately suggests that death in service benefits should be costed for all male members incorporating a suitable proportion married in the rates. For very small schemes for which it is known that either none or a small proportion of members
are married it might be more equitable to cost in respect of married members or offer only an annual premium costing basis if the former is thought to involve too much administrative work in the calculation of fractional premiums.

The provision of benefits on an ultimate basis in respect of members who die before retirement after leaving service raises costing problems. Continuing to cost these benefits by yearly single premiums is not sound and the choice lies between purchasing the benefits outright and leaving the emergent cost to be met from reserves held in the fund. In the former case, and indirectly in the latter, there are complications in that the benefit to be costed may not be constant.

10. SOCIAL SECURITY ACT 1973

With the cancellation of the State Reserve Scheme the effect of the SSA 1973 was reduced to that of requiring all schemes, whether approved or unapproved, to provide preserved "short service benefits" (SSB) for members who leave service other than on immediate pension where certain conditions, basically attainment of age 26 and completion of five years' service, are satisfied. Only post-retirement widows' and widowers' benefits need be preserved - death in service benefits are not covered by the Act. Where the long term benefit is on an ultimate basis the SSB must also be on that basis but marriages taking place after leaving service and before pension age is attained may be ignored.

The next two paragraphs discuss preservation problems in two areas ignoring the effect of contracting out of the new State Scheme. While one case deals with a widow's pension and the other a widower's pension, the problems and comments apply to both forms of benefit.

A scheme which provides members' and 50% widowers' pensions on a final salary basis (on death in service the widowers' pensions are based on last salary and total potential service) has to quote benefits in respect of a transfer value (TV) from another scheme in respect of a new married female entrant. The former scheme was non-contributory and provided only members' pensions.

If it is intended to grant fixed benefits in respect of the TV the choice is between a member's pension or a reduced member's pension together with an associated 50% post-retirement widower's pension. (The logical extension to a member's pension and associated 50% widower's pension on death in service and after retirement is ruled out because it is not permissible to offer other than retirement benefits in respect of a TV).

If the entitlement was to be expressed in the form of "added years" of credited service the only logical offer would be a member's pension plus a 50% widower's pension.

All this seems straightforward enough but what is to be done if the new member is single? and what should be done if the previous scheme was contributory and the member's contributions comprise all or a large proportion of the TV?
3. A male member leaves a contributory scheme with final salary benefits on the lines of the receiving scheme in 2. A TV is not to be paid and there is to be no return of contributions. What Paid-up benefits should be granted?

In this case as opposed to that above it is necessary to provide the member with 'value for money'.

If no SSB is required then the benefit can be the member's pension deemed to be purchased by his contributions. However, if the member joins a scheme which provides widows' pensions at the rate of 50% of members' pensions a request may be made that the paid-up benefit should be expressed in the same form - what should the reaction of the previous scheme's administrators be?

If SSB is required and the member's contributions have purchased less than the preserved member's pension there is no problem but what happens if this is not so? Is it satisfactory to preserve benefits such that the widow's pension is less than 50% of the member's pension or should the member's pension be reduced and the widow's pension increased to the point where the latter is 50% of the member's pension? For a single man would that represent value for money?

11. FUTURE TRENDS

1. The history of widows' pension provision in the UK has reflected the fact that the sole or principal wage earner in the family unit has almost invariably been the husband. That situation was due to a 'division of labour' which was practical in the circumstances of the early part of this century and earlier.

2. Over the last 50 years and in particular since the end of the Second World War the economics and structure of the family unit have altered. Major influences have included labour-saving devices in the home, smaller families resulting from wider practice of birth control and the emergence of a materialistic society. As a result of these and related changes married women have been returning to the work force after child bearing/rearing in increased numbers.

However the husband is still the principal or sole wage earner in the majority of families and this situation is likely to be maintained for some time. The effect of the Sex Discrimination Act 1975, the Employment Protection Act 1975, the Equal Opportunities Commission and any future Government action of a like nature may of course change the situation in the long term (see paragraph 4).

It may also be noted that although the changes which have taken place have reduced the need for marriage on economic grounds marriage is still a popular institution so that in looking at the next 50 years or so there is little probability that widows'/widowers' benefits will become an irrelevant concept.

3. Given the present situation and considering couples of working age, for the State to pay widows' but not widowers' benefits can be justified (a) because the proportion of families relying solely on the husband's earnings is still high and (b) even if the wife is working, the fact that the average female wage is lower than that for males (this being a result of 'role conditioning', lack of equal job opportunity,
individual choice or a combination thereof) means that payment of a State pension to the widow leads to broadly equal total incomes for widows and widowers.

However in a 'sex equality' environment it can be argued that, to avoid sex discrimination, the State should pay widowers' benefits on a wife's death - particularly in cases where the wife was the sole family earner but also in other circumstances. It is not desirable that State support for orphans should depend on which parent dies.

It would be reasonable to expect that, in view of the relatively small cost, widowers' benefits similar to existing widows' benefits will be introduced to the State scheme in the near future and what applies for that scheme may become compulsory for the private sector.

4. If the situation was reached in which there was an equal probability of the husband or wife being the sole or principal family earner there would seem to be no question that widows' and widowers' benefits would have to be provided on an equal basis under the State scheme and occupational schemes.
Appendix I
Examples of Marriage, Remarriage and Divorce Rates used
Rates per 1000 population in each marital condition

### Males

<table>
<thead>
<tr>
<th>Age Group</th>
<th>1st Marriage Bachelor</th>
<th>Remarriage Widowers</th>
<th>Remarriage Divorcees</th>
<th>1971 Registrar General Report Age Group</th>
<th>1st Marriage Widowers</th>
<th>Remarriage Divorcees</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>103</td>
<td>190</td>
<td>204</td>
<td>25-29</td>
<td>163</td>
<td>237</td>
</tr>
<tr>
<td>25</td>
<td>186</td>
<td>202</td>
<td>424</td>
<td>30-34</td>
<td>86</td>
<td>194</td>
</tr>
<tr>
<td>30</td>
<td>100</td>
<td>197</td>
<td>372</td>
<td>35-44</td>
<td>34</td>
<td>125</td>
</tr>
<tr>
<td>35</td>
<td>56</td>
<td>164</td>
<td>290</td>
<td>45-54</td>
<td>13</td>
<td>84</td>
</tr>
<tr>
<td>40</td>
<td>29</td>
<td>101</td>
<td>218</td>
<td>55 and over</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>50</td>
<td>12</td>
<td>87</td>
<td>136</td>
<td></td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>52</td>
<td>94</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Females

<table>
<thead>
<tr>
<th>Age Group</th>
<th>1st Marriage Spinsters</th>
<th>Remarriage Widowers</th>
<th>Remarriage Divorcees</th>
<th>1971 Registrar General Report Age Group</th>
<th>1st Marriage Widowers</th>
<th>Remarriage Divorcees</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>172</td>
<td>263</td>
<td>942</td>
<td>25-29</td>
<td>162</td>
<td>128</td>
</tr>
<tr>
<td>25</td>
<td>128</td>
<td>179</td>
<td>403</td>
<td>30-34</td>
<td>76</td>
<td>99</td>
</tr>
<tr>
<td>30</td>
<td>82</td>
<td>153</td>
<td>256</td>
<td>35-44</td>
<td>30</td>
<td>53</td>
</tr>
<tr>
<td>35</td>
<td>46</td>
<td>96</td>
<td>171</td>
<td>45-54</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>40</td>
<td>27</td>
<td>60</td>
<td>130</td>
<td>55 and over</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>50</td>
<td>14</td>
<td>34</td>
<td>73</td>
<td></td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>5</td>
<td>14</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Divorce Rates from Registrar General Reports
per 1000 Married population

### Males

<table>
<thead>
<tr>
<th>Year</th>
<th>Age Group</th>
<th>Under 20</th>
<th>20-24</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40-44</th>
<th>45-49</th>
<th>50-59</th>
<th>60 and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>0.1</td>
<td>4.5</td>
<td>10.7</td>
<td>9.9</td>
<td>7.6</td>
<td>5.5</td>
<td>3.8</td>
<td>2.3</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>0.1</td>
<td>5.3</td>
<td>12.4</td>
<td>11.8</td>
<td>9.1</td>
<td>6.7</td>
<td>5.2</td>
<td>3.6</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>0.2</td>
<td>8.9</td>
<td>18.1</td>
<td>17.4</td>
<td>14.0</td>
<td>11.0</td>
<td>8.8</td>
<td>6.4</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>3 Year Average</td>
<td>0.133</td>
<td>6.23</td>
<td>13.73</td>
<td>13.03</td>
<td>10.23</td>
<td>7.73</td>
<td>5.93</td>
<td>4.1</td>
<td>1.9</td>
<td></td>
</tr>
</tbody>
</table>

### Females

<table>
<thead>
<tr>
<th>Year</th>
<th>Age Group</th>
<th>Under 20</th>
<th>20-24</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40-44</th>
<th>45-49</th>
<th>50-59</th>
<th>60 and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>0.3</td>
<td>7.4</td>
<td>11.3</td>
<td>8.9</td>
<td>6.4</td>
<td>4.6</td>
<td>3.3</td>
<td>1.7</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>0.4</td>
<td>8.7</td>
<td>13.1</td>
<td>10.5</td>
<td>7.7</td>
<td>5.8</td>
<td>4.5</td>
<td>2.9</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>0.5</td>
<td>13.7</td>
<td>19.0</td>
<td>15.7</td>
<td>12.2</td>
<td>9.5</td>
<td>7.7</td>
<td>5.4</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>3 Year Average</td>
<td>0.4</td>
<td>9.93</td>
<td>14.47</td>
<td>11.7</td>
<td>8.77</td>
<td>6.63</td>
<td>5.17</td>
<td>3.33</td>
<td>1.73</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix II

**Average age of wife (husband) and weighted average ages and estimate of proportion married \( h(x) \)

- **Percentage of wives**
  - Male \( h(x) \)
    - Female \( h(x) \)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage Married</th>
<th>Average Age</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** According to number of years younger.
APPENDIX III
Estimation of Marriage and Remarriage Rates (see Sections 6 and 8)

1. First marriage rates are required for single persons and remarriage rates for the widowed and divorced. There are no published tables for members of insured schemes and the population rates given in the Registrar General's Annual Reviews are for age groups which are such that interpolation would not produce satisfactory results.

2. Information from which decrement rates were calculated came from

(i) 1971 census Population by sex, age (single years) and marital condition England and Wales
(ii) Estimated population: total, home and civilian, by sex and age group as at 30th June 1971 - Registrar General's Review for England and Wales 1971
(iii) Persons marrying in 1971, ages and conditions - Registrar General's Review for England and Wales 1971

3. The population figures from 2(ii) were in age groups and were not divided by marital status. As we required to use the population figures from this Review rather than the 1971 census the number in each age group was split into individual ages according to marital status by applying proportions calculated for the corresponding age group from 2(i). We thus obtained an Estimated population table as at 30th June 1971 subdivided by individual age and marital status.

Crude independent rates were calculated for each age and marital condition using the numbers marrying from 2(iii) and the estimated populations. These crude rates were graduated using King's Pivotal Point Formula and Bessel's Osculatory interpolation formula. This reduced our original table for ages 16 to 101 to one for ages 45 to 89, but this smaller table was sufficient for our purposes.
APPENDIX IV

State Widows' and Widowers' Pensions under the Pensions Act

Widow's Allowance (WA):

The widow's allowance is paid as a "resettlement benefit" for the first 26 weeks of widowhood. It is payable if:

(a) the widow is under age 60 when her husband dies; or
(b) the husband was not a retirement pensioner.

WA is a fixed amount - not related to earnings. There is payable in addition a widow's supplementary allowance (now known as widow's earnings-related addition). Both cease on death or remarriage and neither is payable during any period of "cohabitation".

Widowed Mother's Allowance (WMA):

A widow becomes entitled to WMA if she has any children under 19 and still living with her when the WA ceases.

If the late husband was under 65 WMA will be the Category A retirement pension he would have received had he retired at 65 on the date of his death, based on earnings and relevant years since the 6th April 1978.

If the late husband was over 65 WMA will be the Category A retirement pension he would have been receiving.

WMA ceases when the widow no longer satisfies the condition in the first paragraph, or she dies, remarries or cohabits.

Widow's Pension (WP): This is payable if

(a) the widow is 40 or over when her husband dies and she is not entitled to a WMA when the 26 weeks WA period ends, or
(b) she is 40 or over when her entitlement to WMA ends.

The rate of the widow's pension is based on her age when her husband dies, or, if she is entitled to WMA, on her age when that entitlement ends. The amount being the Category A retirement pension - calculated as for the WMA - at age 50 and over reducing by 7% for each year under 50 i.e 30% at age 40.

The pension ceases on her death, remarriage or co-habitation but in any event at age 60 when the widow's Category B retirement pension commences.

Widow's Category B retirement pension (WCB)

If the widow is over age 60 when her husband dies she can generally qualify for a WCB whether she has retired or not. This depends on whether the widow or her husband was receiving a retirement pension when he died, and on whether she has any children in her family. The pension is payable for life the amount being as for the Category A retirement pension - calculated as for the WMA.

WCB is payable

(1) if the widow was not receiving a retirement pension when widowed and either,
(a) her husband was receiving a retirement pension but she was not receiving one, because, although over 60, she had not retired, or

(b) her husband was not receiving retirement pension either because he was under 65 or because he had deferred his retirement (in which case payment will commence after the end of the 26 week WA period).

(ii) if the widow was already receiving a retirement pension when widowed. If this retirement pension was based on her husband's contributions then the amount of the pension will be the amount the husband was receiving. If the retirement pension is based on her own contributions her husband's pension would be added to her Category A retirement pension subject to an overall maximum of the maximum possible Category A retirement pension.

If the widow is under 60 when her husband dies she can, when she reaches age 60, claim her WCB if she had been receiving a WA, WMA or WP. If the WP was age reduced then the WCB would be reduced by the same amount.

**Category B retirement pension for the widower**

A man is entitled to a Category B retirement pension if his wife was entitled to a Category A retirement pension and they were both over State Pensionable Age when she died. The widower's pension would equal the Category A retirement pension. The widower's pension would be limited so that together with the husband's own Category A retirement pension they do not exceed the maximum Category A retirement pension.

This pension is payable for life.