

# Continuous Mortality Investigation Reports

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THE EXECUTIVE COMMITTEE OF THE  
CONTINUOUS MORTALITY INVESTIGATION  
BUREAU

as on June 15th 1973

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## INTRODUCTION

THE Councils of the Institute and Faculty have pleasure in presenting in this new format the consolidated reports prepared under the direction of the Joint Continuous Mortality Investigation Committee for the four years 1967-70.

In the past, sectional reports were published as and when they became available both in the *Journal* and the *Transactions*. The two Councils recognized that not only was such duplication unnecessary but also that this arrangement was inconvenient for reference purposes. They readily agreed to the Committee's proposals which have resulted in this, the first of a series of reports on the mortality and morbidity experience of assurance companies in the United Kingdom and Ireland.

We take this opportunity of thanking not only the contributing offices for their continuing support, but also all those actuaries and others who have in any way assisted in the work of the Committee.

Geoffrey Heywood  
President  
The Institute of Actuaries

J. G. Wallace  
President  
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## HISTORY AND DEVELOPMENT

THE first standard table prepared in Great Britain based upon an assured lives experience was the *Seventeen Offices' Table*, which was published in 1843 and based on the combined experience of the group of offices up to 1837. Further standard tables were prepared in the nineteenth century, and an investigation into the mortality of immediate annuitants was made over the period 1900–20, but during the whole of this time the work was in the hands of *ad hoc* Committees. A file of papers left by the late Colonel H. J. P. Oakley, now in the Institute Library, indicates that separate investigations were placed in the hands of different Committees, which disbanded as each experience was concluded, and the 1900–20 annuity experience appears to have been in the hands of the last of these Committees.

The establishment of what was referred to in the Minutes of the Councils of the Institute and Faculty as a Permanent Research Bureau was first considered long before the Bureau was in fact set up, and the Life Offices were circularized in February 1913. The draft of a further letter was approved by the Institute Council in January 1914, and indicated that most of the offices had expressed their approval in principle to the proposal. The distribution of the letter was, however, deferred until the Faculty had decided upon the draft to be sent to the Scottish offices, and the First World War had broken out before the details were concluded. It seems that the matter was left in abeyance until, in 1923, a new investigation into the mortality of assured lives was referred to the *ad hoc* Committee dealing with annuity investigation. The continuous collection of data started from the beginning of 1924 and this can be taken as the time when the evolution of the Bureau resulted in its emergence in its present form.

The first Chairman of the Committee was Mr W. P. (later Sir William) Elderton.

The Joint Committee in its present form was not set up until some years later. In 1931 the two Councils accepted in principle that a working Committee be set up consisting of three representatives of the Institute and three of the Faculty with the two Presidents as members *ex officio*.

No formal minutes were retained of the Committee's transactions up to the end of the Second World War, although its work had been summarized in a note prepared by F. L. Bradshaw in 1949. The last meeting of the Committee at which Sir William Elderton took the chair was held on 14 June 1946, and the next meeting does not appear to have been held until 22 April 1949, with Mr R. Ll. Gwilt in the chair, and at which reference was made to 'the newly constituted Committee'. Mr Gwilt, although a Fellow of both the Institute and the Faculty, was on the Committee as a Faculty representative, and he remained

Chairman until the middle of 1961 when he was succeeded by Mr F. M. Redington.

The unwritten law under which Institute and Faculty representatives alternate in filling the office of Chairman was continued in 1968 when Mr J. M. Denholm succeeded Mr. Redington.

The first appointment of a Secretary to the Committee was that of Mr R. D. Clarke with effect from 1 July 1950, a position he held until 30 September 1972, when he was succeeded by Mr H. A. R. Barnett.

When the collection of data started on a continuous basis in 1924 the offices submitted statistics for three main investigations, viz. Assured Lives, Children's Deferred Assurances, and Immediate Annuities.

Statistics are submitted in a form suitable for the use of the 'Census Method', that is to say the offices submit particulars of policies in force on 1 January each year (a different date can be substituted if more convenient to the office) and of policies becoming claims by death notified in the year. Statistics are usually submitted according to age nearest birthday, but for some offices a different age classification is more convenient, and in these cases the Bureau makes appropriate adjustments to the figures to approximate to an age nearest birthday classification. There are also subdivisions according to curtate duration of policy, durations 0 to 4 inclusive each being shown separately, durations 5 and over being combined. Data are received from about sixty offices. Female lives are generally excluded, but initially offices were permitted to include them if exclusion was difficult and if they were only a small proportion of the total, and a few offices still include a few females in their data. The proportion is believed to be well under 1%.

Mention has been made of 'policies' and this word was used deliberately. The investigations have generally been on the basis of policies rather than of lives, although in the assured lives' experience 'concurrent duplicates' have been excluded, so that a batch of policies effected at the same time on the same life would only be counted as one. Where possible all duplicates in the assured lives over age 80 have also been excluded.

The effect of duplicate policies was investigated by the Committee who invited the contributing offices to analyse the death claims in 1954 showing the numbers of lives at each age having 1, 2, 3. . . policies. The returns were of duplicates within offices, no attempt being made to trace duplicates on the same life in several offices. The purpose of this investigation was to ascertain whether it would be possible to improve the estimates of the standard deviations needed to test the differences between actual and expected deaths; it was based on statistics for durations 3 and over.

The assured lives' experience was originally sub-divided into eight sections according to whether the policies were whole life or endowment assurance, whether they were with or without profits, and whether they were effected with, or without medical examination. (Policies on lives effected at higher than normal rates were excluded.) However, when standard tables were prepared, based

on the experiences of 1924–29 and 1949–52, it was found that the Whole Life section was insufficient to give reliable results at young ages and the Endowment Assurance section was insufficient at the older ages. Furthermore, the Non-Profit Whole Life section was insufficient at the older ages. Variations between individual offices were found to be more significant than variations between the different types of policy and consequently the A1924–29 and A1949–52 tables were constructed from the whole of the data. After the publication of the A1924–29 table, the experience was subdivided into offices exhibiting the lightest and heaviest mortality and ‘Light’ and ‘Heavy’ tables were constructed from the data of a selection of these offices. ‘Light’ and ‘Heavy’ tables were not prepared from the 1949–52 experience.

Despite the knowledge that variations between types of policy were of little significance, the subdivision of the data in this way continued up to and including 1958, after which the only division (apart from age and duration) has been between medical business and business accepted without medical examination.

For convenience, the 1924–29 tables were based on a three-year select period even though data had been collected on a five-year select basis. Similarly, the 1949–52 tables were based on a two-year select period. Details of the graduation methods employed are described fully in the official publications.

Apart from the standard tables, periodical reports have appeared in the *Journal of the Institute* and in the *Transactions of the Faculty*. From 1948 these included comparisons of trends with those of the national mortality—originally as separate reports but now incorporated with the main reports on assured lives.

Although comparisons with national mortality can show overall differences, they cannot analyse these differences in detail, and accordingly from 1964 a subsidiary investigation of the main assured lives’ data has been undertaken according to cause of death. A first report was published in the *Journals* based on years 1964–66.

From 1924 there was a separate investigation into mortality under Children’s Deferred Assurances. A report was made on the experience of the years 1924–36 inclusive. After the First World War interest in the experience under this class of policy declined and the investigation closed with the year 1960, a final note being prepared for the *Journals*.

The other investigation which has been continuing ever since the Bureau was set up is that on immediate annuitants. Data for males and females are kept separate and there has generally been a five-year select period; however, periodical scrutiny of the results in the preparation of reports indicated that from 1957 onwards there appeared to be some change in the class of lives effecting immediate annuities, possibly arising from the effects of the 1956 Finance Act, and accordingly, from 1963 onwards, the select period was extended by one year every year up to and including 1968. The select period has now reverted to five years, but pre-1957 business is kept separate from post-1956.

From 1960 the offices have been asked (in the case of their immediate annuity returns only) to submit lists of deaths notified in the first half of a year which took place in the previous year. This enables the 'in force' figures to be adjusted, and cuts down systematic distortion which can otherwise be quite serious at the advanced ages which figure prominently in this class of business.

A standard table was prepared on the basis of the 1947-48 experience, projected to give rates which might be expected to apply to lives purchasing annuities in 1955. A 'forecast' generation table was also prepared on a projection based on expected improvements in mortality which, in the event, have not materialized.

In 1948 an investigation was started into the experience of annuities payable for a term certain and for life thereafter. This was concluded in 1957.

Also in 1948, collection of data was started for pensioners under life office pension schemes. Originally this investigation was based on lives, but since 1958 particulars based on amounts have also been submitted, and these two sets of data are still being collected. Also, since 1965, separate data have been submitted by five offices based on 'Works' pension schemes, these being also included in the main pensioners' data.

Retirement annuities effected under the 1956 Finance Act have been the subject of an *ab initio* investigation, and will therefore form the basis of the only investigation into which all possible data will have been collected, apart from the fact that there are some offices who write this business but do not submit data.

A special investigation based on seven offices and three years only (1958-60) was undertaken into mortality under group life assurance schemes. This was carried out on a 'policy year' basis, and the results were presented according to both lives and amounts. The returns of policies in force were by age nearest birthday on the scheme anniversary which occurred in the calendar year for which the return was being made. Deaths and withdrawals were tabulated by age nearest birthday on the scheme anniversary prior to death or withdrawal no matter what calendar year the exit took place in. New entrants and increments, where they took place at dates other than the scheme anniversary, were tabulated by age nearest birthday on the scheme anniversary prior to entry.

In 1968 it was decided to investigate the mortality of lives assured under policies written in the Republic of Ireland; twelve offices are contributing data, the first returns being for the year 1970.

Current investigations include one into the mortality under certain temporary assurances, which was started in 1970, and one into the mortality of female assured lives, starting with the year 1973.

A sub-committee has been set up to plan and conduct an investigation into sickness rates under permanent health insurance policies.

Generally it may be stated that wherever appropriate the statistics for medically examined lives are kept separate from those relating to non-medical data.

It should be mentioned that strict anonymity of offices is preserved in all

data and statistics. Each contributing office is allocated a number, and the name of the office does not appear on any data sheets.

Appended to this note are (1) a copy of the Constitution and Rules of the Bureau; (2) a copy of the Consolidated Rules issued to the contributing offices as a guide to the preparation of data, incorporating all amendments to date but not including the recent instructions concerning the permanent health insurance investigation; and (3) a bibliography of all publications and papers prepared by, or under the auspices of the Committee or any of the earlier *ad hoc* Committees.

## APPENDIX I

### CONSTITUTION AND RULES OF THE CONTINUOUS MORTALITY INVESTIGATION BUREAU

1. The Bureau shall be called 'THE CONTINUOUS MORTALITY INVESTIGATION BUREAU' and is herein referred to as 'the Bureau'.

2. The objects of the Bureau shall be:

- (a) To collect statistics relating to the mortality of various classes of insured lives, annuitants and pensioners.
- (b) To analyse such statistics and prepare reports for publication.
- (c) To construct tables of mortality and morbidity functions and of actuarial functions dependent thereon to be published primarily for use by assurance companies.
- (d) To make estimates of future developments in mortality and morbidity rates and to carry out other statistical investigations such as may be useful to the conduct of long-term assurance, annuity and pension business and of sickness insurance.

3. The organization and administration of the Bureau shall be in the hands of an Executive Committee consisting of not less than 6 or more than 10 members of whom not less than 3 or more than 5 shall be appointed by the Council of the Institute of Actuaries and not less than 3 or more than 5 shall be appointed by the Council of the Faculty of Actuaries in Scotland. The said Institute of Actuaries is hereinafter referred to as 'the Institute' and the said Faculty of Actuaries in Scotland is hereinafter referred to as 'the Faculty'.

4. The Chairman of the Executive Committee shall be appointed from the members of the Executive Committee by agreement between the Councils of the Institute and the Faculty.

5. The Executive Committee shall appoint a Secretary of the Bureau on such terms as to service and remuneration as it shall think fit but such appointment shall be subject to the prior approval in writing of the Councils of the Institute and the Faculty.

6. The Treasurer for the time being of the Institute shall be the Treasurer of the Bureau and all property of the Bureau shall be vested in the Institute on

behalf of the Bureau. The financial year of the Bureau shall run from 1 April to 31 March and once in every year the audited accounts of the Bureau shall be presented to the Councils of the Institute and Faculty.

7. A member of the Executive Committee shall hold office either until he is requested by the Institute or the Faculty responsible for his appointment to resign or until he shall tender his resignation in writing to the Institute or Faculty responsible for his appointment.

8. The Executive Committee may within its absolute discretion set up sub-committees and may appoint persons to serve on such sub-committees who are not members of the Executive Committee; provided always that responsibility for the conduct of all the activities of the Bureau shall remain with the Executive Committee.

9. The Councils of the Institute and Faculty shall be entitled to invite subscriptions from persons or Corporations making use of the facilities afforded by the Bureau of such amounts and calculated in such a manner as the Executive Committee of the Bureau may in its absolute discretion recommend.

10. The Executive Committee shall have power to apply the funds of the Bureau in promoting, furthering or protecting the objects for which the Bureau has been established and without prejudice to the generality of the foregoing:

- (a) In acquiring whether by letting or otherwise premises for use as offices or otherwise for the use of members of the Executive Committee or for any purposes of the Bureau.
- (b) In maintaining an official library.
- (c) In paying remuneration to officers and servants of the Bureau or pensions or gratuities to former officers and servants or to their dependants or in making other provision for the payment of pensions or gratuities to former officers and servants or their dependants provided that rates of remuneration, pension or gratuity shall be subject to the approval in writing of the Councils of the Institute and Faculty.
- (d) In paying such reasonable sums for the expenses of officers of the Bureau or members of the Executive Committee as may from time to time be thought desirable or for the expenses reasonably incurred by any persons who may have rendered special services to the Bureau and for meeting all other expenses incurred in the running of the Bureau.
- (e) In making grants to research establishments or other organizations where the Executive Committee is of the opinion that such grants will promote or further the objects for which the Bureau has been established.
- (f) In obtaining or distributing or causing to be published or distributed any book, pamphlet or journal relating to the affairs of the Bureau or promoting or furthering the usefulness or efficiency of the Bureau.

11. No person or corporation making use of the facilities afforded by the Bureau shall be entitled to any direct or indirect payment or transfer of all

or any part of the income or property of the Bureau whether by way of dividend, gift, division, bonus or otherwise howsoever by way of profit.

12. The Executive Committee may at any time with the prior approval in writing of the Councils of the Institute and of the Faculty rescind, vary, amend or add to any of these Rules.

*28th July 1970*

## APPENDIX 2

### **CONSOLIDATED RULES OF THE CONTINUOUS MORTALITY INVESTIGATION BUREAU (AS ISSUED TO THE CONTRIBUTING OFFICES, BUT INCLUDING CHANGES IN PROCEDURE UP TO OCTOBER 1973)**

#### **INTRODUCTION**

During the fifty years' existence of the Continuous Mortality Investigation Bureau many circulars have been issued setting forth rules to be followed by the contributing offices when compiling their returns of data for the various investigations. It has been suggested that a consolidated set of rules would be helpful to the offices and the present memorandum has accordingly been prepared. It is divided into sections corresponding to the various investigations at present being undertaken by the Bureau. These are as follows:

- (1) Assured lives.
- (2) Immediate annuitants.
- (3) Lives covered by retirement annuity contracts.
- (4) Pensioners under life office pension schemes (including subsidiary investigation into 'works' schemes).
- (5) Causes of death among assured lives.

#### **ASSURED LIVES**

The assured lives investigation was originally restricted to policies on male lives issued in the United Kingdom at standard rates of premium without surcharge. It is divided into two sections, *viz.* Medical and Non-Medical. The Medical section relates to lives which have been medically examined at entry and the Non-Medical section relates to lives accepted under a standard type of Non-Medical proposal form.

A separate investigation started in 1970 on policies issued on male lives in the Republic of Ireland, another started in 1973 on policies issued on female lives in the U.K. Both these are on similar lines to the male U.K. investigation.

The investigation is carried out in select form, the period of selection being five years. The census method is employed and offices are asked to submit

annually returns of the 'in force' on 1 January and of the deaths during the preceding year.

Various classes of policy are excluded from the investigation and these are listed below. An essential principle to be borne in mind is consistency. The obvious application of this principle lies in the exact matching of the 'in force' data with the deaths. No policy should be included in the return of deaths unless at the time of death it would have qualified for inclusion in the 'in force'. Equally, no policy becoming a death claim should be omitted from the deaths if at the time of death it was qualified for inclusion in the 'in force'—unless it should belong to one of the excluded categories of death claim noted hereunder.

As the census method is employed in the investigation it can happen that a policy appearing as a death claim has never been included as 'in force'. Thus if the policy is effected in April and becomes a death claim in the following August, it should (if it is not disqualified by falling into one of the excepted classes) be included in the return of deaths at duration 0 even though it will never appear in the 'in force'.

Printed forms are supplied to the offices for making the annual returns and there are separate forms for Medical and Non-Medical business. Individual columns are provided on the forms for durations 0 to 4 and there is a final column for durations '5 and over'. For the 'in force' the duration at 1 January of year  $N$  is given by:

$$\text{Duration} = N - 1 - \text{year of issue}$$

The ages at which the policies in force are tabulated are intended to be the nearest ages on 1 January. However, various approximations are used in practice. A common approximation is:

$$\text{Nearest age on 1 January} = \text{Age next birthday at entry plus curtate duration.}$$

The form of approximation employed by a particular office will obviously depend on its internal system of records.

Deaths are recorded according to nearest age and curtate duration of death. While, as with the 'in force', some method of approximation may be employed in arriving at the nearest age at death, the method of determining the duration should be exact. For purposes of calculating both age and duration at death it is permissible to regard the date of notification of death as the actual date of death.

There are certain categories of death claim which should be excluded from the return of deaths. These are:

1. Deaths from suicide when the sum assured is not paid.
2. Deaths from any cause excluded from cover by the terms of the policy, where the sum assured is not paid.
3. Death claims repudiated by reason of non-disclosure of essential information on the proposal form.

4. Deaths occurring after the policy has been removed from the 'in force' register as a lapse—whether a claim payment is made or not.

The various classes of policy to be excluded from the investigation are listed below. In applying the rules it is intended that offices should be guided by commonsense. For example, it is hoped that an office which transacts a substantial amount of overseas business will adhere to the rule excluding all policies issued outside the U.K. But an office which issues only an occasional policy outside the U.K. may find that the exclusion of these policies creates a major inconvenience. Consequently the office may decide to include its small number of overseas policies, knowing that the effect on the combined experience of all offices will be negligible. As emphasized earlier, however, it is essential that in the preparation of data the principle of consistency should be observed at all stages.

The classes of policy which are excluded from the assured lives' investigation are as follows:

1. Policies on female lives (apart from those offices making separate returns for the female investigation.)
2. Policies on which any form of surcharge has been imposed, whether by way of extra premium, rating-up in age, or deduction from the sum assured.
3. Policies issued outside the U.K. (apart from those offices making separate returns for the Republic of Ireland.)
4. Policies issued under schemes granting cover with minimum evidence of health. (Note: Since 1964, policies issued under the Federated Superannuation Scheme for Universities fall into this category and are therefore excluded.)
5. Policies issued without medical examination in conjunction with an immediate annuity.
6. Temporary assurances (including convertible term assurances and income benefit policies *where there is no basic lump sum benefit*) (but see next section.)
7. Pure endowments.
8. Deferred assurances.
9. Joint life policies of all kinds.
10. Contingent assurances.
11. Double endowments.
12. Increment policies under staff superannuation schemes. (Note: many such policies will already be excluded under item 4. For the rest, only the initial policy should be included and all subsequent policies should be excluded.)
13. Reassurances received from other offices.
14. Policies under which the office is no longer in regular contact with the life assured. These, in general, will be non-participating policies under

- which premiums have ceased to be payable and may include policies which are maintained in force for a prolonged period under non-forfeiture regulations.
15. Simultaneous duplicates, *i.e.* where more than one policy is issued on one life at the same time, only one policy should be included in the investigations.\*
  16. Duplicate policies on lives aged 80 and over. This means, in effect, examining the records for policy holders attaining age 80 in a given year and excluding all policies in excess of one for each policy holder.
  17. Unit-linked policies.

#### TEMPORARY ASSURANCES

A new investigation started in 1970 into the mortality experienced under the following classes of temporary assurance:

1. Level temporary assurances for terms of not less than one year, including convertible term assurances.
2. Decreasing temporary assurances under which there is no terminal endowment benefit and no permanent life assurance.

Within each of the two classes defined above the investigation is subdivided into Medical and Non-Medical sections, in select form with a five year period of selection. In general, the rules applicable to the main investigation for Assured Lives also apply to the Temporary Assurance investigation. If an assurance is extended, it may be removed from the investigation at the end of the original term or may remain for the extended term, whichever the office finds more convenient but the duration must continue to be measured from the original date of entry.

#### IMMEDIATE ANNUITANTS

The immediate annuitants' investigation embraces both male and female lives in receipt of purchased single-life immediate annuities. The following classes are excluded from the investigation:

1. All joint life annuities of whatever types.
2. Annuities guaranteed for a term certain and for life thereafter.
3. Annuities under which there is a return of part of the purchase money on death.

\*Note: This rule has been relaxed in recent years in response to representations from a number of offices. It is now permissible to include simultaneous duplicates, but it is hoped that where an office avails itself of this relaxation it will take special steps to eliminate simultaneous duplicates in all cases where five or more policies are issued on one life at the same time.

4. Annuities purchased in connection with pension schemes.
5. Annuities issued in conjunction with life assurance (usually to elderly lives in connection with Estate Duty avoidance).
6. Annuities issued on special terms on account of health impairment.
7. Annuities which were originally issued as deferred annuities.
8. Annuities secured out of the proceeds of an endowment assurance without the option to take cash.
9. Temporary annuities.

Separate returns are required for male and female annuitants. The investigation is carried out in select form and (subject to the qualification noted hereunder) the select period is five years. The contracts in force on 1 January are tabulated according to nearest age and curtate duration on that date; and the deaths are tabulated according to nearest age and curtate duration at the date of death. (Note: The actual date of death must be employed for calculating age and duration and not the date of notification.)

Data for annuities which entered the experience before 1957 are now kept separate from those which entered after 1956; the pre-1957 data are required in aggregate form.

When deaths are notified too late for inclusion in the return of data for the year in which they occurred, they must be included in the data for the year in which they were notified, but at the age and duration appropriate to the correct year of death. Every year, as soon as possible after 30 June, offices are asked to send a supplementary return (for which a printed form is provided) of annuity deaths occurring in the preceding year but notified too late for inclusion in that year's returns. This is to enable the Bureau to add these deaths into the correct year's data and to adjust the 'in force'. The same 'late-notified' deaths will be included by the offices in their standard returns for the year following the year of death and the Bureau will be responsible for subtracting them.

When notification of death is delayed longer than 30 June following the year of death, no adjustment will be made but offices are asked to send a note of such cases to the Bureau.

#### RETIREMENT ANNUITIES

Since 1958 an investigation has been conducted into the mortality experienced by lives holding retirement annuities, *i.e.* contracts providing pensions for the self-employed under the terms of the 1956 Finance Act. There are eight sections of the investigation, the sub-divisions being:

- male or female
- medical or non-medical
- during deferment or after retirement.

The investigation is conducted on an aggregate basis, so that there is no sub-division by duration. The census method is employed and policies in force

are scheduled according to nearest ages on 1 January and deaths according to nearest ages at death.

This investigation is based on 'lives' as opposed to 'policies'. Consequently all duplicate policies within the same office must be excluded. (Note: it is recognized that, since a life may effect policies with two or more offices, it is impracticable to exclude duplicates completely and such a life will accordingly be enumerated separately by each office with which a contract is effected.)

Retirement annuities payable for term certain and for life thereafter should be included in the investigation. Retirement annuities with a reversionary benefit to widow should be included only in respect of the principal life. Wives and widows of the holders of retirement annuities should not be included in the experience.

If, during the period of deferment, the holder of a retirement annuity leaves the U.K. to reside overseas, the annuity should be removed from the investigation as there is a danger of loss of contact with the annuitant.

#### PENSIONERS

An investigation is carried out into the mortality after retirement of pensioners under life office pension schemes. This is divided into 'early retirements' (*i.e.* retirements taking place before the normal retirement date) and 'normal and late retirements'. Male and female lives are investigated separately.

Schemes qualify for inclusion in the data if they are written under a group contract providing deferred annuities for employees. It is recognized that there is a wide variety of such schemes and precise rules have deliberately not been laid down to define which schemes do or do not qualify for inclusion. The fact that pensions may be guaranteed for a certain number of years is no bar to inclusion and joint pensions are included until the death of the pensioner life.

It is not always possible in this investigation to exclude duplicates. Not only may one person be a member of several schemes (whether with the same life office or different life offices), but even within one scheme he may draw several slices of pension (*e.g.* one for past service as at date of entry into the scheme, another in respect of his own contributions and yet another in respect of supplementary contributions). As pension business is usually administered in bulk, the sorting out and elimination of duplicates is sometimes impracticable.

The investigation is conducted on an aggregate basis, so that there is no analysis by duration. The census method is employed, the 'in force' being scheduled according to nearest age (or some approximation thereto) on 1 January and the deaths according to nearest age at death.

A special feature of this investigation is that the experience is examined not only according to the number of 'lives' (strictly speaking, the number of individual slices of pension), but also according to 'amounts'. For this reason, the total amount of pension per annum must be entered at each age on the returns for both 'in force' and deaths.

A few offices are making separate returns in respect of pensioners under schemes covering 'works' personnel only. The same principles apply as in the main return (in which, of course, these special 'works' schemes are also included).

#### CAUSE OF DEATH INVESTIGATION

Since 1964 the Bureau has conducted an investigation into causes of death among assured lives. The data are provided by the policies included in the return of deaths for the main investigation into assured lives' mortality. Thus, there should be an exact correspondence between the returns of deaths for the main investigation and the cards completed for the cause of death investigation.

One card is to be completed for each policyholder in respect of whom there is at least one policy included as a death in the main investigation. Provision is made on each card to record data for any number of policies up to six. (If there are more than six policies on the same life, a supplementary card must be used and attached to the principal card.) For each policy the nearest age and the curtate duration of death, as calculated for the main investigation, are to be recorded. Where approximate methods are used for calculating the age at death, this can mean that the same life may be recorded at different ages on different policies. Special care must be taken to exclude any policies which are not in the main investigation.

On the card there is a space for recording the cause of death. This must be copied precisely, and in full, from the death certificate, including any code numbers that may appear against the stated causes of death (*e.g.* 1 (a), 2 (b), etc.). The completed cards should be sent to the C.M.I. Bureau, where the cause of death will be coded. It is helpful if they are sent in batches at intervals during the year, care being taken not to mix cards for different years. For this purpose the year is not necessarily the year when death occurred, but the year for which the policy is recorded as a death. When the cards for a year's claims have all been completed, each office is asked to reconcile the data with its return of deaths in the main investigation.

In addition to the deaths which are recorded as death claims in the main investigation, there are other deaths under which the sum assured is not paid (*e.g.* suicide within a certain period from the issue of the policy or claims repudiated because of non-disclosure of material information on the proposal form). When the cause of death investigation was instituted offices were not asked to return cards for these policies which did not qualify for inclusion as deaths in the main investigation. However, it has since been decided that information about these excluded cases would be of interest and offices are asked to complete cards for them. These cards should be plainly marked 'excluded from deaths in main investigation' and it is possible, therefore, that there may be two cards for one life: one card being for 'included deaths' and

the other for 'excluded deaths'. All 'excluded deaths' must relate to policies which qualify for inclusion in the 'in force'; there is no intention of extending the investigation to classes of policy which are at present excluded altogether.

#### CHANGES OF METHOD IN PREPARING DATA

From time to time it happens that an office changes its internal rules for preparing data for the Bureau. This may affect the calculation of ages at which data are recorded or it may be concerned with the inclusion or exclusion of a class of policy or with some other variation of practice. Whatever the nature of the change, offices are asked to notify the Bureau fully of what has been done so that, if necessary, suitable adjustments may be made in the Bureau's calculations of exposed-to-risk, etc.

### APPENDIX 3 BIBLIOGRAPHY

(1) *List of publications not included in J.I.A. or T.F.A.*

Tables Exhibiting the Law of Mortality derived from the combined experience of Seventeen Life Assurance Offices, 1843.

Mortality Experience of Life Assurance Companies collected by the Institute of Actuaries, 1869 ( $H^M$  &  $H^F$ ).

Life Tables Deduced from the Mortality Experience of Life Assurance Companies with an Appendix containing a complete system of notation for life contingencies, 1872. ( $H^M$ ,  $H^{M(s)}$  and  $H^F$ ).

Valuation Tables based upon the Institute of Actuaries Mortality Experience ( $H^M$ ) Table by R. P. Hardy, 1873 (Calculated by the Arithmometer invented by M. Thomas (de Colmar)).

Tables of Annuities and Premiums at  $3\frac{1}{2}\%$  by the  $H^M$  Table. F. C. J. Taylor, 1884.

Valuation and other tables  $H^M$   $3\frac{1}{2}\%$ . W. A. Bowser, 1895.

Select Life Tables deduced from the Institute of Actuaries Experience (Healthy Males) with Commutation columns and monetary functions. T. B. Sprague, 1896.

Tables of Policy Values  $H^M$   $3\%$ ,  $3\frac{1}{2}\%$ ,  $4\%$  and  $4\frac{1}{2}\%$ . D. Carment, 1897.

Valuation and Other Tables  $H^M$  and  $H^{M(s)}$   $2\frac{1}{2}\%$ . E. Colquhoun, 1899.

Tables of Net Premiums and Values  $H^M$   $3\frac{1}{2}\%$ . T. Bradshaw, W. C. Macdonald and F. Sanderson 1900.

Joint Mortality Committee—Reports and Documents, 1893–1905.

Combined Experience of Assured Lives 1863–93, Unadjusted Data, Males and Females:

Vol. I. Abstracts of Data and Exposed to Risk—Select Lives.

Vol. II. Abstracts of Data and Exposed to Risk—Aggregate.

Vol. III. Withdrawals with Fractional Exposure.

Combined Experience of Life Annuitants 1863–93. Unadjusted Data and Working Sheets 1899.

(Many volumes containing Monetary Functions based upon the two preceding tables were published by the Institute of Actuaries in the period 1900–10.)

Mortality of Annuitants 1900–20. Investigation and Tables. W. P. Elderton and H. J. P. Oakley, 1924.

Extension of Annuity Tables to Younger Ages (Ultimate only) W. P. Elderton and H. J. P. Oakley.

Continuous Investigation into the Mortality of Annuity Tables, 1921-25. Report with summary of data. W. P. Elderton and H. J. P. Oakley.

Continuous Investigation into the Mortality of Assured Lives:

Statistics 1924-29, 1934.

Extracts and Discussions, 1935.

Statistics, 1924-1951.

Mortality Functions and Monetary Tables A 1924-29, published in three volumes, 1934.

Light and Heavy Mortality and Monetary Tables, 1937. Vol. IV (supplement to Vol. I), 1947.

a(55) Tables for Annuity Tables, prefaced with a description of the method of construction, and containing monetary functions ranging from 2% to 6%, 1953.

Supplements to a(55) Tables:

1. Monetary functions at  $4\frac{1}{4}\%$ ,  $5\frac{1}{4}\%$ ,  $5\frac{1}{2}\%$  and  $5\frac{3}{4}\%$ , 1959.

2. Monetary functions at  $6\frac{1}{4}\%$  to  $8\%$ , 1966.

3. Monetary functions at  $9\%$  to  $11\%$ , 1971.

4. Monetary functions at  $11\frac{1}{4}\%$  to  $15\%$ , 1973.

Mortality Functions and Monetary Tables A1949-52 published in four volumes, 1957-59.

## (2) List of early papers in J.I.A. prior to 1924

1843. Seventeen offices table for assured lives

J. A. Higham, 1, 198.

W. S. B. Woolhouse, 11, 324.

W. S. B. Woolhouse, 13, 75.

1869.  $H^M$  and  $H^F$  tables for assured lives

	Vol.	Page
W. Sutton	20	177
G. King & G. F. Hardy	22	191
J. A. Higham	23	335
T. G. Ackland	23	354
D. Carment	24	234
W. T. Gray	24	256
J. A. Higham	25	15
Makeham Graduation	28	158
Dr T. Wittstein	33	408
Contingent Assurance Factors	39	373

1869.  $H^{M(5)}$  Table

W. Sutton	20	184
Makeham Graduation	28	190

1869.  $H^{M(0-4)}$  Table

R. Teece	22	250
W. T. Gray	24	256

1863-93. British Offices' Life Tables for Assured Lives and Annuity Tables

General note	36	310	
R. P. Hardy	36	316	Whole life with profits.
T. G. Ackland	37	142	Different classes.

R. P. Hardy	37	147	Comparison with H <sup>M</sup>
G. F. Hardy	37	175	Select tables.
J. Chatham	37	531	Annuities.
G. F. Hardy	38	501	Whole life without profit.

At the time these papers were published, related papers appeared in *T.F.A.* and the following is a short list:

*1863-93. British offices life tables for assured lives and annuitants*

J. Chatham	1	109	Assured Lives.
G. F. Hardy	2	129	Whole life without profit.
T. G. Ackland	3	285	Annuities.
J. Buchanan	4	71	Improvement in vitality

It should be mentioned at this point that few papers relating directly to the earlier investigations appear in *T.F.A.* but there are many papers relating indirectly to them. Mention should also be made of the following papers in the *Transactions of the Actuarial Society of Edinburgh*:

*1884.* On the official publications of the mortality of assured lives. James Meikle, Vol. 1, p. 311.

*1884.* On the several mortality tables employed by life assurance companies in the valuation of their annuity contracts. G. H. Ryan, Vol. 1, p. 403.

(3) *The following papers were published in both J.I.A. and T.F.A.:*

*1900-20.* Report on the results of an investigation of the mortality experience of life office annuitants during the period 1900 to 1920. W. P. Elderton and H. J. P. Oakley, *J.I.A.* 54, 43, *T.F.A.* 9, 169.

*1921-25.* As above, but for the period 1921-25. *J.I.A.* 59, 387, *T.F.A.* 12, 161.

*1924-29.* Some points that have arisen out of the continuous investigation into the mortality of assured lives, 1924 to 1929. W. P. Elderton, H. J. P. Oakley and J. B. Smither, *J.I.A.* 68, 54, *T.F.A.* 15, 315.

(4) *Continuous Mortality Investigation Committee 1924-68*

List of Reports published in the *Journal of the Institute of Actuaries* and the *Transactions of the Faculty of Actuaries* since the founding of the Committee.

	Period covered by Report	<i>J.I.A.</i>		<i>T.F.A.</i>	
		Vol.	Page	Vol.	Page
<i>Annuityants (Life)</i>	1926-35	68	513		
	1921-37	71	277	17	99
	1923-44	74	126	18	322
	1945-47	75	243		
	1923-44 (discussion)	76	130	19	375
	1946-48 (with discussion)	78	27	20	263
	1951-54	84	73	25	316
	1955-58	87	253	27	156
	1959-60	88	357	28	61
	1959-62	91	71	29	223
	1949-64	92	296	30	81
	1963-66	95	137	31	28

	Period covered by Report	<i>J.I.A.</i>		<i>T.F.A.</i>	
		Vol.	Page	Vol.	Page
(Term certain and life thereafter)	1955-68	97	337	32	412
	1948-56	85	444	26	378
<i>Assured Lives</i>					
(Whole of life and endowment assurances)					
	1924-29 (Extracts and Discussions)	Special Volume			
	1924-38	71	259	17	81
	1924-38	71	409		
	1939-43	72	516	18	167
	1944-48	77	103	20	83
	1949-52 (with discussion)	82	3	23	169
	1953-58	87	84	27	153
	1959-62	91	68	29	219
	1959-62	92	2	29	237
	1963-66	95	445	32	72
(Cause of Death)	1964-66	95	339	31	203
(Children's					
Deferred)					
	1947-48	77	106	20	86
	1949-58	87	87	27	76
(Duplicates)		83	34	25	94
(Impaired Lives)	Pilot Investigation	77	448	21	340
(Light Table)		85	57	26	122
<i>Group Life</i>					
<i>Assurances</i>					
	1958-61	92	11	29	247
<i>Pensioners (Life</i>					
<i>Office Schemes)</i>					
	1948-50	78	362	21	219
	1947-51 (duration)	80	395	22	153
	1952-55	84	77	25	322
	1952-55 (erratum)	84	315	25	322
	1955-58	87	257	27	161
	1959-62	91	75	29	228
	1961-63 (works schemes)	92	7	29	243
	1963-66	95	142	31	34
<i>Retirement Annuities</i> (Finance Act, 1956)					
	1958-62 (during deferment)	92	5	29	241
	1963-66	95	459	32	82
<i>Trends</i> (compari- son with National mortality)					
		83	153	25	98
		84	287	26	115
		91	80		

# MORTALITY OF ASSURED LIVES

## EXPERIENCE FOR 1967-70

THIS report follows the previous one which related to the experience of assured lives in the years 1963-66.

Table 1 shows the actual deaths in 1967-70 and compares them with the deaths expected by the A 1949-52 table; the ratios of actual to expected deaths are shown side by side with the corresponding ratios for the periods 1959-62 and 1963-66.

Table 1. *Assured Lives 1967-70: comparison of actual and expected deaths by the A 1949-52 table (medical and non-medical combined)*

Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
Duration 0					
-20	156	134	116	111	106
21-25	287	354	81	90	113
26-30	158	253	62	82	67
31-35	139	199	70	78	72
36-40	183	193	95	106	88
41-45	237	230	103	107	92
46-50	261	284	92	94	106
51-55	238	250	95	94	83
56-60	135	174	78	86	82
61-65	78	84	93	104	115
66-70	23	41	56	112	91
71-	11	14	79	131	108
All ages	1906	2210	86	95	91
Duration 1					
-20	105	97	108	121	98
21-25	273	333	82	92	92
26-30	197	280	70	72	87
31-35	164	232	71	76	81
36-40	218	237	92	92	101
41-45	260	304	86	101	100
46-50	373	400	93	103	97
51-55	304	374	81	86	91
56-60	226	294	77	91	101
61-65	107	144	74	90	88
66-70	53	80	66	89	67
71-	28	29	97	57	74
All ages	2308	2804	82	91	93

*Mortality of Assured Lives*Table 1 (*cont.*)

Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
Durations 2 and over					
-20	119	133	89	93	85
21-25	745	1059	70	75	87
26-30	1034	1832	56	64	61
31-35	1401	2409	58	66	69
36-40	2475	3459	72	80	80
41-45	4786	5936	81	87	85
46-50	8513	10529	81	83	83
51-55	13033	16347	80	83	85
56-60	19490	23661	82	87	90
61-65	16761	19668	85	94	95
66-70	6514	7706	85	90	91
71-75	5379	6089	88	91	90
76-80	5205	6021	86	91	94
81-85	4417	5201	85	89	94
86-90	3003	3564	84	91	93
91-95	1165	1424	82	90	94
96-100	225	272	83	76	87
101-	6	32	19	11	67
-45	10560	14828	71	79	79
46-60	41036	50537	81	85	86
61-75	28654	33463	86	92	93
76-	14021	16514	85	90	93
All ages	94271	115342	82	87	89

The previous report noted that the improvement in assured lives' mortality between 1959-62 and 1963-66 had been less than was observed in the previous quadrennium, but commented that the falling off in the rate of improvement could not necessarily be regarded as statistically significant. It will now be seen that between 1963-66 and 1967-70 the rate of improvement reasserted itself, a substantial reduction in the ratios of actual to expected deaths being observed in very nearly every age and duration group. It must again be remembered that the relatively high ratios at the youngest age group result from the formula by which the A 1949-52 table was graduated (involving a powerful wave-cut over a wide range of ages), rather than from any adverse experience in the years under review.

As in previous reports, an approximate relationship has been found between observed mortality at durations 2 and over and mortality according to the

A 1949-52 ultimate table. After a number of experiments an approximate relationship was found by the formula which is shown below (together with similar formulae applicable to previous periods.)

$$q_x (1967-70) = \cdot 84 q_x (A 1949-52) - \cdot 00016$$

$$q_x (1963-66) = \cdot 89 q_x (A 1949-52) - \cdot 0002$$

$$q_x (1959-62) = \cdot 91 q_x (A 1949-52) - \cdot 0002$$

$$q_x (1953-58) = \cdot 95 q_x (A 1949-52) - \cdot 0002$$

The percentages of actual deaths in 1967-70 to those expected according to the right-hand side of the above formula are given in Table 2; the effect of the graduation of the A 1949-52 table, mentioned above, is illustrated by the very high percentage at ages under 20, followed by low percentages at ages 26-35.

Table 2. *Approximate relationship between 1967-70 mortality and A 1949-52 ultimate table*

Age group (nearest ages)	Durations 2 and over
	100 A/E using $q_x (1967-70) =$ $\cdot 84 q_x (A 1949-52) - \cdot 00016$
-20	129
21-25	101
26-30	81
31-35	82
36-40	97
41-45	104
46-50	100
51-55	97
56-60	99
61-65	102
66-70	101
71-75	106
76-80	103
81-85	101
86-90	100
91-95	97
96-100	99
101-	22
All ages	100

Tables 3 and 4 show the separate experiences for medically examined and non-medical lives in 1967-70, with the corresponding percentages for 1963-66 shown for comparative purposes. These tables show that the improvements already observed have occurred in both the medical and non-medical sections,

in all durations, and in very nearly all age-groups; a summary is given in Table 5.

Table 3. *Assured Lives 1967-70, medically examined. Comparison of actual and expected deaths by the A 1949-52 table*

Duration	Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
0	-20	5	6	83	89	88
	21-25	24	37	65	58	115
	26-30	28	42	67	94	57
	31-35	33	39	85	80	64
	36-40	46	38	121	122	77
	41-45	30	44	68	94	87
	46-50	53	70	76	90	104
	51-55	91	113	81	70	64
	56-60	42	80	53	69	63
	61-65	33	44	75	69	102
	66-70	10	20	50	83	45
	71-	8	10	80	100	89
	All ages	403	543	74	81	77
1	-20	5	5	100	167	83
	21-25	26	33	79	106	68
	26-30	37	49	76	72	80
	31-35	29	49	59	65	84
	36-40	45	52	87	83	102
	41-45	43	64	67	95	107
	46-50	75	98	77	84	82
	51-55	112	161	70	80	77
	56-60	80	140	57	79	92
	61-65	41	76	54	86	77
	66-70	22	40	55	74	59
	71-	12	18	67	31	78
	All ages	527	785	67	81	84
2 and over	-20	4	6	67	25	63
	21-25	67	88	76	65	86
	26-30	144	276	52	64	57
	31-35	340	541	63	63	67
	36-40	654	940	70	79	81
	41-45	1421	1816	78	82	84
	46-50	2678	3479	77	82	79
	51-55	4752	6234	76	81	82
	56-60	7972	10380	77	83	85

Table 3 (*cont.*)

Duration	Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
2 and over	61-65	7975	10007	80	89	91
	66-70	4194	5103	82	88	89
	71-75	3924	4417	89	89	89
	76-80	4088	4749	86	90	92
	81-85	3657	4335	84	89	93
	86-90	2645	3182	83	91	93
	91-95	1094	1333	82	90	94
	96-100	218	256	85	77	87
	101-	6	30	20	12	67
	-45	2630	3667	72	77	79
	46-60	15402	20093	77	82	83
	61-75	16093	19527	82	89	90
	76-	11708	13885	84	89	93
	All ages	45833	57172	80	86	88

Table 4. *Assured Lives 1967-70, non-medical. Comparison of actual and expected deaths by the A 1949-52 table*

Duration	Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
0	-20	151	127	119	112	108
	21-25	263	316	83	95	113
	26-30	130	211	62	79	70
	31-35	106	160	66	78	75
	36-40	137	155	88	101	92
	41-45	207	186	111	111	94
	46-50	208	214	97	96	108
	51-55	147	137	107	118	102
	56-60	93	94	99	107	106
	61-65	45	41	110	157	136
	66-70	13	21	62	140	162
	71-	3	5	60	267	167
	All ages	1503	1667	90	100	98

*Mortality of Assured Lives*

Table 4 (cont.)

Duration	Age group (nearest ages)	Actual deaths	Expected deaths	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
1	-20	100	93	108	117	100
	21-25	247	300	82	90	96
	26-30	160	231	69	72	89
	31-35	135	183	74	79	80
	36-40	173	185	94	95	100
	41-45	217	241	90	104	97
	46-50	298	301	99	110	104
	51-55	192	213	90	90	105
	56-60	146	154	95	106	112
	61-65	66	67	99	96	108
	66-70	31	41	76	107	83
	71-	16	10	160	133	60
	All ages	1781	2019	88	95	99
2 and over	-20	115	127	91	99	88
	21-25	678	972	70	76	88
	26-30	890	1556	57	64	62
	31-35	1061	1868	57	68	70
	36-40	1821	2519	72	81	80
	41-45	3365	4120	82	89	86
	46-50	5835	7049	83	85	85
	51-55	8281	10113	82	86	88
	56-60	11518	13281	87	91	94
	61-65	8786	9661	91	100	100
	66-70	2320	2603	89	98	98
	71-75	1455	1671	87	98	94
	76-80	1117	1272	88	95	103
	81-85	760	867	88	89	98
	86-90	358	382	94	93	96
	91-95	71	91	78	102	105
	96-100	7	16	44	43	67
	101-	—	2	—	—	—
	-45	7930	11162	71	80	79
	46-60	25634	30443	84	88	90
	61-75	12561	13935	90	99	99
	76-	2313	2630	88	93	101
	All ages	48438	58170	83	89	90

Table 5. Percentages of actual deaths to expected deaths by the A 1949-52 table

Durations	Age group (nearest ages)	Medical			Non-medical		
		1967-70	1963-66	1959-62	1967-70	1963-66	1959-62
0	All ages	74	81	77	90	100	98
1	All ages	67	81	84	88	95	99
2 and over	Up to 45	72	77	79	71	80	79
	46-60	77	82	83	84	88	90
	61-75	82	89	90	90	99	99
	76 and over	84	89	93	88	93	101
	All ages	80	86	88	83	89	90
Combined							
		1967-70	1963-66	1959-62			
0	All ages	86	95	91			
1	All ages	82	91	93			
2 and over	Up to 45	71	79	79			
	46-60	81	85	86			
	61-75	86	92	93			
	76 and over	85	90	93			
	All ages	82	87	89			

A comparison of trends between the experiences of assured lives (durations 2 and over) and the population of Great Britain is given in Table 6. The percentage ratios for the assured lives are based on the actual rates of mortality experienced in 1949-52 (as opposed to the graduated rates of the A 1949-52 table). The percentage ratios for the population are based on the notes by L. V. Martin on 'The Recent Trend of Mortality in Great Britain' published in *J.I.A.* 94, 379; 95, 465; 96, 393; and 97, 331, by averaging the respective male ratios for each of the four years but recalculating them on the base years 1950-52, in place of the base years 1960-62 used by Martin.

The improvements since 1949-52 are again slightly better for assured lives than for population; compared with 1963-66 the improvements for both sets of data are similar at the younger ages, but markedly better for assured lives at the older ages.

Table 6. *Percentages of actual to expected deaths in the assured lives' experience, durations 2 and over, compared with the experience of the male population of Great Britain (expected deaths based on actual rates experienced in 1949-52 for assured lives and 1950-52 for population)*

Ages nearest birthday	Assured lives			Ages last birthday	Great Britain population (males)		
	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62		100 A/E 1967-70	100 A/E 1963-66	100 A/E 1959-62
21-25	64	68	80	20-24	69	78	81
26-30	57	64	61	25-29	61	66	68
31-35	61	70	73	30-34	63	68	72
36-40	70	79	79	35-39	72	81	83
41-45	81	87	85	40-44	86	88	87
46-50	80	83	82	45-49	85	86	84
51-55	78	82	83	50-54	85	87	86
56-60	84	89	92	55-59	89	92	95
61-65	85	94	95	60-64	93	97	98
66-70	88	94	95	65-69	98	98	97
71-75	89	92	90	70-74	99	98	99
76-80	89	93	96	75-79	93	94	94
81-85	84	87	92	80-84	88	91	95
86 and over	87	93	97	85 and over	88	89	87

Table 7 shows central rates of mortality in quinary age groups derived from the experience at durations 5 and over, for each of the years 1967-70 and for the four years combined, for the medical and non-medical sections separately and combined, alongside the corresponding central rates for 1963-66 and also the combined national rates for the four years derived from the notes by L. V. Martin. This table brings out the consistent reduction in the assured lives' mortality as compared with the previous quadrennium at all age groups in the assured lives' experience, and at most of the age groups up to 60-64 in the national experience.

No comparative figures are included at this stage on the investigation into the mortality of assured lives under policies effected in the Republic of Ireland; this experience only started in 1969, and the eleven contributing offices did not all start to send in returns of deaths prior to the 1970 experience. When a report on the 1971-74 experience is prepared, it should be possible to include comparative figures both for the Republic of Ireland experience, and for the experience under temporary assurances for which the investigation started in 1971.

Table 7. *Central rates of mortality experienced in the years 1967-70—C.M.I. experience durations 5 and over and Great Britain (males)*

Ages last birthday	1967				1968				1969			
	Assured lives			Great Britain (males)	Assured lives			Great Britain (males)	Assured lives			Great Britain (males)
	Med	Non-med	Combined		Med	Non-med	Combined		Med	Non-med	Combined	
30-34	·0008	·0006	·0007	·0011	·0007	·0006	·0007	·0011	·0008	·0008	·0008	·0011
35-39	·0012	·0012	·0012	·0017	·0010	·0011	·0010	·0017	·0010	·0011	·0011	·0017
40-44	·0018	·0018	·0018	·0030	·0016	·0018	·0018	·0031	·0019	·0020	·0019	·0031
45-49	·0034	·0034	·0034	·0052	·0034	·0033	·0034	·0052	·0034	·0038	·0037	·0057
50-54	·0060	·0064	·0062	·0090	·0063	·0065	·0064	·0094	·0056	·0065	·0062	·0095
55-59	·0106	·0108	·0107	·0159	·0100	·0110	·0106	·0163	·0102	·0114	·0109	·0164
60-64	·0168	·0182	·0175	·0266	·0166	·0189	·0177	·0272	·0171	·0192	·0182	·0281
65-69	·0273	·0294	·0280	·0427	·0279	·0289	·0283	·0446	·0285	·0320	·0297	·0459
70-74	·0489	·0466	·0483	·0649	·0499	·0513	·0503	·0692	·0477	·0485	·0479	·0709
75-79	·0736	·0613	·0711	·0964	·0811	·0902	·0830	·1056	·0814	·0786	·0807	·1032
Ages last birthday	1970				1967-1970				1963-1966			
	Assured lives			Great Britain (males)	Assured lives			Great Britain (males)	Assured lives			Great Britain (males)
	Med	Non-med	Combined		Med	Non-med	Combined		Med	Non-med	Combined	
30-34	·0008	·0007	·0007	·0011	·0008	·0007	·0007	·0011	·0009	·0008	·0009	·0012
35-39	·0011	·0011	·0011	·0016	·0011	·0011	·0011	·0017	·0012	·0012	·0012	·0019
40-44	·0022	·0020	·0020	·0030	·0019	·0019	·0019	·0031	·0020	·0021	·0021	·0032
45-49	·0034	·0037	·0036	·0054	·0034	·0036	·0035	·0054	·0036	·0037	·0037	·0054
50-54	·0064	·0063	·0063	·0093	·0061	·0064	·0063	·0093	·0063	·0066	·0064	·0095
55-59	·0094	·0109	·0103	·0162	·0101	·0110	·0106	·0162	·0109	·0115	·0113	·0167
60-64	·0169	·0189	·0180	·0271	·0169	·0188	·0178	·0273	·0186	·0205	·0195	·0285
65-69	·0285	·0312	·0295	·0444	·0280	·0304	·0289	·0444	·0301	·0327	·0309	·0444
70-74	·0513	·0494	·0507	·0689	·0495	·0490	·0493	·0685	·0504	·0542	·0512	·0679
75-79	·0776	·0786	·0778	·1027	·0783	·0773	·0781	·1020	·0807	·0858	·0816	·1034

## MORTALITY OF IMMEDIATE ANNUITANTS

### EXPERIENCE FOR 1967-70

THE last note on a four-year experience of the mortality of immediate annuitants related to 1963-66. That report, and the previous one relating to 1959-62, had indicated an apparent change since the Finance Act, 1956, in the class of life purchasing annuities and in order to pursue this further the offices submitted data for individual durations up to 1968 relating to the post-1956 purchases, and the results of this special investigation were published in *J.I.A.* 97, 337 and *T.F.A.* 32, 412; the general indications were that at durations 0 and 1 the mortality experienced had remained fairly level with the passage of time; mortality rose appreciably between durations 0 and 1, with smaller increases at durations 2 and 3, after which it remained fairly level up to duration 8 for males and duration 7 for females; thereafter there was a further significant, but unexplained rise.

The present note reverts to the previous pattern, with all durations of 5 and over combined, since data for individual durations beyond 4 are not available for the years 1969 and 1970. However, the ultimate data have been subdivided between annuities purchased before 1957 and those purchased after 1956, so that the experience of the new class of life can be investigated separately.

As in some instances the trend between 1959-62 and 1963-66 has been reversed, figures for both the earlier quadrennia are repeated in Table 1, which shows the comparison of actual and expected deaths based on the table of annuitant mortality for 1947 published on page xviii of the preface to *The a(55) Tables for Annuitants*. It will be seen that at duration 0 the level of mortality for both sexes has returned to approximately that of 1959-62 after a substantial rise in 1963-66, but at durations 1-4 there has been over the three quadrennia a gradual fall with the passage of time. At durations 5 and over (post-1956 annuities) the rise in male mortality from 1963-66 to 1967-70 can be explained by the increase in average duration, but the same does not apply to female mortality which has fallen over the range of ages 71-90; there is of course no experience for these durations in 1959-62, other than for pre-1957 annuities.

For the pre-1957 annuities, male mortality has been fairly stable, as has female mortality up to age 79; at the higher ages female mortality has fallen steadily.

Table 2 shows a similar comparison, for 1963-66 and 1967-70, based on the *a(55)* table. The male experience for post-1957 annuities was not very different from the *a(55)* table, except at durations 1-4 where mortality was appreciably lower than shown by the standard table. Female mortality was lower than *a(55)* at all durations, and all ages except the 41-60 group. The mortality experienced

Table 1. *Mortality of Annuityants, 1959-70: actual deaths under immediate annuities and percentages of actual to expected deaths according to the table of annuityant mortality for 1947, printed on page xviii of the preface to the a(55) tables for Annuityants*

Duration	Age group (nearest ages)	Males						Females					
		1959-62		1963-66		1967-70		1959-62		1963-66		1967-70	
		Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E
0	41-70	51	63	78	75	75	61	45	42	72	53	47	37
	71-80	77	48	128	73	97	52	109	50	158	56	128	49
	81 and over	55	50	72	46	85	53	106	57	153	54	173	57
	All ages over 40	183	52	278	64	257	55	260	51	383	55	348	50
1-4	41-60	20	145	24	122	22	128	22	69	21	53	24	78
	61-65	33	76	77	100	63	67	64	72	108	86	86	66
	66-70	132	87	161	75	270	95	103	58	156	62	223	78
	71-75	158	83	207	74	213	69	210	69	260	63	304	65
	76-80	187	68	250	68	284	72	332	78	456	75	459	70
	81-85	188	69	275	72	263	63	326	80	466	74	510	68
	86-90	99	75	156	67	170	68	186	71	318	80	407	75
	91 and over	22	76	60	87	71	67	101	95	150	88	191	83
	All ages over 40	839	76	1210	74	1356	72	1344	75	1935	73	2204	71

Table 1 (cont.)

Durations 5 and over (largely pre-1957)													Durations				
Age group (nearest ages)	Males				Females				Males					Females			
	1959-62		1959-62		1963-66		1967-70		1963-66		1967-70			1963-66		1967-70	
	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E		Actual deaths	100 A/E	Actual deaths	100 A/E
41-60					9	194	11	125	12	113	25	132					5 and over post-1956
61-65					14	88	32	83	35	112	48	65					
66-70					56	93	140	88	69	66	218	83					
71-75					111	73	361	92	146	77	416	74					
76-80					131	78	423	81	247	80	710	80					
81-85					185	85	447	80	318	87	869	73					
86-90					102	69	386	86	215	86	757	80					
91-95					36	87	201	92	87	79	347	84					
96 and over					2	120	16	68	25	112	96	91					5 and over pre-1957
All ages over 40					646	80	2017	85	1154	83	3486	78					
41-60	13	103	25	59	12	151	5	114	13	54	10	101					
61-65	25	94	105	101	26	133	17	182	68	105	25	82					
66-70	106	109	333	94	61	104	57	197	214	99	96	95					
71-75	410	121	883	94	194	94	79	103	599	91	339	102					
76-80	596	91	1993	98	425	91	226	96	1469	97	948	101					
81-85	888	99	3321	107	614	89	409	94	2572	97	1660	89					
86-90	688	94	3094	105	632	99	404	95	2707	100	2183	93					
91-95	304	103	1644	108	320	107	257	101	1670	103	1460	99					
96 and over	39	97	463	104	54	78	48	85	496	98	494	89					
All ages over 40	3069	99	11861	103	2338	95	1502	98	9808	98	7215	94					

Table 2. *Mortality of Annuitants, 1963-70: actual deaths under immediate annuities and percentages of actual to expected deaths according to the a(55) tables (select for duration 0, ultimate for other durations)*

Durations	Age group (nearest ages)	Males				Females			
		1963-66		1967-70		1963-66		1967-70	
		Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E	Actual deaths	100 A/E
0	41-70	78	149	75	121	72	109	47	75
	71-80	128	140	97	99	158	106	128	91
	81 and over	72	77	85	88	153	92	173	96
	All ages over 40	278	117	257	100	383	100	348	91
1-4	41-60	24	143	22	149	21	70	24	103
	61-65	77	120	63	80	108	109	86	83
	66-70	161	89	270	114	156	74	223	94
	71-75	207	87	213	81	260	73	304	75
	76-80	250	78	284	83	456	85	459	80
	81-85	275	81	263	71	466	85	510	78
	86-90	156	74	170	74	318	91	407	86
	91 and over	60	95	71	73	150	97	191	91
	All ages over 40	1210	84	1356	83	1935	85	2204	82
5 and over post-1956	41-60	9	226	11	146	12	148	25	174
	61-65	14	105	32	100	35	141	48	82
	66-70	56	111	140	105	69	79	218	99
	71-75	111	86	361	109	146	89	416	86
	76-80	131	89	423	93	247	91	710	91
	81-85	185	96	447	90	318	101	869	84
	86-90	102	76	386	94	215	99	757	92
	91-95	36	95	201	100	87	87	347	92
	96 and over	2	127	16	73	25	119	96	97
5 and over pre-1957	All ages over 40	646	91	2017	97	1154	95	3486	90
	41-60	12	173	5	133	13	71	10	133
	61-65	26	159	17	219	68	133	25	104
	66-70	61	124	57	235	214	118	96	114
	71-75	194	111	79	121	599	105	339	117
	76-80	425	105	226	111	1469	110	948	115
	81-85	614	100	409	106	2572	111	1660	103
	86-90	632	109	404	104	2707	115	2183	107
	91-95	320	116	257	109	1670	113	1460	109
5 and over pre-1957	96 and over	54	84	48	91	496	104	494	95
	All ages over 40	2338	107	1502	110	9808	112	7215	107

by the purchasers of pre-1957 annuities was consistently higher than  $a(55)$ , reflecting the fact that the data are now all at high durations.

It is desirable now to consider whether a new standard table should be prepared; the last such table was based on an experience which ended 19 years before the beginning of the quadrennium upon which this present report is based, with a projection to make it applicable to purchases 18 years ago. The forecast rates of improvement have not been realized.

The length of the experience since 1956 is scarcely sufficient to permit an extrapolation formula to be devised on a basis of anything but guesswork, whilst the recent changes in select mortality suggest that a 1967-70 experience table based on the post-1956 purchases would give as good a forecast as any other basis. It might be felt that the actual experience at durations 1 and over (the maximum possible curtate duration being 13) would allow for falling mortality for some years to come, when average durations in the experience are bound to increase.

It is the intention in future to prepare for the contributing offices an annual summary of the experience of all offices combined, similar to those already prepared in respect of life office pensioners. This up-to-date information may be some consolation, albeit small, for the fact that the data are not at present considered suitable for the preparation of the next standard table (which might possibly be compiled four or eight years hence).

It is also hoped that, starting with the year 1975, it will be possible to collect all data by individual ages (at present the data at many of the younger ages are combined in broad groups), and also for immediate annuitants' data to be submitted by amounts as well as by lives.

## MORTALITY OF PENSIONERS UNDER LIFE OFFICE PENSION SCHEMES

EXPERIENCE FOR 1967-70

(including separate investigation of 'Works' Pension Schemes)

THIS report covers the experience of both investigations in the years 1967-70.

The standard tables used for calculating the expected deaths were:

- (i) English Life Table No. 11—to facilitate comparison with the experience of previous periods
- (ii) English Life Table No. 12—to give a comparison with the latest available standard table based on population mortality in England and Wales
- (iii) The 1947 table of annuitant mortality printed on page xviii of the *a(55)* Tables for Annuitants—to give a comparison with the mortality experience of Immediate Annuitants during the same period of investigation and to facilitate comparison with previous periods
- (iv) The *a(55)* tables—to give a comparison with the mortality experience of Immediate Annuitants during the same period of investigation

Table 1 compares on a 'lives' basis the mortality experienced by pensioners who retired at or after the normal age under all schemes for which data have been submitted (whether 'staff', 'works' or mixed schemes) with the expected deaths on the four bases. For male lives there has been a further small reduction in the mortality in all age groups except 91 and over where there has been a slight increase. The mortality of the youngest age group is still somewhat higher than that of the general body of lives, thus adding weight to the suspicion that there might be a selective influence at work, causing the healthier lives to defer their retirement. This feature has shown itself in the female experience too, but it does not always do so, having been absent in the two periods 1959-62 and 1963-66. As for the rest of the female experience, the general trend is slightly downwards but the exposed to risk is too small to justify more detailed conclusions.

The percentages based on E.L.T. No. 12 show that, apart from the youngest age group for each sex, the male mortality has been between 81% and 91% of the standard table and the female mortality has been between 73% and 83% of the standard table. This difference might be due to the fact that a higher proportion of males than females in the general population is covered by occupational pension schemes.

In the last report a comparison was given between the mortality of pensioners and of annuitants (durations 5 and over) at the more important age groups, expected deaths being based upon the 1947 table of annuitant mortality. The

Table 1. *Pensioners retiring at or after the normal age. Experience 1967-70 on a basis of 'lives'*

Age group (nearest ages)	Actual deaths 1967-70	100 A/E (E.L.T. No. 11)				100 A/E (E.L.T. No. 12)		1955- 58	100 A/E 1947 table			100 A/E a (55)	
		1955- 58	1959- 62	1963- 66	1967- 70	1963- 66	1967- 70		1959- 62	1963- 66	1967- 70	1963- 66	1967- 70
<i>Males</i>													
65 and under	1723	128	99	106	94	107	95	174	135	143	128	172	153
66-70	16099	99	91	89	86	90	87	129	118	115	112	138	134
71-75	12991	93	87	86	86	88	88	114	108	106	107	125	126
76-80	8752	86	84	84	80	88	84	105	103	102	97	117	112
81-85	4478			82	76	89	82			101	92	113	103
86-90	1461	82	83	81	72	91	81	100	101	98	88	108	97
91 and over	359			72	79	83	91			85	93	93	101
All ages	45863	94	88	86	83	89	86	119	110	108	105	126	122
<i>Females</i>													
60 and under	63	121	76	66	97	78	115	138	84	73	109	103	150
61-65	720	91	85	78	70	90	81	108	101	92	83	116	104
66-70	1064	71	75	72	73	82	83	90	95	90	92	108	110
71-75	938	70	82	70	68	80	78	93	110	94	93	109	107
76-80	609			70	64	80	73			99	89	112	102
81-85	287	68	83	66	65	75	74	95	116	92	90	105	103
86 and over	147			72	74	80	82			95	97	109	111
All ages	3828	79	81	72	69	82	79	99	102	92	90	111	107

figures are reproduced below with the percentages for 1967-70 added, and the figures for annuities purchased before 1957 omitted from the experience of 1963-66 and 1967-70. The latter figures were omitted because the number of pensioners surviving to the ages in the table during the period 1967-70 out of those who retired before 1957 is a small and diminishing proportion of the whole.

Age group	Pensioners				Annuityants			
	1955-58	1959-62	1963-66	1967-70	1955-58	1959-62	1963-66 (purchased after 1956)	1967-70
<i>Males</i>								
66-70	129	118	115	112	108	109	93	88
71-75	114	108	106	107	112	121	73	92
76-80	105	103	102	97	96	91	78	81
<i>Females</i>								
61-65	108	101	92	83	90	101	112	65
66-70	90	95	90	92	108	94	66	83
71-75	93	110	94	93	90	94	77	74

Table 2 gives similar comparisons to Table 1 but based on 'amounts' instead of 'lives'. As in the previous report, the percentages according to 'amounts' are generally lower than those according to 'lives' except for males in the oldest age group and for females in the youngest age group and in age groups 76-80 and 81-85.

The following table has been prepared to throw more light on the differences between Tables 1 and 2. Percentages of exposed to risk and deaths in the

Age group	Exposed to risk % of Total		Index of average pension	Deaths % of Total		Index of average pension
	Lives	Amounts		Lives	Amounts	
<i>Males</i>						
65 and under	6.6	9.8	148	3.7	5.3	118
66-70	49.3	50.8	103	35.1	36.9	88
71-75	26.2	24.5	94	28.3	28.3	83
76-80	12.3	10.6	86	19.1	17.8	77
81-85	4.4	3.5	79	9.8	8.7	74
86-90	1.0	.7	67	3.2	2.4	63
91 and over	.2	.1	61	.8	.6	63
All ages	100.0	100.0	100	100.0	100.0	83
<i>Females</i>						
60 and under	3.7	5.4	81	1.6	2.9	79
61-65	36.8	41.9	61	18.8	22.6	53
66-70	32.2	31.6	53	27.8	30.2	48
71-75	17.4	14.0	43	24.5	20.2	37
76-80	7.3	5.2	39	15.9	14.5	40
81-85	2.0	1.5	39	7.5	6.6	39
86 and over	.6	.4	36	3.9	3.0	34
All ages	100.0	100.0	54	100.0	100.0	44

Table 2. *Pensioners retiring at or after normal age. Experience 1967-70 on a basis of 'amounts'*

Age group (nearest ages)	Actual deaths 1967-70	100 A/E (E.L.T. No. 11)				100 A/E (E.L.T. No. 12)		100 A/E 1947 table				100 A/E a(55)	
		1955- 58	1959- 62	1963- 66	1967- 70	1963- 66	1967- 70	1955- 58	1959- 62	1963- 66	1967- 70	1963- 66	1967- 70
<i>Males</i>	£ per annum												
65 and under	306059		80	86	78	88	80		110	118	107	141	128
66-70	2127251		82	81	73	82	74		107	105	96	125	114
71-75	1628651		78	76	77	78	79		96	94	95	111	112
76-80	1022069		76	73	72	77	76		92	89	88	102	101
81-85	500339		74	77	71	83	76		91	93	86	105	96
86-90	139102			80	69	90	78			98	84	125	93
91 and over	34333			71	81	82	94			84	94	91	102
All ages	5757804		79	78	74	80	76		99	98	93	115	109
<i>Females</i>													
60 and under	7466		67	55	98	64	114		75	61	108	84	149
61-65	57725		92	65	61	76	71		108	71	72	97	91
66-70	77066		70	66	66	76	76		89	83	84	100	101
71-75	51704		67	68	58	78	67		90	92	79	106	91
76-80	36969		83	64	66	74	76		116	91	93	103	106
81-85	16980			68	65	78	75			95	92	109	105
86 and over	7572			60	69	67	77			79	91	90	104
All ages	255482		78	66	64	75	73		98	84	82	101	98

Table 3. *Pensioners who retired before the normal age. Experience 1967-70 on a basis of 'lives'*

Age group (nearest ages)	Actual deaths 1967-70	100 A/E (E.L.T. No. 11)				100 A/E (E.L.T. No. 12)		100 A/E 1947 table				100 A/E a(55)	
		1955- 58	1959- 62	1963- 66	1967- 70	1963- 66	1967- 70	1955- 58	1959- 62	1963- 66	1967- 70	1963- 66	1967- 70
<i>Males</i>													
65 and under	4044	260	247	215	169	220	173	359	342	297	233	358	281
66-70	2937	146	142	133	120	135	122	190	185	173	158	207	189
71 and over	1843	106	100	104	94	109	99	131	123	128	116	148	135
All ages	8824	169	162	152	131	156	134	220	211	198	171	235	202
<i>Females</i>													
60 and under	152	284	191	194	171	230	203	318	216	215	192	297	267
61-65	164	117	124	104	100	120	115	137	146	123	118	155	149
66 and over	331	109	89	80	70	92	80	141	117	106	92	124	108
All ages	647	143	117	100	88	116	102	174	144	126	112	154	137

Table 4. *Pensioners who retired before the normal age. Experience 1967-70 on a basis of 'amounts'*

Age group (nearest ages)	Actual deaths 1967-70	1955- 58	100 A/E (E.L.T. No. 11)			100 A/E (E.L.T. No. 12)		1955- 58	100 A/E 1947 table			100 A/E a(55)	
			1959- 62	1963- 66	1967- 70	1963- 66	1967- 70		1959- 62	1963- 66	1967- 70	1963- 66	1967- 70
<i>Males</i>													
	£ per annum												
65 and under	569510		190	148	122	151	124		263	204	167	246	201
66-70	399653		121	109	98	110	99		158	142	128	170	153
71 and over	198850		88	104	88	109	92		109	128	109	149	127
All ages	1168013		138	124	105	127	108		181	163	140	194	167
<i>Females</i>													
60 and under	13652		133	154	159	181	187		147	171	177	236	244
61-65	10576		120	87	83	100	95		142	102	97	129	123
66 and over	14268		63	87	62	99	70		82	114	80	134	94
All ages	38496		95	98	78	113	99		116	121	106	150	131

Table 5. Comparison between experience of pensioners who retired before the normal age and that of pensioners who retired at or after the normal age  
(expected deaths according to English Life Table No. 12)

Age group (nearest ages)	Lives Before normal age 100 A/E		Lives At or after normal age 100 A/E		Lives 100 A/E (early retirement) ÷ 100 A/E (normal or late retirement)		Amounts Before normal age 100 A/E		Amounts At or after normal age 100 A/E		Amounts 100 A/E (early retirement) ÷ 100 A/E (normal or late retirement)	
	1963- 66	1967- 70	1963- 66	1967- 70	1963-66	1967-70	1963- 66	1967- 70	1963- 66	1967- 70	1963-66	1967-70
<i>Males</i>												
65 and under	220	173	107	95	2.06	1.82	151	124	88	80	1.72	1.55
66-70	135	122	90	87	1.50	1.40	110	99	82	74	1.34	1.34
71 and over	109	99	88	85	1.24	1.16	109	92	79	77	1.38	1.19
All ages	156	134	89	86	1.75	1.56	127	108	80	76	1.59	1.42
<i>Females</i>												
60 and under	230	203	78	115	2.95	1.77	181	187	64	114	2.83	1.64
61-65	120	115	90	81	1.33	1.42	100	95	76	71	1.32	1.34
66 and over	92	80	80	78	1.15	1.03	99	70	76	73	1.30	.96
All ages	116	102	82	79	1.41	1.29	113	99	75	73	1.51	1.36

Table 6. *Mortality of pensioners under works and non-works schemes 1967-70. Retirements at or after normal age (expected deaths according to the English Life Table No. 12)*

Age group (nearest ages)	Works schemes						Non-works schemes					
	Actual deaths	Lives		Actual deaths	Amounts		Actual deaths	Lives		Actual deaths	Amounts	
		100 A/E			100 A/E			100 A/E			100 A/E	
	1967-70	1967-70	1963-66	1967-70	1967-70	1963-66	1967-70	1967-70	1963-66	1967-70	1967-70	1963-66
<i>Males</i>												
65 and under	255	113	97	12801	106	98	885	108	109	159211	95	88
66-70	3153	102	98	154995	101	99	8913	92	91	1203912	80	83
71-75	2110	95	94	105019	94	89	7493	90	89	913091	82	79
76-80	1023	89	96	40648	85	88	5093	84	88	546623	77	76
81 and over	633	89	91	18905	93	90	3614	83	91	342959	78	89
All ages	7174	97	96	332368	96	94	25998	89	90	3165796	80	81
<i>Females</i>												
60 and under	1	50	50	110	100	170	30	115	80	4042	128	77
61-65	38	76	95	1807	78	65	390	85	88	31325	75	71
66-70	73	99	50	2350	81	50	650	88	83	44425	82	73
71 and over	70	93	93	1372	79	86	1181	78	80	55185	72	74
All ages	182	91	79	5639	80	67	2251	83	83	134977	77	73

various age groups are given, together with an 'index of average pension' which is simply the absolute amount of average pension at each age group expressed as a percentage of the average pension for the male exposed to risk at all ages.

The table shows that the average pension tends to fall as age increases, both for exposed to risk and deaths, and that the average of pensions ceasing by death is smaller than the average pension exposed to risk. The table also gives evidence which explains the rather surprising low percentage of actual to expected deaths for males aged 65 and under in Table 2.

Tables 3 and 4 give comparisons for pensioners who retired before the normal age, according to 'lives' and 'amounts'. As before, the mortality is relatively heavy throughout and the proportional extra mortality decreases as age increases. This feature is also illustrated by Table 5 which compares the mortality of those who retired early with those who retired at or after the normal age.

Table 6 shows a comparison between the mortality of 'works' schemes and of 'non-works' schemes for five offices which contributed data. In this table the basis for comparison is E.L.T. No. 12. The tendency is for the mortality of 'works' schemes to be somewhat heavier than that of 'non-works' schemes and for mortality by 'lives' to be heavier than by 'amounts'. When this table is studied, it should be remembered that 'mixed' schemes covering both 'staff' and 'works' are included with the 'non-works' schemes. Furthermore the table is based upon retirement at or after the normal age, no results being obtainable for early retirements because of the smallness of the volume of data.

## MORTALITY EXPERIENCED DURING THE PERIOD 1967-70 BY PURCHASERS OF RETIREMENT ANNUITIES UNDER THE PROVISIONS OF THE FINANCE ACT, 1956

THIS is the third report on the mortality experienced by purchasers of retirement annuities under the provisions of the Finance Act, 1956, the first two relating to the periods 1958-62 and 1963-66 respectively.

Considering first the experiences during the period of deferment, the expected deaths for 1958-62 had been calculated on the  $\alpha(55)$  ultimate table for both sexes, and on the A 1949-52 table for males. For 1963-66 the E.L.T. No. 12 was employed as an additional basis. The following table demonstrates that, for the males, the mortality experienced in 1967-70 was actually higher than that experienced by assured lives during the same period, except at ages 51 to 60 where there was no significant difference between the two experiences, and at ages over 60 where the retirement annuity experience had presumably been affected by the reverse selection resulting from transfer from 'deferment' to 'in course of payment' on early retirement through ill-health.

*Comparison of actual and expected deaths by the A 1949-52 table (medical and non-medical combined), 1967-70*

Age group (nearest ages)	100 A/E (assured lives durns. 2 and over)	100 A/E (retirement annuities, males, during deferment)
-30	63	75
31-35	58	82
36-40	72	85
41-45	81	93
46-50	81	89
51-55	80	79
56-60	82	84
61-65	85	76
66-70	85	65

The true difference between the two experiences may be even more marked, when it is remembered that the assured lives' data are believed to be subject to selective withdrawal by surrender whereas the retirement annuitants' data are not. In fact the retirement annuity male mortality starts, at the youngest ages, about midway between the mortality of assured lives in the same period and the E.L.T. 12 male mortality, and as age increases the experience moves

Table 1. *Mortality under retirement annuities during the period of deferment. Comparison of actual deaths 1967-70 with expected deaths on two bases*

Basis for expected deaths								
		A 1949-52 ultimate				E.L.T. No. 12		
Age group (nearest ages)	Actual deaths 1967-70	Expected deaths 1967-70	100 A/E 1967-70	100 A/E 1963-66	100 A/E 1958-62	Expected deaths 1967-70	100 A/E 1967-70	100 A/E 1963-66
Non-medical data, male lives								
-30	11	14.63	75	147	112	13.62	81	157
31-35	25	30.18	83	90	102	33.14	75	82
36-40	60	72.50	83	96	106	89.51	67	78
41-45	165	175.64	94	91	95	216.49	76	74
46-50	378	418.21	90	90	85	504.99	75	74
51-55	714	889.83	80	97	84	1116.73	64	78
56-60	1347	1593.73	85	86	81	2097.32	64	66
61-65	1264	1653.89	76	86	83	2186.52	58	65
66-70	355	542.25	65	72	67	688.82	52	56
Up to 50	639	711.16	90	92	91	857.75	74	76
51 & over	3680	4679.70	79	87	81	6089.39	60	67
All ages	4319	5390.86	80	88	83	6947.14	62	69
Medical data, male lives								
Up to 50	8	14.24	56	61	*	17.22	46	51
51 & over	45	93.25	48	60	*	121.25	37	46
All ages	53	107.49	49	60	*	138.47	38	47
Non-medical data, female lives†								
-40	4					4.92	81	206
41-45	10					11.56	87	74
46-50	19					29.10	65	84
51-55	49					57.81	85	53
56-60	69					99.73	69	89
61-65	56					85.84	65	65
66-70	12					22.46	53	57
Up to 50	33					45.58	72	96
51 & over	186					265.84	70	71
All ages	219					311.42	70	75

\* Not available.

† The A 1949-52 table is not appropriate to female lives and no calculations have been made on that basis.

closer to the assured lives' experience. This seems to demonstrate the unsuitability of a table as light as the  $\alpha(55)$  for comparing mortality under retirement annuities during deferment, and accordingly comparison on this table has been discontinued.

Table 1 shows the experience during the period of deferment, non-medical and medical data shown separately, compared with the A 1949-52 table for males and with E.L.T. No. 12 for both sexes; no figures, however, are shown for the female medical data, where there were only 124 years of life exposed to risk during 1967-70, with one death. The male non-medical experience was broadly similar to the experience of 1958-62, and mortality was generally lower than in 1963-66, as was mortality in the rather scanty male medical data and the female data. The female mortality was nearer to the national table than the male mortality at all age groups except 46-50.

Table 2. *Mortality under non-medical retirement annuities in course of payment (excluding retirements before age 60). Comparisons of actual deaths 1967-70 with expected deaths according to the  $\alpha(55)$  ultimate table*

Age group (nearest ages)	Males				Females			
	Actual deaths	Expected deaths	100		Actual deaths	Expected deaths	100	
			A/E 1967-70	A/E 1963-66			A/E 1967-70	A/E 1963-66
-65	265	241.72	110	131	32	33.09	97	134
66-70	725	731.20	99	101	37	55.49	67	93
71-75	423	523.16	81	80	20	30.02	67	48
76-	141	189.41	74	85	4	5.73		
All ages	1554	1685.49	92	97	93	124.33	75	100

When the report on 1963-66 was prepared, it was observed that the mortality experienced tended at many ages to be higher than in 1959-62, and it was inferred that duration since entry might be an important factor. The present report shows a reversal of this trend, mortality having fallen since 1963-66, and the suggestion concerning duration since entry appears to be invalidated.

Table 2 shows the experience in respect of retirement annuities in course of payment, excluding the medical data which were so scanty that only 18 deaths occurred at all ages and both sexes; and excluding also early retirements where there were 28 deaths before and 23 after age 60. Mortality has generally been lighter than in 1963-66 at those ages where there is any significant difference between the two periods.

In view of the selective transfers from the deferred period experience to the annuities in course of payment, the data have again been merged as they were in the previous report, but this time the comparison has been on the basis of E.L.T. No. 12. The results are given in Table 3 and show that mortality diverges from the national table with advancing age.

It is difficult to summarize, or to draw any firm conclusions. Presumably the medical data are cases where dependants' benefits are insured, whereas only a proportion of the non-medical data would cover these benefits. It would therefore seem reasonable to regard the experience during deferment as if it

*Table 3. Mortality under retirement annuities, combining the data during deferment and after retirement (including retirements before age 60) for both medical and non-medical sections. Comparison of actual deaths 1967-70 with expected deaths*

Age group (nearest ages)	Actual deaths	Expected deaths (E.L.T. 12)	100 A/E
<b>Male lives</b>			
41-45	167	221.11	76
46-50	383	515.70	74
51-55	729	1141.87	64
56-60	1395	2156.73	65
61-65	1554	2619.61	59
66-70	1099	1850.87	59
71-75	427	767.70	56
76-80	132	236.44	56
81-85	9	18.65	48
41-85	5895	9528.68	62
<b>Female lives</b>			
41-45	11	11.61	95
46-50	19	29.18	65
51-55	49	58.03	84
56-60	72	110.33	65
61-65	87	127.51	68
66-70	49	96.39	51
71-75	21	41.31	51
76-80	4	7.71	52
41-80	312	482.07	65

were an assured lives' experience, and the fact that this would tend to underestimate mortality at the younger ages may be on the safe side from the office's point of view. After normal retirement the experience tends toward that of immediate annuitants in the ultimate period, but with relatively scanty data (particularly for the females) comparisons are hard to make. It will be interesting to test the experiences against any new standard tables which might be compiled.

## MORTALITY OF ASSURED LIVES 1967-70, ACCORDING TO CAUSE OF DEATH

### INTRODUCTORY

1. This is the second report on the mortality of assured lives according to cause of death, the first having related to the years 1964-66. All but two of the offices submitting assured lives' data also completed cause-of-death cards, and cards were received in respect of 95,132 policies.

### THE DATA

2. As far as possible, the number of policies for which cards were received from each office in respect of each year of notification of death was reconciled with that office's return of assured lives' data for the main investigation. Sometimes there was an acceptable difference due to claims which were not admissible within the terms of the policies; such cases, usually suicides or aircraft accidents at the early durations, were specially marked on the cause-of-death cards and were correctly excluded from the main returns. Apart from these cases, there have been some unaccountable minor discrepancies in the numbers which have been ignored as they are insignificant. In a few cases a major discrepancy appeared; if there were too many cards they were returned to the office for extraction of those cases not in the main investigation; if there were too few and the office was unable to account for the shortfall, the number of missing policies in each age and duration group was added to the number of 'cause of death unknown'. In some instances the reconciliation brought to light errors in the statistics returned for the main investigation, which might otherwise not have been discovered. As in the main investigation, lives not accepted at normal rates were excluded.

### CODING

3. As before, coding of cause of death has been in accordance with the *Manual of the International Statistical Classification of Diseases Injuries and Causes of Death* (W.H.O.), and the data are presented in this report in broad groups of causes. For the previous report, the *Seventh Revision* was used, but the *Eighth Revision* took its place from 1968 onwards, 1967 being the year for which the national statistics (with which the assured lives' experience was compared) were published according to both Revisions. The effects of changing the basis of coding, as displayed by examining the 1967 experience according to both coding systems, will be mentioned later in this report.

4. As the experience was to be compared with the national experience it

was essential to ensure that, as far as possible, each case was coded to the same underlying cause as would have been allotted to it by the Office of Population and Census Surveys at Titchfield; for this purpose coders have completed a course at Titchfield to learn, in particular, the correct selection of the underlying cause when more than one cause of death is stated on a certificate; for certain combinations of causes, information obtained at Titchfield takes the coders somewhat further than the instructions given in the *Manual*, and for this reason it is essential for the coding and checking to be centralized in one office.

5. A large sample of nearly 10,000 cards, on which the offices supplied sufficient data to enable the cases to be identified at Titchfield, were sent there for comparison with the national coding; examination of this sample indicated that over 87% of the cases were assigned to the correct codes by the Bureau's coders, and nearly half the remainder, though in different codes, fell into their correct cause-groups. A scrutiny of the discrepancies indicated that in only two groups were significant systematic errors present in the classification of the data. 95% of the discrepancies arose through cases where Titchfield are able to obtain additional confidential information which is not available to the Bureau; a few arose because the extracts taken by the offices from the death certificates were incomplete; and a very small number were cases where Titchfield informed the Bureau that there was room for doubt as to the underlying causes, and where neither coding could be criticized as being incorrect. As already mentioned, the net differences, group by group, were insignificant, apart from two groups where additional information obtained by Titchfield caused systematic discrepancies which the Bureau is now able to overcome by changing its coding instructions (see paragraph 13). Acknowledgments are made to the Office of Population and Census Surveys for their assistance and co-operation, and to the offices for the voluminous data, they have submitted.

6. It was necessary for the Bureau to use one code in addition to those listed in the *Manual*. This was for cases where the office was unable to obtain the death certificate, or where on a foreign or consular certificate no cause was stated. These 'cause unknown' cases were coded to 799, a number not used in the *Manual*, and are quite separate from those cases where a certificate was produced but the certifying doctor had been unable to ascertain the cause.

#### COMPARISON WITH NATIONAL DATA

7. As before, comparison has been made with the Registrar General's data for England and Wales. The inclusion of Scotland would have made no significant difference to the results and would have been an unnecessary refinement, particularly when it is remembered that some of the deaths in the investigation occurred outside Great Britain anyway. In order to bring the Bureau's data strictly into line with the national data, the exposed-to-risk in each age and duration sub-group was reduced in the proportion (all assured lives' deaths in the sub-group less deaths assigned to code 799) divided by (all assured lives'

deaths in the sub-group). This adjustment was not, however, made when the expected deaths for all causes combined were calculated. In the next section, describing the calculation of expected deaths by cause, reference will be made to the 'unadjusted exposed-to-risk' and the 'adjusted exposed-to-risk'.

#### CALCULATION OF EXPECTED DEATHS BY CAUSE

8. For each cause-of-death group, national crude central mortality rates were obtained in age groups from the actual deaths and the home male population published in *The Registrar General's Statistical Review of England and Wales, Part 1, Tables, Medical*, and the rates so obtained were adjusted graphically to allow for the half-age shift in the grouping of the national data (by age last birthday) so that the rates could be applied to the assured lives' data (classified according to ages nearest birthday), and for any other differences in the mean ages to which the age-groups applied.

9. The central exposed to risk were obtained from the main investigation, excluding those offices which do not contribute cause-of-death cards, and adjusted as explained in paragraph 7. The central rates of mortality for each cause-group applied to the adjusted exposed-to-risk, gave the expected deaths in each age-group; for all causes combined a similar calculation was made using the unadjusted exposed-to-risk. The actual deaths and expected deaths for each of the four years 1967-70 were brought together, and the percentage ratios expressed to whole numbers. The results are shown in Tables 1-4.

#### SOCIAL CLASS

10. It may be considered that much of the difference between population mortality and assured lives' mortality arises from difference in social class, as it is believed that members of social classes 4 and 5 enter the assured lives' experience to a much smaller extent than members of the other social classes. A study has been made of certain figures given in *The Registrar General's Decennial Supplement, England and Wales, 1962 Part II Volume 2* and Table 5 of this report shows the percentage ratios of the central mortality rate for all social classes except 4 and 5 to the corresponding rate for all classes combined, for those cause-groups and age-groups for which the *Decennial Supplement* gives the appropriate information. The figures in the table take the place of 100 for the national data for the purpose of comparing the assured lives' results with the national statistics standardized for social class.

#### PURPOSES OF THE INVESTIGATION

11. At this stage, before examining the results, it is perhaps appropriate to recall the purposes of the investigation, the information it is hoped to glean from

it, and certain ancillary uses to which the statistics have been put; originally, the purposes were considered to be:

- (a) To indicate in what respects, i.e. in which causes of death, lie the main differences (both absolute and secular) between the mortality of assured lives and population mortality;
- (b) To indicate similarly the details of the difference between mortality experienced by the medically examined lives and those not medically examined;
- (c) To indicate for which causes of death initial selection is effective, and for how long in respect of each cause-group;
- (d) As a corollary to (b) and (c), the investigation may yield information as to those causes which medical selection is successful in eliminating for a time, and those in respect of which there may be selection against the office;
- (e) To give a continuous record to which reference could be made if medical science were successful in eliminating, or in appreciably postponing, deaths from any one particular cause, in order to estimate the possible effect of such an event on the mortality of assured lives.

In the event, the data have also been put to the following subsidiary uses:

- (f) To give an automatic check on the deaths returned by individual offices to the main assured lives' investigation; this check has resulted in the correction of a number of errors in these returns;
- (g) To give additional information in respect of the youngest and the oldest ages, which has been helpful in estimating the true shape of the assured lives' mortality curve at these ages for purposes of graduation;
- (h) To give additional information as to the effects on the mortality statistics of the volume of duplicate policies; although a full investigation has not been made since the Committee's special report on duplicates based on the year 1954, those cards which were examined for purpose (g) indicated that the incidence of duplicates was higher than was displayed in 1954 and that the effect of duplicates between different offices indicated that a new investigation into duplicates might be undertaken in the near future.

If the cause of death investigation were to be suitably extended in the future, similar information with regard to female assured lives would become available; judging from the offices who have asked whether cause-of-death cards are required for females, and others who have prepared them without asking, there should be no difficulty in obtaining these cards if such an extension were required.

## THE RESULTS

12. The results, in each cause-group, sub-grouped by age and duration as in the previous report, will now be examined by general comparison with

the national data, by comparison of the different durations, and by comparison between the medical and non-medical experiences. The figures in each group will also be compared with the corresponding figures for all causes combined; if the percentage ratios for all causes combined (regarded as the 'norm') were reflected equally throughout the whole range of causes, then a similar set of percentage ratios would be expected to be reproduced in each cause-group; on the other hand if the percentage ratios were to vary from cause-group to cause-group, then some groups would show ratios larger than, others smaller than, the norm, and an examination of the figures should thus indicate in which cause-groups the selective forces have been more, or less, powerful than the average.

13. Also, in each cause-group, the results will be compared wherever possible with the corresponding results in the previous report (for 1964-66). Some indication will be given as to whether the change in the basis of coding has invalidated this comparison, on the evidence of the dual coding which was applied to the data for the year 1967. And in those groups where the sample of cards for the year 1969 checked by the Office of Population and Census Surveys at Titchfield, indicated the need for any systematic changes in the coding, reference will be made to this also.

#### DEATHS DUE TO NEOPLASMS (140-239)

14. Table 1 shows the actual deaths, and the percentage ratios of actual to expected deaths, in 1967-70 due to neoplasms. Besides the figures for the whole group, subdivisions are shown in seven different site-groups, but the figures for all neoplasms are not reproduced by cross-adding as the group totals include deaths from neoplasms in ill-defined and unspecified sites which accounted for about 7% of all deaths from neoplasms. The additional confidential information which is in certain cases available to the Office of Population and Census Surveys has the effect that in the national data (but not in the assured lives' data) a substantial number of these ill-defined cases are re-coded to a specific site; this invalidates any comparison with the national data for the ill-defined sites, without having any significant effect on the comparisons within the seven site-groups.

#### 150-9. *Malignant neoplasms of digestive system*

The percentage ratios were all below the standardized national percentages. The indications are that duration effects lasted for 5 years in the medical experience, and for 2 or 3 years in the non-medical, while the percentages in the medical experience were all smaller than in the non-medical. The percentages were generally appreciably smaller than in 1964-66, with evidence of initial selection lasting longer in the medical experience in 1967-70 than in 1964-66. This group displayed no regular significant variation from the norm. The effect of changing the coding from the Seventh to the Eighth Revision was negligible,

Table 1. Actual deaths reported in 1967-60 due to neoplasms, and percentages of actual to expected deaths from these causes

Duration	Age-group	150-9			160-3			170-4			180-9		
		Malignant neoplasms of digestive system			Malignant neoplasms of respiratory system			Malignant neoplasms of bone, connective tissue and skin			Malignant neoplasms of genito-urinary organs		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
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Duration	Age-group	Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of lymphatic and haematopoietic tissue			All neoplasms (including ill-defined and unspecified sites and not included in the seven sub-groups)		
		Malignant neoplasms of nervous system			Malignant neoplasms of buccal cavity, pharynx and endocrine glands			Neoplasms of					

a few secondary neoplasms (with no primary stated) being transferred to the residual group of neoplasms; such codings are rare.

*160-3. Malignant neoplasms of respiratory system*

The percentage ratios were all well below the standardized national percentages, but there was no clear indication of any duration effects after the first year. The percentages in the medical experience were, with one exception, all smaller than in the non-medical. Most of the percentages were smaller than in 1964-66, but the under-45 age-group showed a rise in both the medical and the non-medical percentages. The percentages were all significantly below the norm. The effect of changing the coding was again negligible, with a very small number of codings transferred to the residual group.

*170-4. Malignant neoplasms of bone, connective tissue and skin*

This is a new group which does not compare directly with any group in the 1964-66 report. Some of the percentage ratios were up to, or near to the standardized national, particularly in the non-medical experience, but they fluctuated widely, probably because of the relatively small numbers of expected deaths. Duration effects seemed to last 3 years, and the medical percentages were generally (but not entirely) lower than the non-medical. The percentages tended to be above the norm.

*180-9. Malignant neoplasms of genito-urinary organs*

All but two of the percentages were below the standardized national. Duration effects appeared to last five years. The medical percentages were below the non-medical, except for ages 60 and over. There was no marked change since 1964-66 but the two periods are not directly comparable as breast neoplasms (male or female) were in this group in 1964-66 but were classified with the skin, etc., sites (170-4) in 1967-70. The percentages were above the norm, except at duration 0.

*190-2. Malignant neoplasms of nervous system*

This is a group where the 1969 sample examined at Titchfield indicated a significant systematic difference in coding, due to the additional information which is available to the Office of Population and Census Surveys. The Bureau had coded 90 sample cases to this group, compared with 111 under the national codings, and this discrepancy arose through a substantial number of cases of brain neoplasms, not specified as malignant, which under the instructions of the *Manual*, were coded by the Bureau to 238; in the vast majority of these cases the confidential information indicated malignancy, and Titchfield had therefore recoded them to 191. It is curious that in this one site the certifying doctors have a tendency not to specify whether the disease was malignant. The Bureau's coding instructions have now been amended to assume that any unspecified brain neoplasm is malignant, but this revision only took effect in the last of

the four years now under review. Apart from this, the coding changes had no effect on this group.

The ultimate percentages were up to or over the standardized national percentages, and some of the percentages in the earlier durations were not far off. Duration effects probably lasted for five years, although paradoxically this was more apparent in the non-medical experience than the medical; it is difficult to see why the medical percentages should have been generally higher than the non-medical. There was no clear comparison with 1964-66; the 1967-70 experience displayed lower percentages in the medical ultimate data and in the non-medical select data. Apart from the non-medical select experience, the percentages were generally well above the norm.

140-9 and 193-4. *Malignant neoplasms of buccal cavity, pharynx and endocrine glands*

This is a fairly small group for which no direct comparison can be made with 1964-66. The percentages were low in comparison with the national experience and with the norm. As far as can be judged from the small numbers in the select experience, duration effects seemed to last five years, and the medical percentages were in many instances larger than the non-medical.

200-9. *Neoplasms of lymphatic and haematopoietic tissue*

This is an interesting group where the percentages were well up to, and in many cases in excess of the standardized national. Duration effects lasted fully five years in the medical experience, three years in the non-medical; but except at durations 1-4 the medical percentages exceeded the non-medical. The experience was similar to 1964-66, and nearly all the percentages were well above the norm. Polycythaemia and myelosclerosis are classified to this group under the Eighth Revision but were not under the Seventh, but as these are both rare causes of death the results are not significantly effected by the change.

140-239. *All neoplasms*

This is a combination of all the neoplastic causes, including a small number of ill-defined cases for which a separate comparison would not be valid. The combined percentages were well below the national, and were all lower than in 1964-66 except for two age-groups where the percentages were unchanged. Duration effects lasted for five years in the medical experience, three in the non-medical and all the medical percentages were lower than the non-medical except at ages 75 and over where there was no significant difference. The percentages were generally slightly above the norm, except at duration 0.

DEATHS DUE TO DISEASES OF THE CIRCULATORY SYSTEM (390-458)

15. Table 2 shows the actual deaths and the percentage ratios for deaths due to diseases of the circulatory system divided into six groups. The sample investigation indicated no significant differences in any of these groups.

Table 2. *Actual deaths reported in 1967-70 from diseases of the circulatory system, and percentages of actual to expected deaths from these causes*

Duration	Age-group	410 Acute myocardial infarction				411-414 Other forms of ischaemic heart disease			
		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	109	37	312	52	14	24	51	43
1-2	All ages	280	40	759	58	49	35	91	36
3-4	All ages	463	56	942	67	61	37	150	55
5 and over	-44	323	59	844	63	47	47	150	61
	45-59	4,498	79	7,730	83	536	49	1,056	59
	60-74	5,015	84	4,508	88	844	56	753	62
	75-	2,125	95	495	93	1,230	82	252	79
	All ages	11,961	82	13,577	83	2,657	63	2,211	62

  

Duration	Age-group	400-4 Hypertensive disease (excluding ischaemic heart disease and cerebrovascular disease)				430-8 Cerebrovascular disease				390-8 and 420-9 Other diseases of the heart			
		Med		Non-med		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	4	20	16	34	15	20	83	52	2	4	34	39
1-2	All ages	6	13	40	42	48	26	183	55	20	19	81	35
3-4	All ages	8	14	61	62	72	32	193	55	25	20	94	41
5 and over	-44	19	44	61	54	48	38	191	58	40	36	106	35
	45-59	201	58	352	62	751	59	1,417	69	297	42	565	49
	60-74	194	46	218	61	1,357	59	1,277	71	464	50	440	60
	75-	155	62	38	67	1,909	79	404	77	846	65	182	69
	All ages	569	53	669	61	4,065	67	3,289	70	1,647	54	1,293	53

  

Duration	Age-group	440-458 Other diseases of the circulatory system				390-458 All diseases of the circulatory system (combined)			
		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	6	25	21	41	150	29	517	47
1-2	All ages	16	27	56	53	419	34	1,210	52
3-4	All ages	25	35	71	63	654	45	1,511	61
5 and over	-44	29	73	89	84	506	53	1,441	59
	45-59	236	59	439	68	6,519	68	11,559	74
	60-74	538	73	446	77	8,412	71	7,642	78
	75-	683	74	142	74	6,948	81	1,513	80
	All ages	1,486	71	1,116	73	22,385	72	22,155	75

#### 410. *Acute myocardial infarction*

All the percentages were below the standardized national, to which they became closer with increasing age. The duration effects lasted five years, except perhaps at the youngest ages where they certainly lasted three. The percentages in the medical experience were all lower than in the non-medical, except at the highest age group, and were also lower than in 1964-66. Most of them were above the norm. The coding changes, besides separating this group from 411 to 414 (whereas under the Seventh Revision they would all have been coded together) also permitted a subdivision (with the addition of ·0 or ·9) according to whether or not hypertension was mentioned on the death certificate. Although the national data were also coded with this fourth-figure classification the subdivided national figures were not published for 1967; the comparisons for 1968-70 do not indicate that there would be any advantage in subdividing the figures for the purposes of this report, for the three years only for which comparison is possible.

#### 411-4. *Other forms of ischaemic heart disease*

All the percentages were below the standardized national, duration effects lasted five years, and the medical percentages were all less than the non-medical except in the age-group 75 and over. They were all below the norm except in the same highest age-group. No comparison with 1964-66 is possible as under the Seventh Revision they were merged with the preceding group, which swamped them.

#### 400-4. *Hypertensive disease*

This group excludes any cases of ischaemic heart disease (in its various forms) or of cerebrovascular disease, with mention of hypertension, as these are coded to 410-4 or to 430-8, in each instance with the addition of the suffix ·0. All the percentages were well below the standardized national and mostly below the corresponding figures in 1964-66. They were also, with the exception of the non-medical experience at durations 3-4, well below this norm. Duration effects lasted five years in the medical experience, three in the non-medical, and all the medical percentages were below the non-medical.

#### 430-8. *Cerebrovascular disease*

Under the Seventh Revision this group formed part of the main heading 'diseases of the nervous system and sense organs' whereas the Eighth Revision classified them as circulatory diseases; but the coding system leaves the group substantially unchanged. The 1967-70 percentages were all well below the standardized national and a little below 1964-66. They were below the norm in the select durations, and also in the medical experience below age 75; but in the highest age-group and in the whole non-medical ultimate experience over age 44, they were above the norm. Duration effects lasted 5 years.

*390-8 and 420-9. Other diseases of the heart*

This is a residual group for which there was no directly comparable group in 1964-66. The percentages were well below the standardized national and the norm, and showed duration effects lasting five years, except at the younger ages in the non-medical experience. Most of the medical percentages were lower than the non-medical. Whereas the Seventh Revision permitted a separate group for degenerative heart disease, most of these cases are now included with ischaemic heart disease and the small remainder are included in this residual group.

*440-58. Other diseases of the circulatory system*

This also is a residual group with no exact counterpart in 1964-66. The percentages were below the standardized national, but generally above the norm except in the first five years of duration. Duration effects lasted five years and the medical percentages were all below the non-medical except in the highest age-group where the two percentages were equal.

*390-458. All diseases of the circulatory system (combined)*

Table 2 also shows the figures for all six groups of circulatory diseases combined. It might have been expected that the results would be very similar to those for 410 (acute myocardial infarction) as the latter subscribed more than half the deaths in the combined group in all ages and durations except the 75 and over age-group. In fact the combined percentages were all appreciably smaller than the percentages under cause 410; they were similar to the norm at the select durations, but above the norm in the ultimate experience at all ages 45 and over. Duration effects lasted five years, except in the non-medical experience under age 45, and the medical percentages were lower than the non-medical except at ages 75 and over.

## DEATHS DUE TO SUICIDE, ACCIDENT OR VIOLENCE (E 800-E 999)

16. Table 3 shows the actual deaths and the percentage ratios in 1967-70 due to violent causes, subdivided into motor vehicle accidents, suicides, and other cases (including miscellaneous accidental causes, homicide, and cases where it was not certain at the time of certification whether the violence was accidental or deliberate). Neither the coding changes, nor the sample investigation, gave rise to any significant differences within these groups. As before, coding has been to the type of event rather than to the nature of the injury (the national data are coded both ways).

*E 810-E 823 Motor vehicle accidents*

The percentages were similar to the standardized national, and generally similar to 1964-66. They were well above the norm and, as was to be expected,

Table 3. *Actual deaths reported in 1967-70 due to suicide, accident and violence, and percentages of actual to expected deaths from these causes*

Duration	Age group	E 810-E 823 Motor vehicle accidents				E 950-E 959 Suicide				E 800-E 807, E 825-E 949 and E 960-E 999 All other accidental and violent causes				E 800-E 999 All accidental and violent causes			
		Med A	100 A/E	Non-med A	100 A/E	Med A	100 A/E	Non-med A	100 A/E	Med A	100 A/E	Non-med A	100 A/E	Med A	100 A/E	Non-med A	100 A/E
0	All ages	53	95	326	98	14	37	59	36	57	103	201	75	124	83	586	77
1-2	All ages	98	97	493	97	42	54	122	43	73	67	437	99	213	74	1,052	85
3-4	All ages	81	90	323	90	49	65	129	54	83	79	323	92	213	79	775	82
5 and over	-44	149	92	525	93	105	71	217	49	193	94	560	87	447	87	1,302	79
	45-59	281	92	377	72	238	73	339	61	413	99	578	81	932	89	1,294	72
	60-74	130	79	125	84	111	71	72	50	186	84	131	67	427	79	328	67
	75-	42	64	5	32	23	77	5	68	143	71	18	44	208	70	28	44
	All ages	602	86	1,032	82	477	72	633	55	935	89	1,287	81	2,014	84	2,952	74

there were no duration effects and no discernible differences between medical and non-medical.

#### E 950-E 959. *Suicide*

The percentages were well below the national but generally somewhat higher than in 1964-66. Duration effects lasted five years in the medical data, three in the non-medical, but the percentages in the medical data were higher than in the non-medical throughout. Similarly, the medical percentages were all above the norm, but the non-medical were below.

#### E 800-E 807, E 825-E 949 and E 960-E 999. *All other accidental and violent causes*

This is another group where the percentages in the medical data were generally higher than in the non-medical. There was no significant variation from the standardized national in the medical experience. The 1967-70 percentages tended to be a little higher than in 1964-66. The percentages were well above the norm, and there were no duration effects.

### DEATHS DUE TO MISCELLANEOUS CAUSES

17. Table 4 shows the experience in 1967-70 in ten other miscellaneous groups of causes. These are all relatively small groups which broadly display similar features. The percentages were all lower than the standardized national, apart from a few groups in the non-medical experience at ages 75 and over. They were generally smaller than the norm, except in a number of instances at the highest ages. Where comparison with 1964-66 is valid, there was no significant difference apart from digestive diseases and nephritis where the percentages were generally smaller in 1967-70 than in 1964-66. The deaths at the early durations were small in number, but duration effects appeared to last five years, except for the infective and parasitic group of diseases in the non-medical experience. Broadly speaking the medical percentages were lower than the non-medical, and where at individual age-groups this was not so, the differences were probably insignificant.

18. Infective and parasitic diseases, including influenza, have been grouped together whereas in 1964-66 they formed three separate groups displaying similar features. There was formerly a group of allergic disorders, but these were mostly cases of asthma which are now included with bronchitis. Due to changes in instructions a few cases are now coded to pneumonia where previously some other underlying cause might have been selected, but the effect on the statistics is not great. Acute bronchitis is now included in the residual group 'other respiratory diseases' whereas it was previously included with bronchitis. Gastro-enteritis under age 70 is now included with the infective rather than the digestive group; and mesenteric infarction and portal vein thrombosis have been transferred from the digestive to the circulatory group; here again, the effect is small.

Table 4. *Actual deaths reported in 1967-70 from miscellaneous causes, and from all causes combined, and percentages of actual to expected deaths*

Duration	Age-group	000-136 and 470-4 Infective and parasitic diseases, including influenza				250 Diabetes mellitus				290-389 Diseases of the nervous system				480-6 Pneumonia			
		Med		Non-med		Med		Non-med		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	6	29	13	22	—	(7)	4	19	—	(23)	10	11	6	18	14	17
1-2	All ages	9	19	39	33	—	(16)	9	22	8	17	28	18	8	10	50	30
3-4	All ages	16	30	38	34	2	10	10	25	19	39	36	28	23	24	37	23
5 and over	All ages	17	30	49	31	2	9	21	32	37	53	85	41	10	16	58	33
	45-59	80	25	150	28	51	54	75	48	150	59	228	54	142	29	254	31
	60-74	108	29	115	37	107	76	80	70	164	73	159	84	299	32	298	42
	75-	108	65	37	96	88	99	27	129	107	76	30	93	863	54	195	59
	All ages	313	35	351	34	248	71	203	57	458	66	502	59	1,314	42	805	40
Duration	Age-group	490-3 Bronchitis				460-6 and 500-19 Other respiratory diseases				520-77 Diseases of the digestive system				580-4 Nephritis			
		Med		Non-med		Med		Non-med		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	2	3	17	14	2	18	9	32	9	30	30	38	—	(11)	9	25
1-2	All ages	15	9	50	19	2	8	13	23	25	36	61	39	2	9	24	36
3-4	All ages	24	12	57	20	8	26	18	33	24	30	65	42	8	33	24	40
5 and over	All ages	23	33	52	29	10	44	21	33	47	64	106	53	12	35	39	40
	45-59	259	22	592	32	60	33	110	37	282	59	458	58	64	46	152	66
	60-74	712	31	772	41	111	44	91	44	356	67	286	65	41	44	54	66
	75-	530	44	131	47	114	66	26	69	260	78	62	82	50	108	15	143
	All ages	1,524	32	1,547	37	295	47	248	41	945	66	912	61	167	54	260	62
Duration	Age-group	590-678 Other diseases of the genito- urinary system				240-6, 251-89 and 680-779 All other specified causes				All causes (including ill-defined causes not tabulated elsewhere)							
		Med		Non-med		Med		Non-med		Med		Non-med					
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E				
0	All ages	1	16	2	12	—	(15)	12	20	395	32	1,473	46				
1-2	All ages	4	26	8	25	8	24	38	36	1,137	40	3,542	57				
3-4	All ages	4	21	10	31	9	25	32	36	1,526	47	3,684	60				
5 and over	All ages	3	22	23	61	25	51	56	39	1,600	62	4,547	65				
	45-59	58	60	74	47	78	43	168	55	12,282	62	21,388	66				
	60-74	83	47	76	57	112	68	90	64	15,444	63	13,952	69				
	75-	255	80	43	67	71	63	33	134	11,583	75	2,579	75				
	All ages	399	66	216	55	286	56	347	57	40,909	66	42,466	67				

And finally, the 1969 sample indicated that about one-quarter of the cases coded by the Bureau to diabetes would have been coded elsewhere by Titchfield as a result of additional confidential information; it is now possible to eliminate the discrepancy by disregarding diabetes in all those cases where death certification does not strictly follow the international pattern, but the new instruction only took effect from 1970 onwards and there is therefore some significant overstatement in the table under this heading.

19. No attempt has been made to analyse the 380 deaths coded to ill-defined causes (780-96) as many of these would have been recoded to better defined causes by Titchfield on the receipt of additional confidential information. And there were 981 cases coded to cause unknown (799) where no certificate or extract was produced by the office, or where there was a foreign or consular certificate which did not state the cause of death. These cases, representing 1.4% of the total, are of course included in the figures for all causes combined.

#### SUMMARY

20. Table 4 also shows the figures for all causes combined which are, of course, the 'norm' with which one of the comparisons has been made for each cause-group. The all-causes percentages were lower than the national throughout but tended to come closer to the national with advancing age. They were all lower than in 1964-66. Duration effects lasted the full five years in the medical experience, but in the non-medical the effect in the fourth and fifth years was only small. All the medical percentages were lower than the non-medical, except in the age-group 75 and over where the two were equal.

21. The groups where the percentages were not generally smaller than the national were malignant neoplasms of bone, connective tissue and skin, malignant neoplasms of nervous system (ultimate data only), neoplasms of lymphatic and haematopoietic tissue, motor vehicle accidents, and other accidents (medical experience only).

22. The percentages were generally greater than the norm in the following groups: malignant neoplasms of bone, etc., malignant neoplasms of genito-urinary organs, malignant neoplasms of nervous system, neoplasms of lymphatic and haematopoietic tissue, acute myocardial infarction, cerebrovascular disease (non-medical experience), and other diseases of the circulatory system; also all the accidental and violent groups, with the exception of suicide in the non-medical experience. The percentages for malignant neoplasms of the digestive system were similar to the norm, and for all other groups generally smaller.

23. The groups showing percentages greater than in 1964-66 were malignant neoplasms of respiratory system (under age 45 only), suicide and other accidental causes. The percentages for neoplasms of lymphatic and haematopoietic tissue and for motor vehicle accidents were similar to 1964-66; for all other groups where there was any significance in the results, the percentages were lower than in the earlier period.

Table 5. *Factors for standardizing the national data according to social class*  
 $\frac{100 \times \text{death rate for all classes except 4 and 5}}{\text{death rate for all classes combined}}$  (England and Wales, 1961)

Causes of death	000- 136 and 470- 474	160- 163	140- 159 and 170- 239	250	410- 414	400- 404	390- 398 and 420- 429	440- 458	430- 438	480- 486	490- 493	520- 577	580- 584	810- 823	800- 807, 825- 949 and 960- 999	970- 959	All other causes	All causes
Ages 1bd																		
20-24	105	100	100	106	100	85	94	—	96	112	93	100	99	97	84	87	94	95
25-34	89	91	97	83	91	86	90	100	87	99	91	91	92	95	83	85	92	91
35-44	86	90	95	94	97	94	89	78	96	88	76	91	95	95	84	88	90	92
45-54	84	90	95	98	98	95	90	92	96	81	76	89	92	89	82	92	91	92
55-64	86	92	95	101	101	97	91	90	95	84	81	91	94	85	83	89	93	94
65-69	88	94	95	106	101	96	91	92	95	88	85	96	100	80	84	93	94	95
70-74	86	94	94	104	99	94	90	88	94	88	85	95	97	84	85	88	94	94

*Note:* The above cause groups are shown according to the Eighth Revision coding, although the 1961 figures from which the percentages were derived were tabulated according to the Seventh Revision.

24. Duration effects in the medical experience lasted five years except in the case of malignant neoplasms of the respiratory system (one year only), malignant neoplasms of bone etc. (three years), acute myocardial infarction at ages under 45 only (three years) and motor vehicle and other accidents (no duration effects). In the non-medical experience they lasted 3 or 5 years except in the case of malignant neoplasms of the respiratory system (one year) and motor vehicle and other accidents (no duration effects).

25. The medical percentages, apart from the oldest age-group, were generally smaller than the non-medical in all cause groups except malignant neoplasms of the nervous system and of miscellaneous specified sites (buccal cavity, pharynx, and endocrine glands), neoplasms of lymphatic and haematopoietic tissue, and the accidental and violent groups.

26. Finally, some experiments have been made with a view to ascertaining whether certain causes in the 520-77 group would fit more appropriately in a different group; although not in the same category as neoplasms, circulatory diseases, or accidental causes, all of which are already subdivided, 520-77 is numerically the largest group under the heading 'Deaths due to Other Causes' apart from pneumonia (490-6) and bronchitis (490-3) which do not seem to require subdividing; furthermore, 520-77 comprises 44 different code numbers, or more if the fourth-figure sub-classifications are taken into account, and includes a relatively high number of deaths under age 60; is this feature spread over the whole variety of diseases within the group? 571.0 (cirrhosis of the liver with mention of alcoholism) seems a possible 'odd man out' with its underlying cause perhaps not really a digestive cause; and as it is understood that 571.9 (cirrhosis of the liver with no mention of alcoholism) includes a substantial number of cases where alcoholism was present though not stated on the certificate it was decided to investigate the whole of 571 as a separate group. And it proved, indeed, to be the odd man out, as shown by the proportion of deaths falling into the age-group 45-59. In the whole 520-77 group 30% of the deaths in the medical experience, 50% in the non-medical, occurred in the 45-59 age-group; in cause 571 alone 45% of the deaths in the medical experience, 63% in the non-medical, occurred in that age-group; in the group 520-77 excluding 571 the proportions were 26% (medical) and 47% (non-medical). (In all cases the proportions of the expected deaths in that age-group were slightly higher.) The picture therefore seems to be of a different mortality shape in cause 571.

27. However, if 571 is to be segregated from the other digestive diseases it would seem logical to include with it 291 (alcoholic psychosis) and 303 (alcoholism) which, although not large enough to form a separate group on their own, also have a higher proportion of deaths in the same age-group.

28. Table 6 shows the actual deaths, and the percentage ratio of actual to expected deaths, for cause 571, and also for causes 571, 291 and 303 combined. It will be seen that although the duration effects lasted five years, the ultimate percentages were mostly much higher than in the digestive group of causes as a whole; the percentages exceeded the national at the age-groups 60 and over in

Table 6. *Actual deaths in 1967-70 from certain re-grouped causes, and percentages of actual to expected deaths*

Duration	Age-group	571 Cirrhosis of the liver				571, 291 and 303 Cirrhosis of the liver and/or alcoholism				520-77 excluding 571 All other diseases of the digestive system				240-389 and 680-779 excluding 250, 291 and 303 All other specified causes			
		Med		Non-med		Med		Non-med		Med		Non-med		Med		Non-med	
		A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E	A	100 A/E
0	All ages	1	16	1	7	1	15	1	6	8	34	29	45	—	(37)	22	15
1-2	All ages	8	57	11	35	8	52	12	34	17	31	50	40	16	20	65	26
3-4	All ages	7	44	19	59	7	40	19	53	17	27	46	37	28	34	68	31
5 and over	—44	10	63	18	44	14	74	22	44	37	65	88	56	58	51	137	40
	45-59	95	84	131	70	105	87	136	68	187	51	327	54	218	51	391	55
	60-74	91	123	57	85	98	128	59	85	265	57	229	61	269	69	247	75
	75-	17	119	3	83	17	118	3	83	243	76	59	82	178	70	63	111
	All ages	213	98	209	70	234	101	220	68	732	61	703	58	723	61	838	58

the medical ultimate experience, and were higher than the norm in all the ultimate age-groups except non-medical under age 45. All the ultimate percentages were higher in the medical experience than the non-medical; this could be due to differences between offices rather than to any peculiarity in the medical data; it could also be an indication of selection against the offices, the group of causes being one with only long-term fatality with the result that selection by the offices may only have been successful in weeding out those cases where the disease had already reached a fairly advanced stage.

29. For record purposes Table 6 also shows the revised figures for the digestive group excluding 571, on the assumption that the new grouping of causes will be continued in future years; also the residual group 'all other specified causes', with the inclusion of what is left of the 'diseases of the nervous system' which have already been depleted by the removal of cerebrovascular disease, and which with the further removal of 291 and 303 are scarcely worth retaining as a separate group; these two residual groups display similar characteristics and will accordingly be combined in future.

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