

## THE WORK OF THE CONTINUOUS MORTALITY INVESTIGATION BUREAU

by

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*(A paper discussed at a joint meeting of the Society and the Royal Statistical Society (General Applications Section) on 20 November 1970.)*

### EARLY HISTORY

It is difficult to say exactly when the Continuous Mortality Investigation began, beyond saying that the first report of the Committee was on the experience of assured lives in 1924–29. There are, however, some earlier developments which are worth following, although it is still difficult to know where to start recording the process of evolution.

If we start in the Institute of Actuaries *Year Book* we find that the Bureau was established soon after the 1914–18 war. However, in the Presidential Address of the late W. P. Phelps published in *J.I.A.* 54 there was a reference to a decision having been taken by the Institute and the Faculty in 1912–13, and a perusal of various Minutes of the Institute Council during the period immediately prior to the 1914–18 war yields much information. But perhaps we should start even earlier than that.

A file of papers formerly retained by the late Col. H. J. P. Oakley has recently been sent to the Bureau and is now in the Institute Library. As far back as 1896 reference was made to a 'Joint Mortality Experience Committee' but in February 1905 it was reported to the Institute Council that the functions of that Committee had been concluded. It thus appears that the 1863–93 experience was placed in the charge of an *ad hoc* committee set up for the one particular task. Subsequent references to the Annuity Investigation Committee suggest that the 1900–20 annuity experience was in the hands of another *ad hoc* committee; in other words, so far there was nothing continuous.

An informative Minute was passed by the Council of the Institute

on 13 January 1914; the draft of a letter to the English life offices on the establishment of a Permanent Research Bureau, which had been approved by the Joint Committee, was submitted and, with slight alteration, approved. (The offices had previously been circulated on the subject in February 1913.) The draft indicated that most of the offices had expressed their approval in principle to the establishment of a department for a continuous investigation of the rates of mortality amongst assured lives and annuitants and for specialized research into the rates prevailing amongst certain sections of assured lives. It went on to say that the Councils of the Institute and Faculty had further considered the matter with a view to formulating an acceptable scheme, and concluded with details of data to be contributed by the offices and with forms of cards and schedules. The letter was, however, not issued until the Faculty had settled on the communication to be sent to the Scottish offices, and the Faculty's draft was reported in March 1914. The issue of the letter was apparently further delayed for the consideration of details (e.g. in June 1914 it was decided to base the investigation on policies rather than on lives) and in October 1914 the whole matter was deferred until after the conclusion of the war.

In 1923 a fresh investigation into the mortality of assured lives was referred to the Annuity Investigation Committee (the last of the old *ad hoc* mortality committees) and with the inception of the continuous collection of data from the beginning of 1924 along the lines planned in 1913-14 it could be said that the C.M.I. Bureau as we now know it had started.

This section would not be complete without reference to a further Institute Council Minute of May 1931, which accepted in principle that a working committee be set up consisting of three representatives of the Institute and a like number of the Faculty to produce schemes as regards ordinary mortality investigations without interim discussions with the Councils or any large Committee. This then was the start of the Joint Mortality Investigation Committee in its present form.

## DEVELOPMENT

When the collection of data started on a continuous basis in 1924 there were three main investigations for which the offices submitted statistics; these were Assured Lives, Children's Deferred Assurances,

and Immediate Annuities. All statistics were submitted in a form suitable for use of the 'Census Method', that is to say the offices submitted particulars of policies in force on 1 January each year (a different date could be substituted if more convenient to the office) and of policies becoming claims by death notified in the year. Statistics, where possible, were submitted according to age last birthday, but for some offices a different age classification was more convenient, and the Bureau in these cases made appropriate adjustments to the figures to approximate to an age last birthday classification. There were 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 Joint Mortality 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.

The assured lives' experience was originally subdivided 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 those 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 beyond the scope of this paper as they were applied by the Committee rather than the Bureau, and 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 has been published in the Journals of the 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 1939-45 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.

Starting in 1968, a new investigation is being made into the

mortality of lives assured under policies written in Eire; twelve offices are subscribing data.

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 been a five-year select period throughout; 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 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. (Annuitants tend to live to ripe old ages but until a cause of death investigation can be instituted for them too, we shall not really know from which causes they do not usually die.)

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' 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 only 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.

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.

An investigation into mortality under certain decreasing temporary assurances has just been started in 1970 and, finally, a sub-committee has been set up to plan and conduct a new investigation into morbidity experience under permanent health insurance.

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

Finally under this section, 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.

#### FUNCTIONS OF THE BUREAU

Having completed two long and largely introductory sections, we can now examine the present functions of the Bureau. First, it receives data from the offices, scrutinizes the returns received in order to confirm, as far as possible, that the figures are consistent with those of the previous year (and this scrutiny not infrequently discovers relatively gross errors which would otherwise go undetected), and sees that the offices are fed with adequate supplies of forms.

Next, the Bureau prepares, for the assured lives' data only, a statement of exposed to risk, expected deaths, and comparison between actual and expected deaths, for each office separately as well as for all offices combined. For the other experiences it merely brings all the data of different offices together into an 'all offices' experience and then calculates combined figures for exposed to risk, actual deaths and expected deaths.

Periodically, the data are combined for a number of years (usually, now, four-year periods are used as it is desired to keep the periods short enough not to be obsolete before reports are prepared while being long enough to have an average experience of epidemics) and summarized for the Committee, who then decide on the form of a note for the Journals. Standard tables would usually only be prepared as and when there appears to be the demand for a new one.

The cause of death cards are coded according to the International Classification, tabulated in cause groups office by office, and the tabulations brought together into 'all office' figures to enable comparison with the national experience for the same year to be made.

Several members of the Bureau staff have attended training sessions at the Office of Population Censuses and Surveys where they have gained proficiency in the coding of causes of death, and in addition, samples of the Bureau's coding have been checked by Government coders. The Office of Population Censuses and Surveys has also helped the Bureau by making available information about causes of death in England and Wales which, whilst not being confidential, is too voluminous to publish for the benefit of a limited number of interested readers.

Each year the offices receive a summary of their own assured lives' experience with a similar all-offices summary, together with all-office summaries of the pensioners' experience. They also receive a copy of their own assured lives' death distribution according to cause-of-death groups, a similar distribution of the deaths in all offices contributing data to that experience, and a note on the comparison with the national experience. Sheets are also printed of the in force and deaths, of all offices combined, for both the assured lives' and the immediate annuitants' experiences. In the case of all the other investigations, nothing is circulated to the offices until such time as the Committee decide upon a periodical report.

The duties of the Bureau could thus be summed up as the collection, scrutiny, amalgamation and computation of data, followed by presentation to the Committee and preliminary stages of interpretation. The ultimate interpretation and presentation to the public is, however, the responsibility of the Committee.

The new morbidity investigation will not, however, fall within the ambit of the Bureau as the intention is for the offices to submit the data in a form ready immediately for the computer, and for the sub-committee to pass them straight to the computer.

Whether this may be the pattern for the future for the other investigations remains to be seen, but some disadvantages of direct computerization are evident. For one thing, the fact that the offices do not all submit their data in identical form would mean that, for direct computerization, the non-conformist offices would have either to fall into line or drop out. For another, the manual

adjustments for late notification of annuitant deaths may not be readily dealt with by computer. For another, the check against gross error from year to year would be missed if computerized. Again, it has happened in the past that apparent discontinuity in an experience has been traced to the data of one or two offices, reference to whom has unravelled the reason for the discontinuity; such scrutiny would be difficult if not impossible in the event of full computerization. And, finally, cause of death coding by over fifty different offices could not be undertaken without either massive training or massive inconsistencies.

It seems then, that direct computerization for many of the investigations is not a workable proposition. But computerization by the Bureau may be a possibility *in the future*—when the computer costs are low enough for the amalgamation of relatively small sets of figures by computer to be cheaper than by hand. That time is definitely not yet.

#### ACKNOWLEDGMENT

We have tried to avoid mentioning by name the illustrious personalities who have formed the Committee from time to time, but a general acknowledgement must be made to those members (and particularly past members) of the Committee who have helped us with the historical section.