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THE EXECUTIVE COMMITTEE OF THE CONTINUOUS MORTALITY INVESTIGATION BUREAU

as on 23rd April 1979

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INTRODUCTION

THE Joint Continuous Mortality Investigation Committee of the Institute and Faculty has pleasure in presenting the fourth number of its Reports.

This number contains a paper dealing with the Sickness Experience in 1972–75 under Individual P.H.I. policies. The paper was discussed at the Institute of Actuaries on 23 April 1979 and an abstract of the discussion appears in *J.I.A.* **106**, 433.

The P.H.I. investigation Sub-Committee has held 34 meetings over a period of some nine years. The paper is the result of this work assisted by a graduation working party which was set up recently. The following members of the Institute or Faculty have served on the Sub-Committee:

J. Hamilton-Jones (Chairman 1970–)

P. H. Bayliss (1970–)	F. W. Eschrich (1970–77)
D. B. Biggs (1970–72)	A. Marshall (1977–)
D. J. Bond (1970–77)	F. Martin (1978–)
J. A. Cairns (1972–)	R. H. Plumb (1977–)

R. E. White (1970–72)

The members of the graduation working party were R. Garden, E. A. Hertzman and G. C. Orros.

G. T. Humphrey has been Data Processing Adviser to the Sub-Committee since 1972, R. D. Clarke was Secretary from 1970–72 and R. E. Hayward has been Secretary since 1972.

The following Offices have contributed data to this investigation:

Clerical Medical & General	Medical Sickness
Commercial Union	National Employers' Life
Eagle Star	Norwich Union
Friends Provident	Phoenix
Guardian Royal Exchange	Scottish Mutual
Legal & General	Yorkshire General

The Joint Mortality Investigation Committee records its thanks to the persons and Offices mentioned above and to all those who have worked behind the scenes. In particular the Committee wishes to record the special contribution made by J. Hamilton-Jones as the only Chairman of the Sub-Committee.

The Sub-Committee is reconsidering the graduations of the sickness experience and will publish its findings in due course.

E. B. O. Sherlock
Chairman of the Committee

SICKNESS EXPERIENCE 1972–75 FOR INDIVIDUAL POLICIES

INTRODUCTION

In 1971 the Continuous Mortality Investigation Bureau invited offices, for the first time in its history, to submit data relating to Permanent Health Insurance. A description of the methods employed, and the data processing system, appeared in *Continuous Mortality Investigation Reports*[1] **2**, 1. In the same issue, the experience under individual policies for the calendar years 1972 and 1973 were tabulated and commented upon. In *C.M.I.R.* **3**, 91, a 4-year period was completed with the publication of results for 1974 and 1975.

At this stage it is considered suitable to combine the 4 separate years into a single experience and to publish a graduation. It is the established practice for mortality experience to be grouped in 4-year periods; such data are generally amenable to graduation, and the period is not long enough to include heterogeneous business. Maybe at a later stage reasons may be put forward for treating P.H.I. experience differently, but there is a sense of immaturity in the present state of the experience. It is not yet possible to discern the influences at work. So on this account, and because some graduated table if used with suitable care is a better guide than nothing at all, the present paper is based on 1972–75 and contains a graduated experience table for males. It is hoped, also, that there is enough commentary and adequate peripheral tables to stimulate a good discussion. For convenience, the coding adopted in the experience is reproduced in Appendix 1. This will enable the reader to follow more readily the actuarial ideas which governed the conduct of the work, and will be particularly useful in following the special tabulations described in Parts 4 and 5 of the paper. Briefly, these are concerned with portions of the data which one would expect to differ from the main body—*e.g.* the experience for Eire, the experience under cases rated-up for occupation, and so forth. Where appropriate, Parts 1 and 2 dealing with the whole experience and graduation include brief references to the special tabulations.

Group policies are the subject of a separate investigation. The first year for which data could be assembled was 1973, so that the 4-year period is not the same as for individual policies. A report will be made in due course, but it is already clear that the experience will differ in important respects from the experience for individual policies.

It will be noted that the term 'Sickness Experience' appears in the title of the paper. Nowadays, 'Permanent Health Insurance' is the accepted description of this class of business. It is so designated, for example, in Article 2 1(e) of the E.E.C. Non-Life Establishment Directive,[2] which was published in 1973. But the current investigation has an important link with the past. The rates produced

belong to the family of Friendly Society sickness rates, and indeed the Manchester Unity sickness experience[1] [3] of 1893–97 is the standard now adopted for calculating 'expected sickness'. Later, the investigation will change direction towards the American tradition, as exemplified in the Commissioners Disability Table, 1964[4]. This involves combining claim inception rates with disabled life annuities. Inception rates are already available and are discussed later in the paper, but it is not yet possible to produce disabled life annuity values with any confidence.

It will be appreciated that a standard table for sickness business, like one for annuities, needs to make allowance for future trends. Sufficient warning of the danger of using an experience table based on data recently assembled was given in *C.M.I.R.* **2,** 21. Time selection for sickness business is a more complex phenomenon than it is for mortality. The Sub-Committee set about the task of investigating selection with confident hopes that the results would be readily interpreted. As will be seen, this was not so. The idea that the time is not ripe for a well-authenticated standard table had been formed earlier. The selection problem greatly strengthened the Sub-Committee's view. On the other hand, the profession must have full details of the current experience consistent with the obligation to preserve confidentiality of results from individual contributing offices.

PART 1

FEATURES OF THE EXPERIENCE TABLES AS A WHOLE

1.1 In this part we are concerned with the ungraduated experience and data applying to aggregate groups analysed by age, sickness period and deferred period, for males and females separately. Sub-divisions of the data according to occupation, type of benefit or other attribute are dealt with in Part 4. The sub-division into 'ultimate' and 'select' is discussed in Part 5 which also gives further consideration to female lives.

The broad picture can be seen from the Se 1972–75 ungraduated experience tables on pages 60 to 80. Similar tables were published for the 4 years separately in *C.M.I.R.* **2,** 22 and **3,** 92. The expected numbers of weeks of claim shown in these tables were calculated on the basis of the Manchester Unity (1893–97) sickness rates for males in occupation group AHJ (the least hazardous occupations). The shortest tabulated period of sickness in the M.U. table relates to the first 3 months, and in order to deal with the comparison for periods 1/3 and 4/9 the M.U. first 3 months' sickness has been sub-divided in accordance with the following table:

Age	Percentage Period 0/4	Age	Percentage Period 0/4	Age	Percentage Period 0/4
18	82	37	69	57	55
22	78	42	65	62	52
27	73	47	62	67	50
32	71	52	58		

No attempt was made to deal separately with the first week of sickness and the next 3 weeks.

1.1.1 We first consider the comparison between the whole experience and the individual years, for which purpose this Part includes summary tables which largely avoid the need to refer to the earlier reports just mentioned. Table Se 1.1.1 summarizes the number of policies in force at the beginning and end of each year of the experience, for the whole investigation and for the various attributes capable of separate investigation. Those attributes which apply only to an insignificant number of policies have been omitted from the summary. The order in which the attributes are listed differs slightly from the order adopted for

Table Se 1.1.1

Attribute	Number of policies (thousands) at 1 Jan 72	31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75
Total	137·9	157·1	163·2	185·7	201·7
Sex					
Male	132·7	150·7	156·8	177·9	190·6
Female	5·2	6·4	6·4	7·8	11·1
Country					
U.K.	134·3	152·8	158·4	179·9	194·9
Eire	3·5	4·1	4·7	5·7	6·5
Channel Islands	0·1	0·1	0·1	0·1	0·2
Occupation					
Normal rates	117·0	140·2	144·3	161·6	174·4
Rated	20·8	16·9	18·9	24·1	27·3
Type of benefit					
Level	126·4	142·9	146·8	163·3	175·6
Increasing	3·7	6·8	9·5	14·9	19·1
Decreasing	7·7	7·3	6·8	7·5	7·1
Medical evidence					
Medical	9·8	18·3	30·2	45·5	51·8
Mon-medical	5·2	15·3	17·8	29·0	43·6
Unknown	122·8	123·5	115·2	111·1	106·3
Type of premium					
Level annual	137·8	157·1	163·2	184·5	199·0
Increasing annual	—	—	—	1·2	2·6
Underwriting					
No extra risk	84·1	99·3	111·1	135·7	151·5
Exclusion exists:					
Hypertension, etc.	—	—	0·2	0·3	0·3
Neurosis	0·4	0·6	1·0	1·3	1·5
Other conditions	2·6	3·4	5·2	6·1	7·1
Condition unknown*	2·0	1·8	—	—	—
Unknown whether exclusion exists*	48·7	52·0	45·5	42·2	41·2

* For business existing at 1.1.72 only.

coding. The number of claims for the 4 years combined is shown in similar fashion in Part 4 (Table SA 4.3.0). Comment on most of the details is more suitably dealt with in Part 4, but it is of interest here to note the recent relatively fast growth of contracts providing increasing benefits—no doubt partly in

Table Se 1.1.2

Deferred period	Sickness period	Age group	100A EP 1972	1973	1974	1975
1 week	1/3	All ages	104	103	103	91
	4/9		106	101	105	90
	13/13		96	98	108	97
	26/26		87	99	95	117
	52/52		118	103	82	101
	104/all		95	110	101	95
	All periods		101	104	100	96
4 weeks	4/9	All ages	93	94	106	106
	13/13		88	91	110	108
	26/26		79	88	107	122
	52/52		79	79	110	127
	104/all		77	82	119	121
	All periods		85	88	110	114
13 weeks	13/13	All ages	80	87	114	112
	26/26		80	82	100	127
	52/52		76	100	76	136
	104/all		91	103	97	106
	All periods		84	95	97	117
26 weeks	26/26	Under 45	118	122	88	76
		45–64	109	102	100	93
		All ages	112	107	97	89
	52/52	Under 45	115	116	96	77
		45–64	101	109	91	100
		All ages	104	110	92	95
	104/all	Under 45	60	123	116	94
		45–64	103	111	98	91
		All ages	100	112	99	91
	All periods	Under 45	98	120	101	83
		45–64	104	109	97	93
		All ages	103	111	97	92
52 weeks	52/52		125	62	95	117
	104/all		75	100	94	120
	All periods		90	89	95	119
All periods combined	4/9	All ages	99	97	105	98
	13/13		89	93	110	105
	26/26		89	94	99	114
	52/52		99	98	89	113
	104/all		92	104	102	101
	All periods		95	100	101	104

response to the quickening pace of inflation round about 1974. Note also a growing proportion of non-medical acceptances. Although there is no factual justification for statements about cases (large in number) for which the type of medical evidence is unknown, it seems reasonable to suggest that the proportion of them accepted non-medically is quite small.

1.1.2 To compare the 4 individual years and the combined experience, it is convenient to use the expected claims (*i.e.* weeks of sickness) on the basis of the combined experience as the reference standard. This basis is also required in Part 4 as a reference basis for the experience by amounts of benefit rather than policies. It is usual to denote actual claims by the symbol A and where the standard basis used is the M.U. AHJ experience to denote expected claims by the symbol E. To remind us throughout the Report of the special basis of our expected claims we refer to 'EP' signifying 'Claims *Expected* on the basis of the 1972–75 ungraduated experience for individual *policies*'.

The ungraduated experience has been used to calculate expected claims as this has the great advantage that for any sub-division of the data the total 'expected' claims equals the total 'actual' claims. The resulting 100 A/EP figures for any attribute being studied can thus all be related to a base figure of 100, which would not have been the case if graduated rates had been used.

Table Se 1.1.2 shows for all ages combined a comparison between the individual year's results by deferred period and sickness period. Within each sub-division the expected sickness was calculated for individual ages and the results brought together initially into two broad groups of ages. This did not reveal anything of particular interest and the figures therefore have only been shown for deferred period 26 weeks which contains by far the biggest volume of data.

Although the Combined All Periods figures seem to indicate a progressively worsening trend of morbidity over the period under investigation we hesitate to attach too much importance to this as the corresponding figures for deferred periods 1 week and 26 weeks if anything indicate a trend in the opposite direction.

1.1.3 As is to be expected, claim inception rates tend to exhibit greater uniformity because much of the information underlying the overall sickness experience is irrelevant to the mere inception of claims. It is worth recalling that we have no knowledge of the state of health of the population at risk (beyond the initial stage at entry) because prior to the expiry of the deferred period there is no requirement for the sick to report their condition.

Table Se 1.1.3 shows a comparison of inception rates for males for the 4 years. The trends within this table show some similarity to those in Table Se 1.1.2, but once again there is little consistency and no firm conclusions have been drawn.

1.1.4 The variation between offices has been studied, subject of course to the constraint of confidentiality. Each contributing office receives its own results in the same format as the combined experience year by year. This information is not available to the Sub-Committee, but summaries of the information, limited in scope, have been supplied so that a general impression can be given in the present report.

Table Se 1.1.3. *Claim inception rates, males*

Deferred period	Age group	Rate per thousand exposed to risk in year 1972	1973	1974	1975	1972–75
1 week	30–34	136	116	120	116	122
	40–44	133	129	132	124	132
	55–59	161	172	150	127	159
	60–64	178	234	216	187	213
	All ages	135	138	137	126	136
26 weeks	30–34	—	1	1	1	1
	40–44	1	1	1	0	1
	55–59	5	5	3	5	5
	60–64	8	10	13	7	9
	All ages	2	2	1	1	1

For the first year of the experience, 1972, there were 10 contributing offices. By 1975 there were 13. A number of offices have not been included in the following investigation because in the short period since they commenced this class of business the volume of data accumulated is so small. There remain 9 offices for which figures have been compared, with results shown in Table Se 1.1.4. The classification was necessarily arbitrary, since the information studied did not show the exposed to risk or claims but merely the ratio for each office of the total actual weeks of sickness to the expected according to the Manchester Unity experience. The sub-division was sickness period within deferred period.

Each office was classified on two features, namely the variability within its own portfolio and whether its general level of experience was heavy, normal or light.

Table Se 1.1.4. *Offices showing heavy* (H), *normal* (N) *or light* (L) *morbidity, and classification of variability in A/E values 1972–75*

Office	Deferred period of policy 1 Week	4 Weeks	13 Weeks	26 Weeks	52 Weeks
A		—	L*	L*	
B	—	N*	N***	L***	N*
C	H**	H**	H*	H**	H*
D	L*	H***	N***	N***	H**
E	N***	L**	H*	H*	—
F	N***	N***	H***	N**	L*
G	—	N*	N*	N***	—
H	—	N***	L**	L*	L*
I	H**	H***	N***	N***	L**
Range of *A/E* ratios	74–24%	81–33%	36–20%	28–15%	27–6%

The classification of variability in Table Se 1.1.4 was based on the following:

*** Low variability. Ratio of highest to lowest A/E value during 1972–75 *in the first sickness period following each deferred period* less than 1·5.
** Moderate variability. Above ratio between 1·5 and 3.
* High variability. Ratio 3 or more.

It is appreciated that this classification is not very satisfactory for the 52-week deferred period where only a few claimants contribute to the experience leading to widely fluctuating results. On the other hand a more sophisticated analysis would be inappropriate in view of the limited scope of the data under review.

The level of the experience was assessed by taking the arithmetical average of the A/E ratios for the various sickness periods for each of the five deferred periods. It was then possible to classify the experience in each sub-division of the table as heavy, normal or light.

It will be seen that with only one exception (C) no completely consistent pattern of light or heavy experience emerges. Nor does variability show any obvious feature.

The ranges of values of A/E are of interest in that all offices seem to confirm that the experience in respect of longer duration sickness has improved significantly compared with the Manchester Unity. For one office at least the short-term experience is little, if any, better than Manchester Unity. The claims for 1-week deferred are of maximum duration 3 weeks, but the E used relates to 4 weeks' possible sickness.

The exercise was repeated for the claims inception rates, and in general a similar pattern was found. There were, however, some apparently systematic differences in that (C) showed up as average in the inception rate investigation but with consistently heavy sickness, implying a longer than average duration of claims, whereas for (G) and (H) the normal or low sickness classifications concealed relatively high inception rates for the shorter deferred periods indicating below-average claims durations.

1.2.1 Having examined the component parts of the 4 years' experience, we return to a study of the Se 1972–75 rates. For graduation purposes, we need to estimate the variance of the rates and we can also gain a greater familiarity with the nature of the data by producing approximate moments of higher order. This links up with earlier work by Coward[5] on the data of the Manchester Unity experience. Coward wrote his paper some 30 years ago, but the present section can be linked, though less directly, with more recent work—for example 'The moments and distributions of actuarial functions'[6] which was published in 1978.

Coward's paper related to a massive volume of data and is a complex piece of work, notwithstanding several initial simplifying assumptions, *e.g.* that a person cannot experience two spells of sickness within the sickness period in question. The large number of underlying calculations required has placed severe restrictions on the investigations which we have been able to undertake even though we have made no attempt to pursue and adjust for the anomalies and manifest

irregularities which appeared in the computer tabulations. We have therefore departed even further than Coward from a position of ideal refinement.

1.2.2 The present observations record individual claims in units of weeks of sickness. Despite the amalgamation of 4 years, our global information has to be regarded as though it were related to a single calendar year of observation. There is, for example, no attempt to follow 1972 claims through to 1973. Such continuing claims are allocated to the correct period but treated as two claims of shorter duration. We also assume that we can ignore the effect of age within a year, and concentrate on a distribution of claims by duration. The fundamental decrement, as claims cease, is measurable by reference to the instantaneous rate, *i.e.* the force of sickness, at duration t. It is helpful to remember that the force of sickness is equal to the proportion sick at the instant in question.

Denoting this by s_t, the frequency distribution function we study is represented by $n_y = -ds_y/dy$ where y is the duration at termination of the sickness. The moments of the frequency distribution function take the form of expressions in the quantities

$$\mu'_r = \int_a^b (y-a)^r n_y dy + s_b(b-a)^r$$

1.2.3 As we are only aiming at rough measures of the data, we approximate to μ'_r by first studying computer tabulations according to the following scheme. For each claim ceasing in the year of observation, we know w, the weeks of claim in the sickness period under review within that year. We then compile the following schedule, based on the data processed to derive Se 1972–75 results. E_x denotes the exposed to risk, Σw the actual weeks of sickness, and z the rate, as shown in Se 1972–75.

Preliminary tabulations for calculating moments

Deferred period/ Sickness period	Age group	No. of claims	E_x	Σw	Σw^2	Σw^3	Σw^4	Rate z
1 week 1/3 etc.	20 24	216·5	1521	290	631	1622	4459	·191

We assume that the summations tabulated are good enough to regard as rough approximations to integrals over the same interval. Claims actually in course of payment on 1 January or those which are known to have continued after 31 December in the year of observation are truncated. To calculate the necessary adjustments it would be necessary, for example, to make an assumption that if $\bar{w}$ is the mean number of weeks per claim within the sickness period, then truncated claims at the beginning of the year can be combined with an equal batch at the end to make w_1 weeks per claim counted at the beginning, plus w_2 weeks counted at the end, which add up to $\bar{w}$. Clearly $(w_1+w_2)^r$ is greater than $w_1^r + w_2^r$ if $r > 1$. This would not deal with the problem that in the 104/All period the period of sickness exceeds the period of exposure, but our data for making any adjustments in this case are in any event very limited. We have ignored both adjustments,

however, so the moments we operate on are the unadjusted values of Σw^r derived from the observations for E_x lives. We have to change the origin to the mean so as to derive the central moments, but this is a standard procedure giving the following results for a single life:

$$z=(\Sigma w)/E_x$$
$$\mu_2=(\Sigma w^2)/E_x-z^2$$
$$\mu_3=(\Sigma w^3)/E_x-3z\,\mu_2-z^3$$
$$\mu_4=(\Sigma w^4)/E_x-4z\,\mu_3-6z^2\,\mu_2-z^4$$

These moments are shown in Table Se 1.2.3.

Table Se 1.2.3. *Central moments of weeks of sickness per unit of exposed*

Sickness period	Deferred period	Central moment	Age group 25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64
1/3	1 week	μ_2	·29	·34	·39	·46	·54	·58	·71	·97
		μ_3	·67	·76	·88	1·04	1·21	1·31	1·56	1·89
		μ_4	1·7	2·0	2·3	2·8	3·2	3·5	4·1	4·9
4/9	1 week	μ_2	·44	·51	·65	·90	1·41	1·44	2·35	3·49
		μ_3	3·1	3·6	4·6	6·4	10·2	10·6	16·7	23·9
		μ_4	25	29	36	51	82	86	133	189
	4 weeks	μ_2	·55	·60	·69	1·05	1·19	1·38	1·65	2·53
		μ_3	4·2	4·5	5·2	8·0	9·0	10·5	12·2	19·3
		μ_4	34	36	42	58	71	86	99	161
13/13	1 week	μ_2	·32	·27	·49	·52	1·03	1·11	1·87	4·02
		μ_3	3·6	3·0	5·6	5·9	11·4	12·9	21·1	45·3
		μ_4	42	36	67	71	135	158	253	543
	4 weeks	μ_2	·39	·39	·44	·71	·97	1·15	1·76	2·99
		μ_3	4·4	4·5	4·7	8·0	10·9	12·8	20·1	33·9
		μ_4	53	55	55	94	131	152	243	409
	13 weeks	μ_2	·19	·17	·35	·35	·61	·90	1·54	2·48
		μ_3	2·2	1·9	4·0	4·1	7·0	10·5	17·7	29·0
		μ_4	26	23	49	50	85	128	213	356
26/26	1 week	μ_2	·29	·33	·94	1·27	1·61	2·06	3·84	8·59
		μ_3	6·3	7·5	21·3	29·8	33·4	43·3	83·9	189·6
		μ_4	146	177	514	695	755	975	1959	4500
	4 weeks	μ_2	·44	·50	·53	1·13	1·10	2·07	3·08	5·03
		μ_3	9·7	11·1	11·1	25·7	23·5	46·6	65·5	101·9
		μ_4	231	263	250	617	543	1110	1517	2284
	13 weeks	μ_2	·28	·23	·58	·48	·91	2·04	3·52	6·78
		μ_3	6·0	5·0	12·2	10·1	19·6	45·3	80·6	156·5
		μ_4	139	113	278	229	459	1064	1942	3823
	26 weeks	μ_2	·06	·20	·24	·28	·55	1·28	2·50	4·47
		μ_3	1·3	4·1	5·2	6·6	11·3	28·8	57·6	103·5
		μ_4	30	90	119	161	255	683	1387	2515

Table Se 1.2.3. (*continued*).

Sickness period	Deferred period	Central moment	Age group 40–44	45–49	50–54	55–59	60–64
52/52	1 week	μ_2	2·15	2·70	5·40	8·81	16·39
		μ_3	72·7	103·9	191·2	328·3	606·0
		μ_4	2625	4281	7361	13267	24269
	4 weeks	μ_2	1·20	2·48	3·86	7·10	11·48
		μ_3	36·9	92·4	144·5	302·2	432·5
		μ_4	1282	3876	5932	13498	17540
	13 weeks	μ_2	·84	·71	3·12	6·91	20·60
		μ_3	32·6	25·9	114·1	261·3	813·8
		μ_4	1355	1076	4556	10702	35006
	26 weeks	μ_2	·61	1·38	2·60	4·68	12·50
		μ_3	24·2	53·8	99·3	173·1	474·2
		μ_4	1019	2251	4128	6890	19501
	52 weeks	μ_2		1·32	·83	3·40	6·12
		μ_3		49·4	27·3	133·6	228·4
		μ_4		2083	1063	5661	8845
104/All	1 week	μ_2	7·84	9·15	18·08	34·66	75·81
		μ_3	384·9	459·4	885·1	1702·0	3556·7
		μ_4	19424	23475	44485	85939	175653
	4 weeks	μ_2	3·76	8·79	10·09	26·58	32·68
		μ_3	181·2	440·1	487·1	1311·0	1560·3
		μ_4	9033	22475	24316	66213	76779
	13 weeks	μ_2	2·66	5·95	10·85	19·78	72·51
		μ_3	131·7	306·0	544·7	957·8	3460·7
		μ_4	5143	11754	20554	36808	122995
	26 weeks	μ_2	1·47	2·33	14·45	27·31	53·06
		μ_3	72·2	109·0	716·1	1361·2	2502·8
		μ_4	2495	3708	26317	52134	87998
	52 weeks	μ_2		7·59	3·87	10·38	14·49
		μ_3		373·8	188·9	482·5	714·7
		μ_4		18780	9356	23494	35985

1.2.4 The main interest in these results is to confirm that, as Coward found, the ratio μ_2/z is nearly constant. This also prompted an investigation into the ratios μ_3/μ_2 and μ_4/μ_3. It appears that there is a fairly stable pattern in these ratios. It will be seen that Table Se 1.2.4 gives 'high' and 'low' values for the ratios of the μ's.

To compare a sample of the sickness experience in a group of N lives (*e.g.* in an individual office) with the results of the present investigation, the first step is, obviously, to compare actual weeks of claim in each particular sub-group with EP, the expected weeks of claim. The variance of the expected weeks of claim is N times the variance of the expected weeks for a single life, viz $N\mu_2$. The ratios of μ_2/z from which Table Se 1.2.4 was prepared thus also represent the ratio of the variance of the expected weeks of sickness for N lives to the expected weeks Nz.

Table Se 1.2.4. *Ratios of central moments and values of* $\beta_1 \times z$ *derived from previous table*

Sickness period	Deferred period (weeks)	Ratio μ_2/z		Ratio μ_3/μ_2		Ratio μ_4/μ_3		$\beta_1 \times z$	
		High	Low	High	Low	High	Low	High	Low
1/3	1	2·2	2·0	2·3	2·0	2·7	2·6	2·6	1·8
4/9	1	6·4	5·8	7·4	6·8	8·1	7·9	8·9	7·4
	4	7·3	6·5	7·6	7·4	8·4	7·3	8·6	7·9
13/13	1	10·7	9·6	11·6	11·0	12·2	11·8	12·9	11·8
	4	10·9	9·5	11·6	10·9	12·2	11·6	13·1	12·0
	13	11·1	9·8	11·7	10·5	12·3	11·6	13·1	12·3
26/26	1	20·8	17·2	23·5	20·8	24·1	22·5	26·5	23·7
	4	20·1	17·4	22·7	20·3	24·0	22·4	26·3	23·6
	13	21·2	18·2	23·1	21·1	24·4	22·7	25·5	24·6
	26	21·6	15·6	23·4	20·7	24·3	22·2	27·8	23·5
52/52	1	34·3	29·9	38·5	33·8	41·2	36·1	43·2	38·2
	4	37·3	25·5	42·6	30·7	44·7	34·7	48·5	37·0
	13	34·7	29·0	39·5	36·6	43·0	39·9	46·4	42·8
	26	35·0	32·3	39·9	37·0	42·2	39·8	45·5	42·3
	52	35·4	25·9	39·2	33·1	42·4	38·7	44·5	41·1
104/All	all periods	50·6	42·6	51·4	42·1	51·1	34·0	53·4	47·1

If we examine further the distribution of sickness for N lives, we have:

Mean rate of sickness		$= z$
Variance of mean	$(m)\mu_2$	$= \mu_2/N$
Third moment of mean	$(m)\mu_3$	$= \mu_3/N^2$
Skewness coefficient	$\sqrt{(m)\beta_1}$	$= \sqrt{(m)\mu_3^2/(m)\mu_2^3}$
	$(m)\beta_1$	$= \beta_1/N$

It was considered that, in preparing Table Se 1.2.4, an indication of the skewness coefficient $\sqrt{\beta_1}$ could usefully be included. Since $\beta_1 \times z = (\mu_3/\mu_2)^2 \times (z/\mu_2)$ we can expect a stable pattern in $\beta_1 \times z$. So the table shows the 'high' and 'low' values of this expression. The value of $\sqrt{\beta_1}$ for a single life is not of much practical value, since the distribution is concave from above. But when he examined the distribution of the mean rate of sickness of N lives, Coward noted that the skewness is characteristically positive, so that the 'long tail' is towards high values. The distribution can reasonably be treated as a normal curve for large values of N encountered in practical experiences (*e.g.* for an exposed to risk of 10,000), as the value of β_1/N becomes very small.

PART 2

THE GRADUATED EXPERIENCE

2.1 In presenting the 1972 experience the Sub-Committee concentrated on the data: no attempt was made to discuss graduation. Mention was made of important features which have to be borne in mind in using any results as a guide to the future, which is the main practical consideration. This is the first graduation of its kind, so the present relative ignorance of the form of statistical distribution to employ stimulated the investigations we have described in Part 1. The root of the problem is that we are dealing with events involving human intervention at every stage. Claims are not paid according to when sickness occurs, but depend on the insured stopping work. A test is applied to validate the claim—does it fall within the policy conditions? If the insured happens to be abroad in a zone to which restricted cover applies, the claim may commence as though a 'home' case but cease after a stipulated period. In published Friendly Society experiences (which form the basis of our present knowledge) there was the important influence of reducing benefit, *e.g.* the amount of claim starts at the full rate for say 6 months but then reduces to half rate. In the present investigation there is a reducing proportion of business of this type. These features are some of many which are familiar to the practitioner, and need to be kept in mind when dealing with the experience.

2.2.1 Taking first a fixed age x, there is not much practical difficulty in coping with q_x, the rate of mortality at that age derived from a reasonably large sample of n lives. We are sampling a binomial population. Subject to proper safeguards concerning non-homogeneity, therefore, we can work on the theory that q_x is a sample mean belonging to a normal distribution. Different problems arise when tackling z_x, the central rate of sickness at age x. (In theory, using central rates eliminates the complications arising from mortality in the population studied.) As we have seen, if z_x is derived from a small sample, the distribution of the mean rate of sickness estimated from a study of the moments is appreciably skew. The skewness also varies with age. Samples of the rates at age x for various offices, as well as the combined experience, fluctuate widely in certain age and sickness groups.

2.2.2 Now considering the variation in the rates according to age, actuarial records abound with mathematical expressions for q_x or μ_x as a function of x. There is nothing much to guide us in the choice of a formula for a rate of sickness. One feels that preconceived ideas of a 'law' which might be followed (analogous to Makeham's law) would be more likely to impose a pattern which is not really there than to illuminate the important features of the data.

Faced with these considerations, a few straightforward trial curves were used by the Sub-Committee. It was decided that summation graduation, the historic method of graduating sickness experiences, was inappropriate. This was because little reliability can be placed on observed rates at either end of the range of ages,

so that an effective range for summation graduation is not attained in the present investigation.

2.3 The use of a computer to produce the graduated rates may well seem the obvious choice. Nevertheless, the limitations of the data must be faced. At the present stage it is difficult to exploit the power of a computer. One is like a sports-car driver in a rutted lane, unable to create a suitable impression but hoping that the road will later match the car. The data show irregularity even when grouped into fairly large cells. For example, the experience rates progress unevenly with age. Our first approach was to use rates for quinquennial groups of ages, which would, it was hoped, be more manageable. As will be seen, this produced usable results in several important parts of the work. The practising actuary however judges graduations by several criteria, and certain graduations using rates for individual ages proved slightly more acceptable than the quinquennial-age ones. As regards selection, it will be seen in Part 5 that interesting, and debatable, information emerged and the graduation was based on the aggregate rates. In such aspects of the experience, observed results have been tested to see whether they can be explained on some hypothesis which would appeal to the practitioner in PHI. Most hypotheses neither fail nor pass scientific testing, but rest unproved.

2.4 Throughout the investigation it has been thoroughly established that the deferred period is an important factor influencing the rates. There is no doubt that the rates for each deferred period must be graduated separately. Having decided that a mathematical curve should be fitted to the data, the next problem is how to approach the work. We do not know what type of curve will stand the test of time, and so the method used must enable a large number of trials to be made without re-programming, since each trial has to be repeated for various deferred periods.

The method of maximum likelihood was applied to recent graduations of mortality rates. A full account of the technique will be found in *J.I.A.* **101** and *T.F.A.* **34**[7]. The likelihood function can be written:

$$L = \prod_x \left\{ \begin{array}{l} \text{Probability of observing the } A_x \text{ actual} \\ \text{deaths among the exposed to risk } ER_x \end{array} \right\}$$

and is applied to graduate q_x.

Naturally it should be considered whether the method could be followed for sickness rates. To apply the method one needs to postulate a probability structure in which, given a model of sickness rates and a set of parameters, one can choose that set of parameters that maximize the likelihood. We know that the distribution of sickness at each age is not very well-defined. The distribution at younger ages is gradually altered in general shape as we approach the oldest age-groups. So we have an open mind about the form of the curve showing z_x as a function of age, and a simpler method than maximum likelihood is to be preferred. All we can assume is that the observed rates are probably unbiased estimates of the means of the true rates. We cannot make any assumptions about the standard errors of our estimates.

The practical choice is thus so narrowed down that the method of least squares is the obvious one to try. It is straightforward and the equations to be solved were readily processed on a programmable desk calculator by the small working party dealing with graduation. Perhaps this method can be commended in our present stage. It will encourage more actuaries to make their own experiments, whereas a complex method might stifle initiative.

2.5 The end-product must include 'all sickness'. Indeed, the only graphical presentation for the 1972 results compared 'all sickness' with Manchester Unity rates. Nevertheless, because of the recent origin of the business and the effects of market practice, each component period is composed of a markedly different population. A notable proportion of policies give benefit subject to a 26 weeks' deferred period. Thus the 26/26 rates for that deferred period relate to fairly mature business from older portfolios combined with a substantial injection of newly selected business. Although selection is a difficult matter, it can only be analysed if the deferred period is known. Following this through to the 52/52 weeks' rates, the effect of the older portfolios will be greater. Adding the 104/all rate, we obtain an ungraduated 'all sickness' rate by summing quite disparate components. The inescapable conclusion is that rates for each sickness period should be graduated, and 'all sickness' rates should simply mean the sum of the graduated components. In other words, it would not help to graduate 'all sickness' rates separately.

The volume of data for female lives is insufficient to justify repeating the full graduation procedure used for males. In practice, offices seek a simple approximate relationship such as a flat percentage adjustment to male rates which will enable them to deal economically with the small volume of business relating to females. A table of ratios of actual weeks of claims to weeks expected according to the ungraduated male rates appears in part 5 and the female claim inception rates are shown in table 14 of Se 1972/75.

2.6 When we look at claim inception rates, the picture is somewhat clearer. Of course it would be encouraging if a trend were discernible. It is possible that a change in the experience as a whole would first be signalled by a change in the inception rates. Moreover, the rates, still complicated by multiple increments and decrements, duplicate policies and the heterogeneity which bedevils the sickness rates, are nevertheless simpler in form than sickness rates. Following the brief outline of the approach to graduation of sickness rates, the approach to inception rates can be disposed of similarly but more briefly.

There is no accepted mathematical curve which approximately represents the frequency distribution of the 'inception rate at age x'. It is of interest to refer to a simplified model derived on lines described in 'Introduction to Stochastic Processes in Biostatistics' by Chin Long Chiang[8]. The method is indicated in Appendix 2. Clearly this ideal model is far from reality because it is based on a homogeneous population and in particular, the past history of individuals is deemed to have no effect on the future. But it conveys a sense that if a simple exponential curve survives the tests for graduation of inception rates, then a

bridge, however flimsy, connects practice and theory. It will be seen that the graduation put forward fits in with these ideas.

2.7.1 To return to the main part of the work, the first step was to inspect the tables in Se 1972–75 in order to compare sickness rates for a given period, say 13/13, in each age group, between different periods of deferment. For ages below

Table 2.7.1 (a). *1972–75 Experience. Males—Sickness rates for ages over 30*

	Age						
Sickness period	30–34	35–39	40–44	45–49	50–54	55–59	60–64
13/13	·018	·033	·034	·059	·084	·144	·223
26/26	·013	·032	·026	·050	·103	·169	·320
52/52	·014	·018	·025	·024	·099	·209	·594
104/all	·013	·020	·055	·118	·222	·426	1·524

Table Se 2.7.1 (b). *1972–75 Experience: Males—Ratios of sickness rates for policies deferred (d) weeks to corresponding rates, 13 weeks deferred. Per cent*

Sickness period/ deferred period *d*	Age						
	30–34 %	35–39 %	40–44 %	45–49 %	50–54 %	55–59 %	60–64 %
13/13							
d= 1 week	156	145	156	180	127	128	169
4 weeks	211	139	212	163	137	115	126
13 weeks	100	100	100	100	100	100	100
26/26							
d= 1 week	138	147	235	180	108	117	134
4 weeks	200	94	215	124	100	100	90
13 weeks	100	100	100	100	100	100	100
26 weeks	85	41	50	62	62	69	65
52/52							
d= 1 week	21	100	288	293	175	129	85
4 weeks	150	133	188	304	120	91	58
13 weeks	100	100	100	100	100	100	100
26 weeks	86	72	68	171	80	69	63
52 weeks	36	0	16	175	32	46	30
104/all							
d= 1 week	0	220	307	159	173	169	107
4 weeks	108	20	151	155	100	129	46
13 weeks	100	100	100	100	100	100	100
26 weeks	54	95	58	47	136	131	75
52 weeks	0	0	2	136	36	57	20

30 the data appeared to show features of considerable variability, and the impression that the main graduation should start at age 30 was confirmed by later trials. Table 2.7.1(a) summarizes the actual sickness rates for male lives age 30 and over, and Table 2.7.1(b) gives the ratios of rates in each age group for 'deferred *d* weeks' policies to the rates for 'deferred 13 weeks' policies. The lack of

Table Se 2.7.2. *Males—Sickness Rates in period 26/26 at individual ages*

	Deferred period (weeks)			
Age	1	4	13	26
30	·013	·032	·011	·002
31	·018	·018	·008	·012
32	·030	·011	·011	·015
33	·007	·016	·030	·018
34	·019	·053	·004	·007
35	·051	·032	·016	·004
36	·053	·030	·046	·021
37	·049	·022	·042	·014
38	·048	·036	·034	·016
39	·033	·032	·021	·012
40	·051	·016	·027	·012
41	·047	·028	·040	·013
42	·065	·079	·019	·013
43	·054	·084	·020	·014
44	·085	·080	·025	·015
45	·056	·050	·061	·037
46	·068	·054	·034	·023
47	·160	·072	·047	·026
48	·097	·067	·067	·053
49	·067	·070	·040	·013
50	·069	·061	·061	·080
51	·066	·067	·093	·051
52	·135	·117	·117	·058
53	·219	·134	·117	·076
54	·077	·169	·156	·053
55	·159	·143	·063	·086
56	·230	·189	·061	·080
57	·183	·173	·151	·063
58	·202	·170	·314	·136
59	·210	·179	·326	·245
60	·278	·371	·322	·226
61	·415	·223	·276	·129
62	·400	·430	·511	·149
63	·490	·129	·187	·295
64	·662	·198	·265	·311

consistency in these ratios was the main reason for deciding that separate graduations should be prepared for each deferred period.

2.7.2 We have mentioned the use of quinquennial age-groupings. There is a maximum termination age of 65 for males, and 60 is also a popular choice of termination age. Grouping by quinquennial ages fits in with this feature and it is believed that there is no advantage in trying other groupings. Table Se 2.7.2 shows the 26/26 rates, males, for the available deferred periods at individual ages, as an illustration.

The number of age groups dealt with in each graduation on the quinquennial bases was at most, seven. For the 52 weeks' deferred period, it was down to five due to paucity of data. The aim of the exercise was thus unlike that of most mortality graduations. It was rather to produce an intelligible pattern to which 18 separate graduations, each comparatively flexible, could be fitted. As the present stage is pioneering, it should be mentioned that in theory a fruitful result might be produced by relegating age to a minor place in creating the pattern. This would be a clean break with the past, and the amount of data and the state of our knowledge about the data deter us from such a venture. Another important aspect is the need for results in a form sufficiently familiar to the profession to provide a basis for standard tables.

PART 3

DETAILS OF GRADUATION

3.1 Given the nature of the collected data, the lack of any wholly satisfactory previously developed statistical models to represent sickness data, and the limitation of computational facilities, it was recognized that this first attempt at graduation would have to be regarded as particularly experimental in character. This will already be clear from comments made earlier. From a statistical standpoint, problems arise not only from the evident heterogeneity of data and from the inclusion of duplicates, but also from some loss of independence in the observed sickness rates at adjacent ages due to the combining of 4 successive years' data relating to substantially the same body of lives. If a claim continues from one calendar year into the next, the part of the claim occurring in the first year contributes to the observed sickness at one age, while the part falling in the following year contributes at the next higher year of age. In the extreme, a permanent claim persisting over the whole 4-year period, would contribute observed sickness of 52 weeks at each of four successive ages. For various reasons, therefore, doubts must be held about the possibility of judging the success of the graduation by applying standard statistical tests.

3.2.1 As mentioned in section 2.2.2, it was felt best to graduate the sickness rates by curve-fitting and the method of least-squares was applied separately to each deferred period/sickness period table. Preliminary examination of the crude

rates strongly suggested a predominantly exponential form, at least over the middle and higher age ranges. Data for ages below 30 were excluded from the graduation, as being too sparse and unreliable; for some tables this age had to be raised. Experiment failed to reveal any conclusively preferable type of formula, but, taking into account the desire to avoid forms which would be intractable for computational purposes, it was thought that the following might be suitable:

$$z_x = a + bx + cx^2 + df^x$$

where z_x is the sickness rate (in weeks of sickness per annum) at age x.

For ease of computation, the true age x was transposed into $X = (x - 47)/5$ and the working formula taken as

$$a + bX + cX^2 + df^X$$

3.2.2 Details of the fitting procedure are given in Appendix 3. This involved inserting various trial values of the coefficient f into the graduation formula, and then estimating the remaining coefficients by the standard linear regression method, so as to minimize the sum of squares of differences between observed and graduated rates. It was learnt that, for most tables, a fair degree of latitude in the choice of f was feasible without serious detriment to the closeness-of-fit as measured by the resulting sum of squares of deviations. This discovery was somewhat disturbing, as it suggested a measure of redundancy between the coefficients in the formula, in that any adjustment to the value of f was, within limits, automatically compensated for by adaptive corrections in the remaining coefficients. Although this feature may raise doubts as to the suitability of the graduation formula, the Sub-Committee received a comment that this is a common problem, particularly when a parabola component is employed to assist in the 'correction'.

For many of the graduations it will be seen that the round number 2 or 3 was assigned to the coefficient f. This was to avoid spurious accuracy when appreciable alterations in f hardly changed the sum of squares. For one table relating to sickness period 104/all, trial optimum values of f were found to be quite different from those judged suitable for other tables. In any event it should be appreciated in this connection that the sparsity of data for 104/all sickness (especially at young ages) will throw some doubt on the appropriateness of any graduation.

3.2.3 Table 3.2.3(a) summarizes the number of male sickness claims. The total number of claims that appears in this table, 28,079, cannot be compared with the total number of male claims shown in Table SA 4.3.0, 21,534, because the former includes a count for each new sickness period entered and the latter is simply a count of the number of claim records submitted. This overstating may be particularly significant for sickness periods 52/52 and 104/all.

The data for deferred period 52 weeks were so sparse that graduation was abandoned. A summary of the values adopted for all the parameters in the remaining deferred periods appears in Table Seg 3.2.3 (b). The individual parameters have a wide range of values when one Table is compared with another. This was accepted as an inevitable feature.

Table 3.2.3 (a). *Number of male sickness claims*

Sickness period	Deferred period 1 week	4 weeks	13 weeks	26 weeks	52 weeks
1/3	12,319				
4/9	4,315	3,250			
13/13	1,165	1,228	739		
26/26	613	535	446	406	
52/52	425	283	267	321	45
104/all	609	269	296	482	66

The final column of Table Seg 3.2.3 (b) shows whether the graduation in tables Seg was based on quinquennial or individual ages. Of course, for practical use of the graduation formula it is not necessary to refer to this information.

3.3.1 For the first set of trials, the data were grouped in quinquennial ages and corresponding crude rates were graduated for all deferred periods and sickness periods. Many of the results were acceptable for practical use. Because a few were suspect, all the trials were repeated using rates for individual ages. This led to consideration of criteria for the final choice of graduation to be published in each case.

An attempt was made to improve the graduations by applying weights, because in least-squares theory the rates to be graduated should have equal variances. The method was to minimize $\sum_x (E_x/z_x)\ (z_x - \dot{z}_x)^2$ (where $\dot{z}_x$ is the observed rate and z_x the graduated rate), rather than $\sum_x (z_x - \dot{z}_x)^2$. It will be seen from paragraph 1.2.4 that the weights E_x/z_x can be regarded as roughly proportional to the reciprocal of the variance of z_x for any particular value of x. It was generally found that this sophistication did not materially improve the graduations.

3.3.2 Consideration was given to various statistical tests of the graduated male sickness rates. The validity of the χ^2 test was considered but it was rejected, in view of the lack of knowledge regarding the distribution of sickness rates by age, and the lack of independent events within duration of sickness claims. Furthermore, in view of the adopted least-squares method of curve fitting, most statistical tests involving the magnitude of squares of deviations probably had doubtful validity.

3.3.3 It was considered, however, that tests of runs of signs would be more appropriate. One test of changes of sign has been developed by W. L. Stevens and was discussed during the reading of H. L. Seal's paper 'Tests of a mortality table graduation'[9].

This test can briefly be outlined as follows:

let n = number of observations
r = number of cases where *(observed value)* minus *(expected value)* is positive
t = number of unbroken runs of positive deviations.

Individual P.H.I. policies (1972–75) experience

Table Seg 3.2.3 (b) *Graduation of male sickness rates, using formula* $a + bX + cX^2 + df^X$

		Graduation formula parameter coefficients						Age basis of crude rates I—Individual ages Q—Quinquennial
		a	*b*	*c*	*d*	*f*	Age range	
Deferred 1 week								
Sickness period	0/4	·23032023	·01747721	−·00078350	·00628956	3	30–64	I
	4/9	·18887696	·04142916	·00237725	·00794972	3	30–64	I
	13/13	·07364859	·00391686	−·00407909	·01232513	3	33–64	I
	26/26	·06988598	·00548888	−·00384716	·01398574	3	33–64	I
	52/52	·091510	·04325	·0046200	·007320	3·2	37–64	Q
	104/all	·18409173	·03134177	−·02696741	·05913230	3	40–64	I
Deferred 4 weeks								
Sickness period	4/9	·16694855	·02506754	−·00044187	·00395594	3	30–64	I
	13/13	·08829687	·02364185	·00216092	·00340548	3	30–64	I
	26/26	·039010	·006040	·000080	·028960	2	30–64	Q
	52/52	·068870	·029580	·004350	·004510	3·2	30–64	Q
	104/all	·16001238	·06913332	−·02444014	·02603448	3	42–64	I
Deferred 13 weeks								
Sickness period	13/13	·042380	·014040	·002070	·015140	2	30–64	Q
	26/26	·041010	·017500	·003080	·014370	2·4	30–64	Q
	52/52	·010450	−·001910	−·000300	·026910	2·8	30–64	Q
	104/all	·109650	·053280	·006240	·005540	6·0	30–64	Q
Deferred 26 weeks								
Sickness period	26/26	·02775377	·01550375	·00327705	·00442108	3	33–64	I
	52/52	·02811338	·00800117	−·00096745	·01252978	3	40–64	I
	104/all	−8.783530	−1.511580	−·097460	8·874400	1·2	34–64	Q

If n is sufficiently large (say 20 or more) then the χ^2 test with one degree of freedom may be used as an approximation to the exact test, and

$$\chi^2 = \frac{n\,(t-rq)^2}{r\,(n-r)\,pq}$$

where $$q = \frac{(n-r+1)}{n} \text{ and } p+q=1.$$

The above outline is described more fully in 'The analysis of mortality and other actuarial statistics'[10].

3.3.4 The results of the above test of runs of signs have been summarized in Table Seg 3.3.4. High values of χ_1^2 tend to indicate non-random runs of signs. The exceptionally high value of 15·1 found for the table for deferred period 1 week, sickness period 1/3, was due to an unduly large number of changes of sign, a feature which would often be taken to indicate over-graduation. High test values, where they occurred in other tables, were always due to there being too few runs of signs, which, though normally indicative of under-graduation, may be partly due in the present investigation to the lack of complete independence in the crude rates at adjacent ages, mentioned in 3.1. Thus, although some of the results of this test appear unsatisfactory, their precise significance is uncertain. No better alternative graduations were found which also satisfied other criteria.

3.3.5 It was considered that an important criterion for the choice of a particular graduation was that one should prefer the graduation by individual ages in cases where the quinquennial-age fit was, on balance, no better. If the age range was short, or the data sparse, this tipped the scales in favour of quinquennial ages.

Table Seg 3.3.4. *Statistical test of runs of signs*

		Estimated value of χ_1^2			
		Deferred period 1 week	Deferred period 4 weeks	Deferred period 13 weeks	Deferred period 26 weeks
Sickness rates					
Period	1/3	15·1			
	4/9	2·2	0·0		
	13/13	2·5	0·7	4·0	
	26/26	0·5	1·9	0·3	0·0
	52/52	0·3	4·4	4·8	0·3
	104/all	0·3	0·6	8·4	5·5
Claim inception rates		1·1	0·1	0·1	0·7

Significance levels for χ_1^2 10% 2·71; 5% 3·84; 2·5% 5·0; 1·0% 6·63; 0·5% 7·88.

Since the method of graduation is a variant of the method of moments, it follows that the sum of the deviations $\sum_x (z_x - z_x)$ is zero if an individual age fit is preferred. But if $\sum_x (z_x - \dot{z}_x)$ is calculated from a formula based on quinquennially grouped data, this sum is usually non-zero.

Another major criterion which was used to judge the relative merits of alternative graduations was to compare scales of net premiums calculated from the graduated rates with those calculated from the crude rates. These net premiums were calculated on the basis of A67/70 ultimate mortality and 6% interest, suggested in 'Practical P.H.I.' by R. J. Sansom[11]. It was found that, in the main, the net premiums using graduated sickness rates did not diverge by more than about 4% from those calculated from the crude rates. Graduations showing low divergence were preferred.

Table Seg 3.3.5 shows the comparison of net premiums on the graduated rates

Table Seg 3.3.5. *Comparison of net premiums on graduated rates with those on experience rates and M.U. rates for benefit £10 per week to age 65*

	A67/70 ult 6% net premiums		Seg premiums as a proportion of M.U. AHJ
	Seg 1972/75 £	Se 1972/75 £	%
Deferred period 1 week			
Age 40	13·12	13·00	55·3
Age 45	16·35	16·17	56·9
Age 50	20·79	20·58	58·4
Age 55	27·60	27·70	61·8
Deferred period 4 weeks			
Age 45	9·62	9·58	42·6
Age 50	12·05	11·88	41·5
Age 55	15·33*	15·50*	40·8
Deferred period 13 weeks			
Age 35	4·20	4·17	38·5
Age 40	5·71	5·63	40·8
Age 45	7·88	7·84	43·7
Age 50	11·15	11·17	46·9
Age 55	16·51*	16·19*	52·4
Deferred period 26 weeks			
Age 40	3·95	4·01	34·6
Age 45	5·66	5·77	37·9
Age 50	8·15	8·56	40·9
Age 55	11·73	12·02	43·7

* Tables 2 and 3 of Se 1972–75 show anomalous rates at ages 55–65.

put forward in the tables Seg described below and the crude rates, and also on the Manchester Unity rates combined with A67/70 ultimate mortality, at 6% interest.

It is important to note that the ungraduated rates themselves are suspect, and in certain places need arbitrary adjustment to produce 'safe side' rates for premium and other financial calculations. The first broad indication of this can be found by inspection of the last column. The percentages for deferred period 4 weeks are low; this is traceable to the 104/all rates for that deferred period. The financial effect of ignoring this feature would be considerable.

3.3.6 At this point, subject in particular to the warning about the ungraduated data just given, we introduce the graduated experience tables Seg 1972–75 which

Table Seg 3.3.6. *1972–75 Experience: Males—Ratios of graduated deferred period* d *weeks to deferred period 1 week*

	Age 32 %	Age 37 %	Age 42 %	Age 47 %	Age 52 %	Age 57 %	Age 62 %
Sickness period 0/4							
Deferred 1 week	100	100	100	100	100	100	100
Sickness period 4/9							
Deferred 1 week	100	100	100	100	100	100	100
Deferred 4 weeks	102	99	94	87	79	71	63
Sickness period 13/13							
Deferred 1 week		100	100	100	100	100	100
Deferred 4 weeks		98	97	107	113	99	71
Deferred 13 weeks		51	54	67	81	79	59
Sickness period 26/26							
Deferred 1 week		100	100	100	100	100	100
Deferred 4 weeks		76	74	81	91	87	68
Deferred 13 weeks		47	51	65	85	90	75
Deferred 26 weeks		22	26	38	53	59	52
Sickness period 52/52							
Deferred 1 week		100	100	100	100	100	100
Deferred 4 weeks		117	82	74	72	71	69
Deferred 13 weeks		71	40	37	52	80	118
Deferred 26 weeks			42	41	45	56	76
Deferred 52 weeks				29	30	32	36
Sickness period 104/all							
Deferred 1 week			100	100	100	100	100
Deferred 4 weeks			52	77	77	65	52
Deferred 13 weeks			44	47	55	66	93
Deferred 26 weeks			18	37	70	87	70
Deferred 52 weeks				39	42	31	19

will be found immediately following the Se 1972–75 tables. Dashes denote values where the graduation formula produced unsatisfactory results. The final choice of graduations, from the various trials, was made mostly on the basis of simple inspection, together with the net premium comparisons described in 3.3.5. The test referred to in 3.3.3 and 3.3.4 was not considered conclusive, and applications of other formal statistical tests were not pursued. The acceptability of the graduations depends therefore largely on practical judgment. Further data and research are required before reliable graduations will become available. Nevertheless, at this early stage in the accumulation of data, the graduated results which are presented may be of some use to practitioners. They are incomplete, but the Sub-Committee stopped short of any attempt to introduce hypothetical rates. It can be claimed that the graduated tables do not produce a misleading impression of the rates actually experienced.

Table Seg 3.3.6 provides comparisons of the graduated male sickness rates at each deferred period within each sickness period. Ratios were calculated of the graduated results at deferred period d weeks to those at deferred period 1 week. It would appear that the longer deferred periods have a lighter claims experience. It is also easy to discern the profile of the rates for each line in the table, and to see the regions of suspicious departure from the main pattern.

3.4.1 A graduation of the claim inception rates for males was also undertaken. Denoting the graduated rate at age x by i_x, a modified Makeham formula

$$i_x = a + bx + cd^x$$

was tried. The observed rates are incorporated in the Se 1972–75 tables; the graduated rates should represent the probability of a claim arising in a year, at the end of the deferred period, in respect of a life aged x at the beginning of a year.

The trial graduations were thus based on quinquennial age-groups, and the method closely followed the procedure for the rates of sickness z_x. A working formula was adopted as follows:

$$i_X = a + bX + cd^X$$

where $X = (x - 42)/5$.

The data graduated covered the age range 25–64; for the deferred 52 weeks table, the supporting data were too sparse to publish a graduation.

3.4.2 An attempt was also made to apply the χ^2 test, although the validity of this test was rendered doubtful by the least-squares fitting technique adopted. It was found that the χ^2 results for all deferred periods were not too unsatisfactory.

It was felt that the numbers of claims might possibly be treated as independent events (barring duplicate policies), and so the application of the χ^2 test was not as objectionable as for sickness rates.

3.4.3 The graduated claim inception rates were tested for runs of signs in deviations from crude data. The test adopted is described in paragraph 3.3.4. The results of applying this test to individual age data can be seen from Table Seg 3.3.4 and appear to be satisfactory. The graduations of male claim inception rates seem to be more satisfactory than those for male sickness rates.

3.4.4 The results of the final graduations on the male claim inception rates have been summarized in Tables Seg 3.4.4 (*a*) and (*b*). Table Seg 3.4.4 (*a*) indicates the graduation parameters *a, b, c*. The value of *d* was 3 in all cases. Table Seg 3.4.4 (*b*) summarizes the graduated inception rates for each individual age and deferred period. It was not thought possible to improve the graduations by resorting to the observed rates for individual ages to recalculate the parameters *a, b, c* and *d*. Maybe the Sub-Committee appears to have dealt rather summarily with the inception rates, but they are certainly more regular and well-behaved than the sickness rates. The inception of a claim is less influenced by subjective reactions than are subsequent events. For example reduction to partial benefit with the object of rehabilitation may be encouraged by some claims managers but not others. Again, the point of recovery is not preceded by a 'deferred period', or some other form of rehearsal of the event, so the length of claim is likely to import a fair degree of statistical irregularity in the data.

Table Seg 3.4.4 (a). *Graduation of male claims inception rates, using formula* $a + bX + c3^X$

	Graduation formula parameter coefficients		
Deferred period	a	b	c
1 week	0·12560425	0·00263242	0·00094020
4 weeks	0·02373812	0·00327944	0·00014650
13 weeks	0·00453452	0·00096448	0·00016238
26 weeks	0·00119952	0·00035420	0·00008353

Table Seg 3.4.4 (b) is overleaf

Table Seg 3.4.4 (b) *Graduated male claim inception rates*

Age	Deferred period 1 week	Deferred period 4 weeks	Deferred period 13 weeks	Deferred period 26 weeks
25	·11668	·01259	·00126	
26	·11721	·01325	·00145	
27	·11774	·01391	·00165	
28	·11828	·01456	·00184	
29	·11881	·01522	·00204	
30	·11935	·01588	·00223	·00036
31	·11990	·01654	·00243	·00043
32	·12044	·01720	·00262	·00050
33	·12100	·01786	·00282	·00057
34	·12155	·01852	·00302	·00065
35	·12212	·01918	·00322	·00072
36	·12270	·01984	·00342	·00080
37	·12329	·02051	·00362	·00087
38	·12389	·02118	·00383	·00095
39	·12451	·02185	·00404	·00103
40	·12516	·02252	·00425	·00111
41	·12583	·02320	·00447	·00120
42	·12654	·02388	·00470	·00128
43	·12730	·02458	·00493	·00137
44	·12812	·02528	·00517	·00147
45	·12900	·02599	·00543	·00157
46	·12997	·02671	·00570	·00168
47	·13106	·02746	·00599	·00180
48	·13228	·02822	·00630	·00194
49	·13367	·02901	·00664	·00208
50	·13527	·02983	·00702	·00225
51	·13714	·03070	·00744	·00244
52	·13933	·03162	·00792	·00266
53	·14194	·03260	·00848	·00292
54	·14505	·03365	·00912	·00322
55	·14881	·03481	·00987	·00357
56	·15335	·03610	·01075	·00400
57	·15889	·03753	·01181	·00452
58	·16565	·03916	·01308	·00514
59	·17395	·04103	·01462	·00590
60	·18416	·04319	·01648	·00683
61	·19674	·04573	·01876	·00798
62	·21229	·04872	·02155	·00938
63	·23153	·05229	·02497	·01112
64	·25537	·05658	·02919	·01326

PART 4. SUPPORTING INVESTIGATIONS

4.1 The data were collected in such a way that it would be possible to investigate the effect of a number of attributes, such as how the level of morbidity alters according to size of benefit, and whether there has been a medical examination or not. The results are given in the rest of this part together with comments where appropriate. The tables for parts 4 and 5 will be found on pages 35–56.

A lot of caution is needed in the interpretation of these results as the data are far from homogeneous. In some cases more than one trend may be at work, *e.g.* a trend to heavier morbidity for larger amounts of benefit may be masked by the larger policies of short duration (although the relevance of selection is in fact doubtful—see § 5.1). In other cases the volume of data is still small, but nevertheless it was felt desirable to set down the results so far, as the investigations will be repeated in approximately 4 years' time when additional data will no doubt be used to indicate whether a particular feature appears to have significance or not. To this extent some results are merely reported to form the starting point for a longer-term study in the future.

4.1.1. *Basis of comparison.* Actual sickness divided by expected sickness has been used as the basis of all comparisons except for inception rates. The experience as a whole has been compared with Manchester Unity in earlier parts; but in this part it was felt that the comparison should be with the overall ungraduated male experience rather than with Manchester Unity so that all values of 100 A/EP might be compared with a figure of 100. (EP denotes expected sickness from this experience, whereas E denotes expected sickness from Manchester Unity.)

4.2. *Analysis by amounts of benefit.* The data were collected in such a form that it was possible to analyse the results for benefits within certain bands and the four bands selected were: up to £500 per annum, £501–1,000 per annum, £1,001–2,000 per annum and over £2,000 per annum. The investigation still works in calendar years and counts each policy at a unit value; it does not weight the results by size of benefit and no attempt has been made to eliminate duplicates, so that two policies for £400 per annum each on the same life would be counted twice in the 'up to £500 per annum' group and not at all in the '£501–1,000 per annum' group.

4.2.1. The initial comparison was made for males all deferred periods combined and the results are shown in Table SA 4.2.1. To illustrate the heterogeneity the value of the expected weeks of claim divided by the exposed to risk in the 104/all period is given to show that the larger benefits have a lower average age. The percentage of actual claims by sickness period is also shown, as a lower percentage in the 104/all period is likely to indicate more recent selection and/or a lower average age. The overall results for one 5-year age group, namely 45–50 are also given to confirm the provisional conclusion that there is no particular tendency for sickness rates to vary with size of policy.

4.2.2. To eliminate some of the variables, the results were calculated for Table

1—policies deferred 1 week and Table 4—policies deferred 26 weeks, with subdivisions by age and these are given in Table SA 4.2.2. Once more it is not possible to discern any trends by size of benefit and the results simply seem to raise more questions without solving any. For example, the consistently low figures for Table 1, benefit £501–1,000, age 40–50, are preceded by high figures at ages under 40 and again at ages 50–60. A few bad claims, perhaps with duplicate policies, could be the cause although the Sub-Committee were not able to investigate this.

4.2.3. Inception rates are given in Table SA 4.2.3. Looking at these rates, yet again there does not seem to be any real tendency. Counting the number of times the figure in one column exceeds that in the previous column seems to indicate from the 1-week and 4-week results that perhaps there is a tendency for inception rates to increase with size of benefit, but this is not so with regard to the 13-weeks rates and tends to be the reverse with the 26-weeks inception rates. This may be the result of there being a greater amount of recent selection in the larger 26-weeks policies than with the policies with shorter deferred periods, but this would be guessing.

On this question of selection, however, it is worth noting in Table SA 4.2.2 that the actual to expected for benefits £2,001 and over is consistently low at all ages for the sickness period 104/all.

4.2.4. Tables SA 4.2.4a and SA 4.2.4b give the corresponding results for females. There were no sufficient data to justify showing the actual sickness to expected for Table 7—policies with a 1-week deferred period but the comparative figures for Table 12 have been added. In this case it does appear that there may be a trend to have higher sickness rates for the higher benefit policies. At least this would appear to be so on the basis of Table 12 and the inception rates for deferred 1-week and deferred 4-weeks policies. On the other hand, it could be argued that Table 10 and the inception rates for that deferred period indicate the reverse.

4.2.5. The results shown at this stage probably suffer considerably from the effects of inflation, particularly when a life either effects an additional policy or has an existing policy replaced by one which gives rise to a higher amount of benefit. In 4 years' time it is likely that the Sub-Committee would use different ranges, in effect increasing the points of £500, £1,000 and £2,000 to allow for the average amount of inflation between 1972–75 and the period covered by the next investigation.

A better picture might have been forthcoming had an analysis been done on benefit as a percentage of earnings but the Sub-Committee were unable to investigate this. Part of the problem of any analysis lies in the varying methods of increasing a person's cover. Even if cover is increased on the existing policy or by issuing a new policy for the total cover there is a problem in deciding if to treat the life as entering from the old or new entry date. These methods will, however, make for a more satisfactory analysis than one which gives rise to duplicates at smaller benefit levels.

4.2.6. As it was felt that the results could be affected by the considerable inflation which gripped the U.K. economy during the period 1972–75 it was decided to examine the male experience of policies taken out in the five calendar years 1965–69 inclusive. About 20% of the actual sickness for all business was found to be attributable to these policies and the results are given in Tables SA 4.2.6(a) and SA 4.2.6(b). Even though the volume of data implies considerable statistical irregularities the full results of the calculations are shown and again they fail to show any significant trends by size of policy.

4.3. The other attributes, on which experience was collected, are shown in Table SA 4.3.0, together with the number of claims arising under each heading. When a claim continues beyond the end of 1 year and into the next it counts as two claims and if it continues into a further year it counts as three claims, and so on, provided that the office continues to supply data for the investigation.

4.3.1. It was decided to investigate the experience in a number of these subdivisions. The relative morbidity of male and female lives is discussed in § 5.2 but generally speaking the female content of the further investigations would be too small to be significant and these have therefore been restricted to male lives.

A number of classifications have not been investigated because they would be too small to be significant or too large to be much different from the business as a whole, *i.e.* U.K., Isle of Man and Channel Islands; unrated for occupation; waiver of premium on life policies and lump sum benefits; medical non-selection; all types of premium; no medical exclusion. Two other groups were not investigated because they are not expected to be a permanent feature of the investigation, namely unknown type of medical evidence and cases where a medical exclusion may or may not be present (for business existing at 1 January 1972 only).

It was also decided to amalgamate all four categories where a medical exclusion was known to exist and, even though it was still small, to further report on the experience for policies excluding claims by neurosis, psychoneurosis and psychosis (including anxiety state) as it was felt that this aspect could be of increasing importance for future underwriters.

The experience is shown together in Table SA 4.3.1(a)100A/EP and Table SA 4.3.1(b)—Inception rates.

4.3.2. *Eire.* Except for the oldest group and the longest duration of sickness the morbidity seems to be fairly consistently above average—overall 155%. Compared to all policies in the investigation, inception rates vary quite a bit, probably because of the small amount of data, but are not as much as 55% higher on average. This might seem to suggest that recovery rates are lower than in the U.K. but the worst comparison with U.K. sickness rates—Table SA 4.3.1(a)—seems to be in the periods 26/26 and 52/52 and not in the 104/all period.

4.3.3. *Policies charged higher rates of premium on account of occupation.* Overall the average of actual claims to expected is 163% and all figures are fairly consistently high. There is a fairly young average age in this group, so that very

little reliance should be placed on the figure of 228% for age group 60–65. This group probably contains a fairly wide variety of risks and will probably give very little guidance to underwriters. About 55% of the policies in this group have a deferred period of 4 weeks and as the inception rates do not seem to be nearly as high as 163% of the rates for all policies, it would seem to be a case of poorer recovery rates as well as more claims.

4.3.4. *Level, increasing or decreasing benefit policies.* It was felt worth while tabulating the results for all three types as the decreasing benefit policies are generally speaking ones taken out many years in the past, whereas the increasing benefit policies are of very recent origin. Most of the business is of the level benefit type and its experience cannot be said to be anything other than the experience of the business as a whole.

Over 80% of the decreasing benefit policies have a deferred period of 1 week or less and the balance is almost entirely from 4-weeks deferred policies. The actual to expected tends to increase for sicknesses of longer duration but not with age whereas the opposite might have been expected for a benefit of this nature; this group contributes 40% of sickness claims in the age group 60–65 as against 20% overall. Inception rates for 1-week policies are about average on the whole but the exceptionally low rates for 4-week policies are difficult to understand.

Increasing policies contain very few 1-week deferred policies and have a young average age. The low morbidity for longer periods of sickness is almost certainly due to relatively few lives yet being eligible for benefits of the longer duration. The figure of 274% for age group 60–65 is of no real statistical significance. The inception rates jump around so much that they cannot yet be said to be reliable. Time alone will tell whether the morbidity calculated for 1972–1975 gives an indication of how the experience of the increasing benefit policies will gradually work its way ultimately to the experience now shown by the decreasing benefit policies.

4.3.5. *Medical or non-medical business.* At the start of the investigation some offices found it impractical to say whether existing business was medical or non-medical with the result that these two groups are of comparatively recent origin. Like the increasing benefit policies they therefore also have a young average age and ratios of actual to expected that become lower for the longer periods of sickness. Probably for the same reason the ratios of actual to expected tend to decrease as age increases so this feature is likely to be of lessening importance as time passes.

Except at the older ages the non-medical experience would appear to be more favourable than the medical but the amount of data is still fairly small. One explanation might be that at the younger ages it is those lives who appear less healthy that are asked to attend for medical examination, whereas at the older ages any underwriting was probably done many years ago and any differences between the groups have probably worn off.

A scrutiny of the inception rates does not seem to add anything further—if anything the variations that are shown tend to emphasize the importance of

obtaining more data. On the whole the inception rates for medical business appear to be average or slightly above average with those for non-medical being at a slightly lower level.

4.3.6. *Policies with medical exclusions.* Except at the higher ages and longer durations of sickness the percentages of actual to expected claims appear to be consistently above average, even in the smaller group of policies with exclusions limited to neurosis, psychoneurosis and psychosis (including anxiety state) where the very limited experience averages 158%.

As with the investigation of medical and non-medical business it was not practical for all offices to state whether there was any exclusion or not at the start of the investigation, but the problem is not nearly so serious in this case.

On the whole the above remarks appear to be borne out by higher inception rates.

PART 5

5.1. *Selection* This part of the investigation, like the graduation problem, presented complexities requiring a good deal of further research. It is clear that no worthwhile conclusions about the effect of medical selection could have been expected, at least until combined figures for several years' experience were available. It was thought that to establish basic facts about selection, one should make a reasonable estimate of the period of selection and then run a tabulation of the ultimate experience. It was strongly felt that the period should be short since the possibility of tracing selection among other complex factors for even 5 years is remote. The choice fell on a 3-year period, and the tabulation first examined was for all deferred periods combined.

5.1.1. By subtraction from the aggregate figures, it was possible to compare ultimate and select data. The results appear in Table SA 5.1.1. They suggest that there may be little difference between select and ultimate morbidity; indeed over the range 30–44 the select experience appears to be slightly the heavier. Naturally it is important to analyse the data in the light of a working hypothesis which might account for the results.

In a recent paper to the Society of Actuaries Miller & Courant (12) recalled that a similar type of negative selection at the younger ages had been found on the individual waiver of premium benefits experience by amounts from 1946 to 1950. The data had been divided into three age groups, 25–39, 40–49 and 50–59 and two policy year groups 2–5 and 6–10. The authors commented

> The coefficient of selection at the younger ages is actually negative; at the middle ages it is positive, but hardly significant. Only at the older ages does it bear some resemblance to that observed in life insurance. Two possible explanations are submitted. At the younger ages a large portion of disability is due to accident. If there is a correlation between accident proneness and a tendency to neglect one's financial undertakings, lapsation could result in improvement in the experience.

> Furthermore, the generally presumed inclination for the impaired or substandard lives to be more persistent than the healthy lives may be more than offset by a similar correlation between the management of one's budget and the observance of good health habits. That is to say, the person who lapses his policy because he loses his job or neglects his financial husbandry may also be negligent with respect to his health.
>
> At the older ages attrition through lapsation may continue to exert a salutary effect on the experience, but, if so, this is more than offset by the inevitable deterioration in health as chronic diseases take their increasing toll.

They also reported on some experience for a small Canadian office which appeared to reinforce their theory that lapses do not necessarily result mainly in the loss of healthier or non-claiming lives.

5.1.2. On planning the present investigation in the early 1970s the census method was chosen as being most compatible with the form in which a majority of contributing offices preferred to submit their data. Therefore we must accept that it is not possible to investigate why exits disappeared from the 'in force' between successive censuses. The best we can do is to make simple calculations to assess the effect of supposing that withdrawals are on a selective basis (in this case, withdrawal of lives otherwise most likely to make future claims).

There is some evidence that the more usual form of selection may be operating. Indeed, at the ages over 50 where there is probably little in the way of lapsing policies, it would seem reasonable to suggest that select sickness rates might be about 85% of ultimate rates. Comparing the select rates in the last column of Table SA 5.1.1. with 85% of the ultimate rates in the same table suggests, therefore, that the 'self selection' extra morbidity in the age range 30–44 may perhaps be in the region of 25–30% during the first 3 years of a policy's existence.

On the other hand it cannot be said with any degree of certainty that the findings from waiver of premium business in America will apply to income replacement business (*i.e.* PHI) in the United Kingdom, even though it would be wrong not to point out the possible similarities. Moreover the proportion of business charged higher rates of premium on account of occupation has been increasing more rapidly throughout most of the period as the following figures show:

	1 Jan. 72	31 Dec. 72	31 Dec. 73	31 Dec. 74	31 Dec. 75
Total in force (M/F)	137,831	157,098	163,199	185,733	201,700
Total occupationally rated cases (M/F)	20,831	16,935	18,892	24,089	27,304

The exposed to risk for the select group therefore includes a slightly higher proportion of this type of business, which on average experienced 163% of the claims expected according to the results for all business. This is almost certainly one of the reasons for the unexpected results from the select/ultimate investigation but no further work was done, there appearing to be little prospect of any clearer result. (In considering this particular aspect it should be borne in mind

that the Sub-Committee were unable to put forward an authoritative opinion on the way underwriting of the occupation risk should be done.)

5.1.3. The search for a working hypothesis included the possibility of time selection. In Part Four we investigated policies effected in 1965–69 separately for the purpose of the 'amounts' analysis. This showed no evidence of a breakthrough to a homogeneous group. It was equally difficult to see any consistent alteration in the pattern of 'ultimate' rates in that period. We therefore sum up with the suggestion that selective lapsation and effects of occupational risks are almost certainly the strong factors. The data, however, are heterogeneous and remain so even if we narrow the investigation to include only 1965–69 entrants.

Table SA 5.1.3(a) was prepared with the intention of investigating the effect of deferred period on selection and it can be seen that similar results were obtained except for Table 1—policies with deferred periods of 1 week or less. It should, however, be mentioned that compared with earlier years the proportion of new policies in 1972–75 with a deferred period of 1 week is substantially reduced.

Table SA 5.1.3(b) was prepared with the idea of showing some evidence of regularity in the complex pattern. It will be seen that age and deferred period are relevant factors, but it is only when most of the details are suppressed that such a pattern emerges.

Whatever the lack of conclusion arising from these results, it is not suggested that selection of lives on medical grounds should be abandoned. There is little doubt in the minds of the Sub-Committee that the morbidity would have been considerably heavier without such a selective influence.

5.2. *Female lives* Table SA 5.2.0 shows 100 A/EP for female policies, all deferred periods combined in quinquennial groupings. There are insufficient data to provide any meaningful percentages in such detail for any of the individual deferred periods. However, by combining certain of the quinquennial groups it is possible to obtain slightly more consistent figures, although paucity of data does still cause substantial variations from one sickness period to the next, or from one age group to the next.

Table SA 5.2.0. 1972–75 *experience—Females—Comparison with Males. Actual weeks of claim (females)* × 100/*EP*

Table 12. *All deferred periods combined*

Sickness period	Age group							
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59
1/3	85	188	150	196	138	168	118	156
4/9	142	139	184	202	146	206	136	172
13/13	241	157	259	150	227	135	121	161
26/26	207	301	428	197	263	141	135	126
52/52	29	184	385	488	233	143	128	129
104/all	0	0	41	195	160	303	60	186
all periods	144	167	241	224	192	206	100	162

5.2.1. The resulting figures are shown in Tables SA 5.2.0 and 5.2.1. There is very little to comment on, except for the fact that at the highest age group, 50–59, the percentages are somewhat less than in the central group and this corresponds with what has been experienced in some other investigations.

It was thought that it might be worth looking at the question of recent selection, but this does not appear a significant factor, as the exposed to risk in the 104/all period divided by the exposed to risk in the period immediately following the completion of the deferred period tends to be only very slightly less for females than for males, nor does there appear to be any great difference between the average ages in the male experience and the female experience.

5.2.2. A comparison of the inception rates given in Se 1972–75, Tables 13 and 14, does tend to confirm the results observed by comparing actual and expected claims.

Table 5.2.1. 1972–75 *experience—Females—Comparison with Males. Actual weeks of claim (females)* $\times 100/EP$

Sickness period	20–39	40–49	50–59
Policies deferred 1 *week*			
1/3	167	159	134
4/9	230	228	179
13/13	317	197	111
26/26	286	200	104
52/52	354	142	91
104/all	0	324	175
all periods	206	214	145
Policies deferred 4 *weeks*			
4/9	148	141	110
13/13	142	142	136
26/26	193	179	109
52/52	232	233	131
104/all	179	292	184
all periods	160	191	141
Policies deferred 13 *weeks*			
13/13	183	194	178
26/26	235	197	182
52/52	178	313	200
104/all	194	442	174
all periods	199	308	182
Policies deferred 26 *weeks*			
26/26	426	247	127
52/52	648	91	126
104/all	77	36	54
all periods	395	109	79
Policies deferred 52 *weeks*			
52/52	5,100	332	126
104/all	—	148	34
all periods	5,100	195	62
All deferred periods combined			
1/3	167	159	134
4/9	171	182	151
13/13	186	169	138
26/26	273	189	131
52/52	375	178	128
104/all	126	258	120
all periods	205	201	129

Table SA4.2.1. 1972/75 *experience—Males. Preliminary analysis by amounts. All ages combined*

	Amount of benefit per annum			
	£1–500	**£501–1,000**	**£1,001–2,000**	**£2,001 and over**
Total weeks of claim	45,740	87,875	55,442	15,524
Percentage of total				
in sickness period 1/3	8	9	11	16
4/9	13	16	19	23
13/13	9	11	12	15
26/26	13	13	13	18
52/52	15	15	14	15
104/all	42	36	31	13
all periods	100	100	100	100
(EP weeks of claim)				
÷ (Exposed to risk)				
for 104/all period	0·23	0·16	0·11	0·09
Actual weeks of				
claim × 100/EP				
in sickness period 1/3	94	102	97	113
4/9	97	101	94	115
13/13	94	104	91	114
26/26	95	99	93	140
52/52	97	103	92	118
104/all	101	106	96	58
all periods combined				
All ages	98	103	94	105
Age group 45–50	111	93	101	101

Table SA4.2.2 *(Analysis by amounts)* is overleaf

Table SA4.2.2. 1972/75 *experience—Males. Analysis by amounts. Actual weeks of claim* × 100/*EP*

Table 1. *Policies deferred* 1 *week*

		Amount of benefit per annum			
Age group	Sickness period	**£1–500**	**£501–1,000**	**£1,001–2,000**	**£2,001 and over**
Under 40	1/3	95	118	88	106
	4/9	126	137	79	96
	13/13	183	159	72	73
	26/26	184	172	56	79
	52/52	348	162	53	61
	104/all	32	61	164	0
	all periods	124	130	83	95
40–50	1/3	95	93	105	122
	4/9	95	92	103	133
	13/13	109	89	90	185
	26/26	123	83	91	181
	52/52	135	102	77	129
	104/all	184	67	103	86
	all periods	121	87	99	131
50–60	1/3	94	100	101	143
	4/9	97	100	89	211
	13/13	85	106	82	282
	26/26	76	104	82	401
	52/52	91	103	97	166
	104/all	111	103	83	66
	all periods	97	102	89	176
60–65	1/3	93	105	105	134
	4/9	100	99	101	152
	13/13	99	88	121	293
	26/26	104	78	118	513
	52/52	96	98	116	127
	104/all	86	115	108	0
	all periods	93	103	110	141
All ages combined	1/3	94	102	97	113
	4/9	99	102	92	123
	13/13	98	102	87	149
	26/26	99	96	86	202
	52/52	100	102	91	128
	104/all	104	101	98	58
	all periods	100	101	94	120
Total actual weeks of claim		22,662	37,607	21,747	6,848

Table SA4.2.2 (*continued*)

Table 4. *Policies deferred* 26 *weeks*

Age group	Sickness period	Amount of benefit per annum £1–500	£501–1,000	£1,001–2,000	£2,001 and over
Under 40	26/26	94	121	77	83
	52/52	102	106	106	49
	104/all	224	64	92	0
	all periods	137	99	91	50
40–50	26/26	104	75	94	188
	52/52	86	62	132	161
	104/all	121	58	156	36
	all periods	106	63	132	120
50–60	26/26	112	102	86	90
	52/52	134	74	90	164
	104/all	80	108	110	95
	all periods	94	102	103	108
60–65	26/26	90	99	112	147
	52/52	85	126	85	44
	104/all	101	113	91	0
	all periods	96	114	93	28
All ages combined	26/26	103	100	90	123
	52/52	107	89	102	125
	104/all	94	102	111	60
	all periods	99	99	105	91
Total actual weeks of claim		9,075	13,405	8,849	1,758

Table SA4.2.3. 1972/75 *experience—Males. Analysis by amounts. Inception rates per thousand exposed to risk*

Deferred period	Age group	All policies	Amount of benefit per annum £1–500	£501–1,000	£1,001–2,000	£2,001 and over
1 week	20–24	138	554	207	138	105
	25–29	115	89	128	111	116
	30–34	122	119	125	110	143
	35–39	123	68	130	113	163
	40–44	132	108	130	136	149
	45–49	132	119	116	145	201
	50–54	135	112	134	152	164
	55–59	159	157	160	152	233
	60–64	213	192	223	229	383
4 weeks	20–24	15	18	11	18	22
	25–29	15	15	14	14	18
	30–34	17	24	16	14	19
	35–39	19	17	19	20	14
	40–44	26	25	27	24	25
	45–49	29	25	26	30	38
	50–54	30	25	34	27	32
	55–59	38	23	40	45	63
	60–64	49	37	60	46	43
13 weeks	20–24	3	1	1	5	0
	25–29	2	4	2	2	3
	30–34	2	2	2	2	1
	35–39	3	3	3	3	5
	40–44	4	5	4	4	4
	45–49	6	3	7	5	7
	50–54	7	7	8	7	4
	55–59	13	10	14	14	18
	60–64	21	16	26	21	13
26 weeks	20–24	1	1	1	4	0
	25–29	0	1	0	0	0
	30–34	1	0	1	0	1
	35–39	1	1	1	1	0
	40–44	1	1	1	1	1
	45–49	2	2	2	1	3
	50–54	3	4	3	3	3
	55–59	5	3	6	4	4
	60–64	9	10	9	9	11
52 weeks	45–49	1	1	1	0	1
	50–54	1	2	1	1	0
	55–59	2	0	3	2	0
	60–64	5	0	0	11	14

Table SA4.2.4a *(Analysis by amounts)* is overleaf

Table SA4.2.4a. 1972/75 *experience—Females. Analysis by amounts. Actual weeks of claim* × 100/*EP*

Table 10. *Policies deferred* 26 *weeks*

		Amount of benefit per annum			
Age group	Sickness period	£1–500	£501–1,000	£1,001–2,000	£2,001 and over
Under 40	26/26	248	88	61	0
	52/52	238	82	72	0
	104/all	125	0	225	0
	all periods	235	80	77	0
40–50	26/26	24	84	198	0
	52/52	41	155	40	0
	104/all	71	164	0	0
	all periods	35	115	131	0
50–60	26/26	223	34	54	0
	52/52	209	57	11	0
	104/all	25	194	0	0
	all periods	114	112	21	0
All ages combined	26/26	167	71	110	0
	52/52	192	87	53	0
	104/all	30	176	42	0
	all periods	123	103	77	0
Percentage of actual sickness by period	26/26	42	27	64	0
	52/52	49	31	28	0
	104/all	9	42	8	0
	all periods	100	100	100	0

Table SA4.2.4a (*continued*)

Table 12. *All deferred periods combined*

Age group	Sickness period	Amount of benefit per annum £1–500	£501–1,000	£1,001–2,000	£2,001 and over
Under 40	1/3	75	69	103	144
	4/9	64	83	116	169
	13/13	81	85	114	137
	26/26	104	92	104	118
	52/52	102	115	79	56
	104/all	22	144	94	0
	all periods	81	93	104	133
40–50	1/3	66	102	83	288
	4/9	89	115	77	130
	13/13	68	133	64	113
	26/26	36	125	93	181
	52/52	35	154	29	222
	104/all	161	99	5	239
	all periods	101	116	47	192
50–60	1/3	111	89	114	0
	4/9	132	86	47	242
	13/13	119	89	43	413
	26/26	117	87	63	410
	52/52	118	100	60	100
	104/all	70	114	146	0
	all periods	98	100	92	176
All ages combined	1/3	89	89	98	174
	4/9	97	96	91	161
	13/13	90	105	83	157
	26/26	85	103	92	179
	52/52	89	123	55	126
	104/all	108	107	56	166
	all periods	97	106	77	162
Percentage of actual sickness by period	1/3	6	7	15	20
	4/9	17	15	23	25
	13/13	10	12	14	13
	26/26	12	15	19	16
	52/52	14	18	11	10
	104/all	41	33	18	16
	all periods	100	100	100	100

Table SA4.2.4b. 1972/75 *experience—Females. Analysis by amounts. Inception rates per thousand exposed to risk*

Deferred period	Age group	All policies	Amount of benefit per annum £1–500	£501–1,000	£1,001–2,000	£2,001 and over
1 week	20–24	136	0	0	143	188
	25–29	173	0	129	186	193
	30–34	181	87	117	184	289
	35–39	218	178	146	218	489
	40–44	179	10	149	185	544
	45–49	198	152	193	185	500
	50–54	149	127	131	222	286
	55–59	213	303	167	175	0
4 weeks	20–24	12	19	3	28	0
	25–29	14	28	11	12	18
	30–34	25	5	32	28	27
	35–39	30	18	26	42	58
	40–44	36	15	64	28	29
	45–49	44	80	24	34	40
	50–54	32	51	15	24	111
	55–59	50	57	61	0	143
13 weeks	20–24	4	0	7	0	—
	25–29	4	0	0	10	-
	30–34	3	9	2	4	
	35–39	5	7	4	6	
	40–44	13	4	18	10	
	45–49	8	3	14	0	
	50–54	18	15	23	8	
	55–59	7	18	14	33	-
26 weeks	20–24	0	0	0	0	.
	25–29	1	0	0	4	.
	30–34	0	0	0	0	.
	35–39	4	9	3	4	-
	40–44	2	0	1	6	
	45–49	3	3	4	1	-
	50–54	4	11	2	2	
	55–59	7	11	5	0	—

Note: Where a '—' has been given rather than '0', very little data has been available. Policies with a deferred period of 52 weeks have been excluded for a similar reason.

Table SA4.2.6a. 1972/75 *experience—Males. Analysis by amounts. Policies taken out in calendar years* 1965 *to* 1969 *inclusive. Actual weeks of claim* × 100/*EP*

Table 6. *All deferred periods combined*

		Amount of benefit per annum			
Age group	Sickness period	£1–500	£501–1,000	£1,001–2,000	£2,001 and over
Under 40	1/3	104	136	89	142
	4/9	107	114	70	108
	13/13	118	107	60	93
	26/26	88	102	71	129
	52/52	146	140	73	77
	104/all	260	127	79	0
	all periods	128	119	74	106
40–50	1/3	74	117	104	127
	4/9	88	101	100	102
	13/13	72	99	92	96
	26/26	39	108	79	105
	52/52	41	144	71	71
	104/all	88	80	75	17
	all periods	70	102	84	71
50–60	1/3	88	106	79	140
	4/9	106	114	73	108
	13/13	139	124	73	93
	26/26	146	106	88	115
	52/52	98	86	83	126
	104/all	68	85	99	48
	all periods	93	95	89	82
60–65	1/3	44	98	98	88
	4/9	83	106	78	65
	13/13	71	71	71	60
	26/26	21	64	74	141
	52/52	11	113	48	159
	104/all	15	67	32	120
	all periods	26	79	48	122
All ages combined	1/3	87	123	92	138
	4/9	99	109	82	104
	13/13	103	106	76	92
	26/26	87	103	79	116
	52/52	78	117	73	102
	104/all	79	84	79	44
	all periods	86	99	80	86

Table SA4.2.6b. 1972/75 *experience—Males. Analysis by amounts. Policies taken out in calendar years* 1965 *to* 1969 *inclusive. Inception rates per thousand exposed to risk*

Deferred period	Age group	Amount of benefit per annum £1–500	£501–1,000	£1,001–2,000	£2,001 and over
1 week	25–29	68	180	116	166
	30–34	100	132	106	169
	35–39	112	145	112	173
	40–44	59	167	131	169
	45–49	133	131	136	181
	50–54	132	158	129	212
	55–59	130	156	115	260
	60–64	146	236	199	278
4 weeks	25–29	11	16	6	0
	30–34	21	15	11	11
	35–39	16	18	14	8
	40–44	15	27	21	19
	45–49	33	28	21	26
	50–54	26	44	26	14
	55–59	66	53	45	63
	60–64	60	95	32	0
13 weeks	25–29	3	2	0	0
	30–34	2	2	1	1
	35–39	4	2	2	1
	40–44	5	3	3	3
	45–49	5	6	4	5
	50–54	11	10	6	2
	55–59	13	14	11	12
	60–64	0	13	10	0
26 weeks	25–29	0	1	0	0
	30–34	0	0	0	5
	35–39	0	1	1	0
	40–44	1	1	0	1
	45–49	1	2	2	2
	50–54	3	2	4	2
	55–59	5	7	5	0
	60–64	14	3	5	19

Table SA4.3.0. 1972/75 *experience. Number of claims during the period, analysed by various attributes*

Attribute		Number of claims
Sex	Males	21,534
	Females	1,142
Country	U.K.	22,108
	Eire	568
	Isle of Man	Nil
	Channel Islands	Nil
Occupation	normal rates	19,599
	at higher rates	3,077
Type of benefit	level benefit	17,431
	increasing benefit	304
	decreasing benefit	4,941
	waiver of premium	Nil
	lump sum benefit	Nil
Medical evidence	medical	2,266
	non-medical	1,598
	non-selection	Nil
	unknown	18,812
Type of premium	level annual premium	22,666
	recurring single premium	Nil
	increasing annual premium	7
	other	3
Medical exclusions	none	18,424
	hypertension and disease of cardiovascular system	20
	neurosis, psychoneurosis and psychosis (including anxiety state)	299
	may or may not be present (for business existing at 1.1.72 only)	2,212
	exclusion present but related impairment not known (for business existing at 1.1.72 only)	131
	all other exclusions	1,590

Table SA4.3.1a. 1972/75 *experience. Analysis by attributes. Males—Table* 6. *All deferred periods combined. Actual weeks of claim* × 100/*EP*

Attribute and sickness period	Age group under 40	40–50	50–60	60–65	all ages	Total weeks of sickness and the percentage in each period
Eire						7,097
1/3	159	123	144	129	141	6
4/9	173	161	162	81	164	24
13/13	202	178	172	59	180	17
26/26	255	153	238	133	206	18
52/52	209	166	197	202	190	17
104/all	136	33	159	34	98	18
all periods	190	127	177	85	155	100
Occupational rated						29,052
1/3	162	150	164	133	157	7
4/9	141	145	124	166	141	30
13/13	170	177	159	259	174	18
26/26	197	199	197	371	208	16
52/52	184	175	220	298	203	13
104/all	90	113	156	189	140	16
all periods	157	154	164	228	163	100
Level benefits						159,760
1/3	99	100	97	113	100	9
4/9	97	99	98	108	98	16
13/13	98	97	99	101	98	11
26/26	100	99	97	94	98	14
52/52	105	102	92	100	98	15
104/all	105	98	97	91	96	35
all periods	99	99	96	95	98	100
Decreasing benefits						41,510
1/3	107	99	103	96	100	16
4/9	65	108	104	95	99	17
13/13	93	130	103	98	104	10
26/26	72	167	117	110	117	10
52/52	0	83	145	98	115	12
104/all	0	175	117	118	120	35
all periods	80	121	114	106	110	100
Increasing benefits						3,344
1/3					123	4
4/9					109	28
13/13					98	23
26/26					68	17
52/52					64	14
104/all					46	14
all periods	91	56	76	274	77	100

Table SA4.3.1a. (*continued*)

Attribute and sickness period	Age group under 40	40–50	50–65	all ages	Total weeks of sickness and the percentage in each period
Medical					14,076
1/3	108	110	93	107	8
4/9	112	103	73	105	34
13/13	116	104	74	106	21
26/26	119	90	53	94	17
52/52	104	92	57	83	13
104/all	51	34	26	32	7
all periods	110	85	50	87	100
Non-medical					6,278
1/3	83	94	58	84	18
4/9	79	82	56	79	26
13/13	77	78	56	75	18
26/26	74	108	81	86	20
52/52	59	53	85	63	12
104/all	32	19	38	28	6
all periods	75	68	59	70	100

	under 40	40–50	50–60	60–65	all ages	
With any medical exclusion						14,846
1/3	111	99	109	113	107	15
4/9	112	102	109	108	107	20
13/13	122	111	119	114	116	12
26/26	163	133	157	97	138	13
52/52	170	206	148	92	142	15
104/all	186	63	95	90	90	25
all periods	125	108	116	97	111	100

	under 50	50–65	all ages	
With neurosis types of medical exclusion				2,208
1/3	119	133	125	10
4/9	157	140	150	19
13/13	197	141	170	13
26/26	258	140	186	14
52/52	475	198	277	22
104/all	183	94	110	22
all periods	201	129	158	100

Table SA4.3.1b. 1972/75 *experience. Analysis by attributes. Males. Inception rates per thousand exposed to risk*

Age group	Eire	Occupation rated	Level benefits	Decreasing benefits	Increasing benefits	All policies	Medical	Non-medical	Any exclusion	Neurosis type of exclusion
Deferred 1 *week*										
20–24	221	286	132	100	426	138	132	105	68	63
25–29	178	120	114	144	71	115	128	98	124	159
30–34	89	159	118	170	120	122	141	112	140	75
35–39	135	147	123	125	80	123	155	112	145	230
40–44	149	164	135	115	70	132	159	122	114	212
45–49	133	166	131	133	219	132	177	138	149	220
50–54	115	203	142	125	105	135	141	122	150	262
55–59	278	213	149	167	200	159	172	65	175	292
60–64	227	254	249	200	0	213	106	111	227	143
Deferred 4 *weeks*										
20–24	14	18	15	3	21	15	16	13	30	32
25–29	17	19	14	8	18	15	17	13	13	14
30–34	28	22	16	7	18	17	19	12	18	28
35–39	27	26	19	5	17	19	22	16	18	32
40–44	43	34	27	8	14	26	29	26	30	38
45–49	31	35	29	8	25	29	29	30	34	29
50–54	45	42	31	9	30	30	27	30	41	28
55–59	69	40	44	4	28	38	36	0	35	143
60–64	30	71	65	6	333	49	36	0	30	67

Table SA4.3.1b (*continued*)

Age group	Eire	Occupation rated	Level benefits	Decreasing benefits	Increasing benefits	All policies	Medical	Non-medical	Any exclusion	Neurosis type of exclusion
Deferred 13 *weeks*										
20–24	0	3	2	—	3	3	5	2	10	0
25–29	2	5	2	—	2	2	2	3	5	11
30–34	4	3	2	—	1	2	2	3	2	0
35–39	6	7	3	—	4	3	5	4	4	9
40–44	8	8	4	—	3	4	5	4	3	16
45–49	4	11	6	—	3	6	8	6	6	9
50–54	6	7	7	—	7	7	7	3	14	52
55–59	7	20	13	—	27	13	27	13	4	0
60–64	27	0	21	—	0	21	8	25	16	0
Deferred 26 *weeks*										
20–24	0	1	1	—	0	1	1	1	0	—
25–29	3	1	0	—	1	0	0	1	0	—
30–34	0	1	1	—	0	1	0	1	0	—
35–39	0	1	1	—	0	1	0	1	0	—
40–44	0	2	1	—	0	1	0	1	0	—
45–49	0	5	2	—	0	2	2	3	0	—
50–54	5	16	3	—	2	3	4	2	11	—
55–54	9	0	5	—	0	5	2	19	10	—
60–64	7	20	9	—	0	9	0	0	0	—
Deferred 52 *weeks*										
45–49	0	13	1	—	0	1	1	1	6	—
50–54	0	0	1	—	3	1	3	0	10	—
55–59	0	0	1	—	26	2	8	0	0	—
60–64	0	0	5	—	0	5	0	0	.43	—

Table SA5.1.1. 1972/75 *experience—Males—Ultimate and Select sickness rates*

Table 6. *All deferred periods combined*

Age group and sickness period	Ultimate experience		Select experience		Actual sickness rates	
	Exposed to risk	Actual weeks of claim	Exposed to risk	Actual weeks of claim	Ultimate	Select
25–29						
1/3	4,493	727	5,965	819	·162	·137
4/9	13,364	971	18,804	1,576	·073	·084
13/13	20,263	659	28,068	807	·033	·029
26/26	34,873	508	43,675	496	·015	·011
52/52	36,904	484	34,064	129	·013	·004
104/all	36,904	492	10,422	0	·013	—
30–34						
1/3	7,922	1,341	3,071	555	·169	·181
4/9	20,395	1,810	13,826	1,298	·089	·094
13/13	34,614	897	22,555	691	·026	·031
26/26	54,944	826	34,677	576	·015	·017
52/52	59,721	685	28,845	428	·011	·015
104/all	59,721	513	9,000	72	·009	·008
35–39						
1/3	9,423	1,732	1,887	391	·184	·207
4/9	25,243	2,546	9,503	1,147	·101	·121
13/13	42,515	1,676	17,017	753	·039	·044
26/26	65,186	1,664	25,761	741	·026	·029
52/52	72,745	1,106	22,351	363	·015	·016
104/all	72,745	1,332	6,970	23	·018	·003
40–44						
1/3	10,557	2,270	1,636	369	·215	·226
4/9	26,716	4,116	6,663	958	·154	·144
13/13	44,737	2,370	12,159	599	·053	·049
26/26	68,549	2,227	18,379	671	·032	·037
52/52	77,823	2,311	16,543	541	·030	·033
104/all	77,823	5,055	5,215	103	·065	·020
45–49						
1/3	12,484	3,026	1,064	273	·242	·257
4/9	26,322	5,100	3,654	743	·194	·203
13/13	41,899	3,548	6,815	557	·085	·082
26/26	63,422	3,289	10,335	624	·052	·060
52/52	71,581	3,682	9,592	353	·051	·037
104/all	71,581	9,472	3,048	72	·132	·024

Table SA5.1.1. *(continued)*

Age group and sickness period	Ultimate experience: Exposed to risk	Ultimate experience: Actual weeks of claim	Select experience: Exposed to risk	Select experience: Actual weeks of claim	Actual sickness rates: Ultimate	Actual sickness rates: Select
50–54						
1/3	10,746	2,825	513	99	·263	·193
4/9	19,912	4,242	1,711	307	·213	·179
13/13	30,112	3,121	2,951	231	·104	·078
26/26	46,793	4,373	4,628	287	·093	·062
52/52	52,213	5,556	4,347	296	·106	·068
104/all	52,213	14,142	1,370	88	·271	·065
55–59						
1/3	8,968	2,871	210	65	·320	·310
4/9	13,950	4,479	513	151	·321	·294
13/13	19,740	3,290	868	156	·167	·180
26/26	30,441	4,841	1,283	181	·159	·141
52/52	33,011	6,436	1,202	133	·195	·111
104/all	33,011	18,435	403	16	·558	·040
60–64						
1/3	5,945	2,671	42	9	·449	·214
4/9	8,046	4,020	76	32	·500	·421
13/13	10,531	3,365	107	47	·320	·439
26/26	15,451	4,981	164	48	·322	·293
52/52	16,216	7,211	160	6	·445	·038
104/all	16,216	20,829	46	0	1·284	—

Table SA5.1.3(a.) 1972/75 *experience—Males—Ultimate and Select sickness rates.*

Tables 1, 2, 3 *and* 4. *Policies deferred* 1, 4, 13 *and* 26 *weeks respectively.*

Age group and sickness period	Sickness rates							
	Table 1		Table 2		Table 3		Table 4	
	ultimate	select	ultimate	select	ultimate	select	ultimate	select
25–29								
1/3	·162	·137						
4/9	·085	·068	·066	·091				
13/13	·039	·025	·037	·041	·023	·017		
26/26	·025	·009	·025	·023	·013	·017	·005	·003
52/52	·020	·009	·016	·008	·025	·005	·006	—
104/all	·004	—	·006	—	·027	—	·016	—
30–34								
1/3	·169	·181						
4/9	·087	·092	·086	·099				
13/13	·026	·034	·034	·044	·018	·017		
26/26	·023	·001	·022	·032	·015	·009	·007	·015
52/52	·003	—	·019	·024	·019	·003	·005	·023
104/all	—	—	·015	·009	·015	—	·005	·015
35–39								
1/3	·184	·207						
4/9	·113	·098	·094	·125				
13/13	·053	·015	·044	·050	·028	·046		
26/26	·049	·036	·029	·034	·025	·048	·014	·012
52/52	·019	·003	·023	·027	·013	·033	·015	·008
104/all	·046	—	·003	·010	·022	·004	·021	—
40–44								
1/3	·215	·226						
4/9	·158	·098	·151	·158				
13/13	·059	·009	·073	·070	·031	·043		
26/26	·066	·020	·053	·068	·021	·042	·012	·018
52/52	·067	·121	·048	·045	·020	·047	·019	·009
104/all	·172	·077	·086	·032	·056	·038	·035	—
45–49								
1/3	·242	·257						
4/9	·226	·192	·165	·208				
13/13	·107	·095	·097	·094	·056	·070		
26/26	·089	·105	·061	·069	·050	·051	·026	·055
52/52	·083	—	·067	·130	·027	·006	·043	·032
104/all	·191	—	·186	·096	·123	—	·056	·020

Table SA5.1.3a. (*continued*)

Age group and sickness period	Sickness rates							
	Table 1		Table 2		Table 3		Table 4	
	ultimate	select	ultimate	select	ultimate	select	ultimate	select
50–54								
1/3	·268	·193						
4/9	·228	·141	·195	·194				
13/13	·108	·088	·121	·064	·083	·089		
26/26	·115	·010	·107	·067	·106	·084	·065	·057
52/52	·178	—	·119	·118	·107	·012	·075	·121
104/all	·387	—	·227	—	·228	—	·307	·171
55–59								
1/3	·320	·310						
4/9	·366	·328	·241	·275				
13/13	·186	·090	·164	·182	·139	·223		
26/26	·200	·012	·169	·183	·166	·229	·117	·094
52/52	·273	—	·188	·233	·209	·193	·147	·080
104/all	·725	—	·558	—	·432	·024	·563	·101
60–64								
1/3	·449	·214						
4/9	·557	·049	·337	·784				
13/13	·378	—	·276	·611	·215	·788		
26/26	·432	—	·286	·286	·309	1·258	·211	—
52/52	·505	—	·350	—	·597	·304	·375	—
104/all	1·628	—	·698	—	1·526	—	1·149	—
Actual weeks of claim	83,611	4,736	38,987	9,075	26,761	3,193	31,004	1,810

Table 5.1.3(b). 1972/75 *experience—Males—individual Policies*

Number of quinquennial age groups in which the select rate was greater than or less than the ultimate rate, analysed by deferred period

Age group and sickness period	Deferred period: 1 week		4 weeks		13 weeks		26 weeks		All deferred periods combined	
	Select rate greater	less	greater	less	greater	less	greater	less	greater	less
25–45										
1/3	3	1							3	1
4/9	1	3	4	0					3	1
13/13	1	3	3	1	2	2			2	2
26/26	0	4	3	1	3	1	2	2	3	1
52/52	1	3	2	2	2	2	1	3	3	1
104/all	0	4	1	3	0	4	1	3	0	4
45–65										
1/3	1	3							1	3
4/9	0	4	3	1					1	3
13/13	0	4	2	2	4	0			2	2
26/26	1	3	2	2	3	1	1	3	1	3
52/52	0	4	2	2	0	4	1	3	0	4
104/all	0	4	0	4	0	4	0	4	0	4

Note: The rates for deferred period 52 weeks are not based on sufficient exposures to justify inclusion.

PART 6

CONCLUSION

6.1 The Report on this occasion has been compiled with the prospect of discussion. It has proved a complicated exercise, and it is expected that the discussion will produce valuable comments. To aid those taking part, as well as others who read the Report and the recorded discusssion, we now briefly survey the whole Report.

There are two broad divisions. The first three Parts deal with the combined male sickness experience for 1972–75 as a whole, and the graduation of the rates. In parts 4 and 5 the data are segregated into various groups, none of which was sufficiently large to justify statistical work or graduation. Part 4 deals with amounts of benefit, rated-up occupations and so forth. Part 5 analyses the experience during the first 3 years from policy inception, comments on the problem of selection, and reviews the experience for females. Many of the remarks concern tables of figures, and a nomenclature has been adopted which reminds one of the main topic to which a particular table relates. Furthermore, the length of certain tables prevents them from being printed alongside the paragraph in which they are explained. The prefix Se has been used, mainly in Part 1, to denote tables relating to all the male data for the 4 years combined, normally subdivided only by age and other main divisions. The main table, Se 1972–75, is a table showing all the rates by age, deferred period and sickness period. Further tables prefixed Se are explained in the numbered paragraphs, and so Se 1.1.1, for example, is a table explained in paragraph 1.1.1. When we consider graduation, tables are prefixed Seg. In Part 4 we are dealing with Attributes (such as occupational risk), and denote tables by the prefix SA. This is also extended to Part 5.

6.2 The main conclusion is that the deferred period has such a dominant influence that we have to regard each set of rates, *e.g.* the 26/26 sickness period rates for deferred period 1 week, as virtually a separate experience. This situation is easily explained. Offices select the deferred periods they will offer by considering the sector of the market in which they already have established connections. They realize that underwriting and claims control are linked with the deferred period. For example, it would generally be agreed that only offices with considerable experience of the business would offer the shorter deferred periods. It is obvious that if the deferred period is 26 weeks, most claimants have a relatively stabilized condition and diagnosis is not in doubt; thus claims control is less critical. Each deferred period, therefore, represents a different 'mix' of offices.

The Sub-Committee hoped to see a spectrum, a pattern which could be traced back to a uniform white. Thus we hoped for a well-behaved graduation formula for general use. Much time was spent attempting graduations and reverting to further contemplation of the data. So far, it must be admitted that our expectations are unrealized.

6.3 In one important aspect the data are deficient. We are unable to investigate the effect of lapsation, which is suspected to be selective. In addition, therefore, to comment on the work described, consideration should be given to the way the data are at present constituted. Should this be changed? Only the offices contributing or intending to contribute data can decide what is possible; investigators always like as much information as is needed to reach fully satisfactory conclusions.

The problem is important, because evidence discussed in Part 5 leads to the tentative theory that initial medical underwriting produces no apparent 'select' rates because there is a wave of early claims followed by lapsation of their policies on the part of disabled lives. Those remaining in the experience might constitute 'better risks'.

6.4 It is appropriate to express thanks to the existing Contributing Offices for their co-operation in giving their data, and also to encourage the production of a greater volume of data both from existing contributors and offices newly entering the field. Thanks are also due to R. Garden, M.A., F.F.A., E. A. Hertzman, M.A., A.I.A., and G. C. Orros, B.A., F.I.A., A.S.A. who prepared many of the tables and without whose willing help this Report would have been hardly possible.

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• Steven's test is essentially the same as the Wald, Wolfowitz runs test described in Wonnacott and Wonnacott, 'Introductory Statistics', 3rd edition (1977), section 16.4.

Individual P.H.I. Policies Se 1972–75

Table 1 *(Males—Deferred period 1 week)* is overleaf

Individual P.H.I Policies Se 1972–75

All offices—Sickness experience 1972–75

Table 1. *Males—Deferred period* 1 *week*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 1/3											
Exposed to risk	2	1,521	10,458	10,993	11,310	12,193	13,548	11,259	9,178	5,991	86,453
Actual weeks of sickness	1	290	1,546	1,896	2,123	2,639	3,299	2,924	2,936	2,680	20,334
Expected weeks of sickness	1	744	4,874	5,173	5,531	6,372	7,596	6,920	6,375	4,737	48,323
Actual sickness rate	·500	·191	·148	·172	·188	·216	·244	·260	·320	·447	
Actual/expected %	100·0	39·0	31·7	36·7	38·4	41·4	43·4	42·3	46·1	56·6	42·1
Sickness period 4/9											
Exposed to risk	2	1,426	10,250	10,892	11,244	12,137	13,509	11,243	9,169	5,990	85,862
Actual weeks of sickness	—	135	776	961	1,249	1,826	3,013	2,525	3,347	3,316	17,148
Expected weeks of sickness	—	213	1,751	2,095	2,501	3,407	4,683	4,969	5,222	4,335	29,176
Actual sickness rate	·000	·095	·076	·088	·111	·150	·223	·225	·365	·554	
Actual/expected %		63·4	44·3	45·9	49·9	53·6	64·3	50·8	64·1	76·5	58·8
Sickness period 13/13											
Exposed to risk	1	1,249	9,837	10,691	11,108	12,028	13,434	11,210	9,156	5,989	84,703
Actual weeks of sickness	—	26	310	304	531	639	1,427	1,201	1,685	2,250	8,373
Expected weeks of sickness	—	99	838	1,034	1,353	1,913	2,743	3,200	3,740	3,562	18,482
Actual sickness rate	·000	·021	·032	·028	·048	·053	·106	·107	·184	·376	
Actual/expected %		26·3	37·0	29·4	39·2	33·4	52·0	37·5	45·1	63·2	45·3
Sickness period 26/26											
Exposed to risk	1	1,010	9,221	10,389	10,909	11,863	13,322	11,160	9,134	5,987	82,996
Actual weeks of sickness	—	52	158	182	511	723	1,202	1,237	1,797	2,569	8,431
Expected weeks of sickness	—	51	559	735	994	1,484	2,224	2,746	3,750	3,979	16,522
Actual sickness rate	·000	·051	·017	·018	·047	·061	·090	·111	·197	·429	
Actual/expected %		102·0	28·3	24·8	51·4	48·7	54·0	45·0	47·9	64·6	51·0

Table 1 *(continued)*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 52/52											
Exposed to risk	—	635	7,997	9,781	10,519	11,534	13,107	11,054	9,097	5,979	79,703
Actual weeks of sickness	—	5	119	26	185	830	1,033	1,917	2,447	3,003	9,565
Expected weeks of sickness	—	20	317	520	719	1,145	1,827	2,412	3,703	4,480	15,143
Actual sickness rate	·000	·008	·015	·003	·018	·072	·079	·173	·269	·502	
Actual/expected %		25·0	37·5	5·0	25·7	72·5	56·5	79·5	66·1	67·0	63·2
Sickness period 104/all											
Exposed to risk	—	227	5,628	8,537	9,760	10,869	12,684	10,844	9,010	5,958	73,517
Actual weeks of sickness	—	—	16	2	433	1,835	2,381	4,157	6,498	9,683	25,005
Expected weeks of sickness	—	6	292	716	1,462	2,837	5,129	7,801	11,718	13,860	43,821
Actual sickness rate	·000	·000	·003	·000	·004	·169	·188	·383	·721	1·625	
Actual/expected %			5·5	0·3	29·6	64·7	46·4	53·3	55·5	69·9	57·1

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 2. *Males—Deferred period 4 weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 4/9											
Exposed to risk	191	5,772	21,918	23,329	23,502	21,242	16,467	10,380	5,294	2,132	130,227
Actual weeks of sickness	15	415	1,772	2,148	2,443	3,248	2,830	2,025	1,284	736	16,916
Expected weeks of sickness	26	852	3,737	4,485	5,230	5,934	5,662	4,571	2,979	1,527	35,003
Actual sickness rate	·079	·072	·081	·092	·104	·153	·172	·195	·243	·345	
Actual/expected %	57·7	48·7	47·4	47·9	46·7	54·7	50·0	44·3	43·1	48·2	48·3
Sickness period 13/13											
Exposed to risk	164	5,226	20,887	22,544	22,958	20,896	16,290	10,302	5,277	2,131	126,675
Actual weeks of sickness	3	119	821	862	1,048	1,510	1,568	1,183	870	600	8,584
Expected weeks of sickness	9	404	1,780	2,179	2,795	3,305	3,292	2,925	2,119	1,243	20,051
Actual sickness rate	·018	·023	·039	·038	·046	·072	·096	·115	·165	·282	
Actual/expected %	33·3	29·5	46·1	39·6	37·5	45·7	47·6	40·4	41·1	48·3	42·8
Sickness period 26/26											
Exposed to risk	129	4,465	19,364	21,372	22,137	20,370	16,021	10,182	5,253	2,130	121,423
Actual weeks of sickness	0	118	467	560	671	1,147	989	1,050	889	615	6,506
Expected weeks of sickness	3	221	1,168	1,512	2,016	2,530	2,648	2,490	2,106	1,381	16,075
Actual sickness rate	·000	·026	·024	·026	·030	·056	·062	·103	·169	·289	
Actual/expected %	0·0	53·4	40·0	37·0	33·3	45·3	37·3	42·2	42·2	44·5	40·5
Sickness period 52/52											
Exposed to risk	76	3,143	16,400	19,049	20,486	19,286	15,473	9,938	5,195	2,123	111,169
Actual weeks of sickness	0	21	195	391	496	912	1,135	1,186	987	733	6,056
Expected weeks of sickness	0	94	644	1,012	1,399	1,902	2,131	2,152	2,054	1,542	12,930
Actual sickness rate	·000	·007	·012	·021	·024	·047	·073	·119	·190	·345	
Actual/expected %	—	22·3	30·3	38·6	35·5	47·9	53·3	55·1	48·1	47·5	46·8

Table 2 *(continued)*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 104/all											
Exposed to risk	22	1,383	11,133	14,797	17,266	17,130	14,345	9,412	5,056	2,106	92,650
Actual weeks of sickness	0	0	50	213	61	1,422	2,618	2,082	2,782	1,463	10,691
Expected weeks of sickness	0	35	567	1,236	2,595	4,431	5,708	6,717	6,430	4,730	32,449
Actual sickness rate	·000	·000	·004	·014	·004	·083	·183	·221	·550	·695	
Actual/expected %	—	0·0	8·8	17·2	2·4	32·1	45·9	31·0	43·3	30·9	32·9

Individual P.H.I. policies Se 1972–1975

All offices—Sickness experience 1972–75

Table 3. *Males—Deferred period* 13 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 13/13											
Exposed to risk	109	3,197	17,607	23,934	25,466	23,972	18,990	11,551	6,175	2,518	133,519
Actual weeks of sickness	0	65	337	423	851	819	1,112	971	890	561	6,029
Expected weeks of sickness	7	247	1,505	2,315	3,108	3,795	3,839	3,275	2,487	1,466	22,044
Actual sickness rate	·000	·020	·019	·018	·033	·034	·059	·084	·144	·223	
Actual/expected %	0·0	26·3	22·4	18·3	27·4	21·6	29·0	29·6	35·8	38·3	27·3
Sickness period 26/26											
Exposed to risk	86	2,744	16,180	22,712	24,516	23,317	18,636	11,413	6,139	2,516	128,259
Actual weeks of sickness	0	52	248	288	779	610	930	1,180	1,040	806	5,933
Expected weeks of sickness	2	136	982	1,607	2,238	2,898	3,081	2,785	2,472	1,628	17,829
Actual sickness rate	·000	·019	·015	·013	·032	·026	·050	·103	·169	·320	
Actual/expected %	0·0	38·2	25·3	17·9	34·8	21·0	30·2	42·4	42·1	49·5	33·3
Sickness period 52/52											
Exposed to risk	55	1,974	13,455	20,285	22,596	21,972	17,900	11,123	6,060	2,508	117,928
Actual weeks of sickness	0	18	209	284	400	549	435	1,106	1,265	1,491	5,757
Expected weeks of sickness	0	60	535	1,079	1,549	2,166	2,466	2,403	2,408	1,817	14,483
Actual sickness rate	·000	·009	·016	·014	·018	·025	·024	·099	·209	·594	
Actual/expected %	—	30·0	39·1	26·3	25·8	25·3	17·6	46·0	52·5	82·1	39·8
Sickness period 104/all											
Exposed to risk	20	929	8,720	15,624	18,804	19,185	16,273	10,463	5,873	2,489	98,380
Actual weeks of sickness	0	0	187	204	382	1,061	1,915	2,328	2,501	3,792	12,370
Expected weeks of sickness	0	23	450	1,309	2,836	4,964	6,486	7,448	7,498	5,574	36,588
Actual sickness rate	·000	·000	·021	·013	·020	·055	·118	·222	·426	1·524	
Actual/expected %	—	0·0	41·6	15·6	13·5	21·4	29·5	31·3	33·4	68·0	33·8

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 4. *Males—Deferred period 26 weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 26/26											
Exposed to risk	117	8,455	33,783	35,148	33,385	31,378	25,778	18,668	11,198	4,982	202,892
Actual weeks of sickness	0	167	132	370	444	415	796	1,195	1,295	1,039	5,853
Expected weeks of sickness	3	420	2,038	2,482	3,041	3,904	4,267	4,593	4,516	3,231	28,495
Actual sickness rate	·000	·020	·004	·011	·013	·013	·031	·064	·116	·209	
Actual/expected %	0·0	39·8	6·5	14·9	14·6	10·6	18·7	26·0	28·7	32·2	20·5
Sickness period 52/52											
Exposed to risk	71	6,278	28,916	31,570	30,835	29,617	24,819	18,228	11,099	4,971	186,404
Actual weeks of sickness	0	96	91	371	389	513	1,020	1,445	1,605	1,847	7,377
Expected weeks of sickness	0	192	1,134	1,675	2,106	2,923	3,426	3,977	4,416	3,609	23,458
Actual sickness rate	·000	·015	·003	·012	·013	·017	·041	·079	·145	·372	
Actual/expected %	—	50·0	8·0	22·1	18·5	17·6	29·8	36·3	36·3	51·2	31·4
Sickness period 104/all											
Exposed to risk	22	2,793	19,175	24,012	25,340	25,723	22,610	17,187	10,838	4,938	152,638
Actual weeks of sickness	0	2	236	166	480	834	1,236	5,203	6,037	5,655	19,849
Expected weeks of sickness	0	75	970	1,996	3,808	6,669	9,030	12,389	13,853	11,086	59,876
Actual sickness rate	·000	·001	·012	·007	·019	·032	·055	·303	·557	1·145	
Actual/expected %	—	2·7	24·3	8·3	12·6	12·5	13·7	42·0	43·6	51·0	33·2

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 5. *Males—Deferred period* 52 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 52/52											
Exposed to risk	26	570	4,202	7,881	10,660	11,957	9,874	6,227	2,762	795	54,954
Actual weeks of sickness	0	0	0	41	0	45	414	200	265	143	1,108
Expected weeks of sickness	0	16	168	421	732	1,181	1,361	1,343	1,079	559	6,860
Actual sickness rate	·000	·000	·000	·005	·000	·004	·042	·032	·096	·180	
Actual/expected %	—	0·0	0·0	9·7	0·0	3·8	30·4	14·9	24·6	25·6	16·2
Sickness period 104/all											
Exposed to risk	9	267	2,672	5,753	8,544	10,134	8,715	5,678	2,637	775	45,184
Actual weeks of sickness	0	0	0	0	0	7	1,391	461	636	235	2,730
Expected weeks of sickness	0	7	138	489	1,294	2,634	3,474	4,033	3,327	1,679	17,075
Actual sickness rate	·000	·000	·000	·000	·000	·001	·160	·081	·241	·303	
Actual/expected %	—	0·0	0·0	0·0	0·0	0·3	40·0	11·4	19·1	14·0	16·0

Individual P.H.I. Policies Se 1972–75

Table 6 *(Males—All deferred periods combined)* is overleaf

Individual P.H.I. policies Se 1972–75

All offices—sickness experience 1972–75

Table 6. *Males—All deferred periods combined*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 1/3											
Exposed to risk	2	1,521	10,458	10,993	11,310	12,193	13,548	11,259	9,178	5,991	86,453
Actual weeks of sickness	1	290	1,546	1,896	2,123	2,639	3,299	2,924	2,936	2,680	20,334
Expected weeks of sickness	1	744	4,874	5,173	5,531	6,372	7,596	6,920	6,375	4,737	48,323
Actual sickness rate	·500	·191	·148	·172	·188	·216	·244	·260	·320	·447	
Actual/expected %	100·0	39·0	31·7	36·7	38·4	41·4	42·5	42·3	46·1	56·6	42·1
Sickness period 4/9											
Exposed to risk	193	7,198	32,168	34,221	34,746	33,379	29,976	21,623	14,463	8,122	216,089
Actual weeks of sickness	15	550	2,548	3,109	3,692	5,074	5,843	4,550	4,631	4,052	34,064
Expected weeks of sickness	26	1,065	5,488	6,580	7,731	9,341	10,345	9,540	8,201	5,862	64,179
Actual sickness rate	·078	·076	·079	·091	·106	·152	·195	·210	·320	·499	
Actual/expected %	57·7	51·6	46·4	47·2	47·8	54·3	56·6	47·7	56·5	69·1	53·1
Sickness period 13/13											
Exposed to risk	274	9,672	48,331	57,169	59,532	56,896	48,714	33,063	20,608	10,638	344,897
Actual weeks of sickness	3	210	1,468	1,589	2,430	2,968	4,107	3,355	3,445	3,411	22,986
Expected weeks of sickness	16	750	4,123	5,528	7,256	9,013	9,874	9,400	8,346	6,271	60,577
Actual sickness rate	·011	·024	·030	·028	·041	·052	·084	·101	·167	·321	
Actual/expected %	18·8	28·0	35·6	28·7	33·5	32·9	41·6	35·7	41·3	54·4	37·9
Sickness period 26/26											
Exposed to risk	333	16,674	78,548	89,621	90,947	86,928	73,757	51,423	31,724	15,615	535,570
Actual weeks of sickness	0	389	1,005	1,400	2,405	2,895	3,917	4,662	5,021	5,029	26,723
Expected weeks of sickness	8	828	4,747	6,336	8,289	10,816	12,220	12,614	12,844	10,219	78,921
Actual sickness rate	·000	·023	·013	·016	·026	·033	·053	·091	·158	·322	
Actual/expected %	0·0	47·0	21·2	22·1	29·0	26·8	32·1	37·0	39·1	49·2	33·9

Table 6 (*continued*)

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Sickness period 52/52											
Exposed to risk	228	12,600	70,970	88,566	95,096	94,366	81,173	56,570	34,213	16,376	550,158
Actual weeks of sickness	0	140	614	1,113	1,470	2,849	4,037	5,854	6,569	7,217	29,863
Expected weeks of sickness	0	382	2,798	4,707	6,505	9,317	11,211	12,287	13,660	12,007	72,874
Actual sickness rate	·000	·012	·009	·013	·015	·030	·050	·103	·192	·441	
Actual/expected %	—	36·6	21·9	23·6	22·6	30·6	36·0	47·6	48·1	60·1	41·0
Sickness period 104/all											
Exposed to risk	73	5,599	47,328	68,723	79,714	83,041	74,627	53,584	33,414	16,266	462,369
Actual weeks of sickness	0	2	489	585	1,356	5,159	9,541	14,231	18,454	20,828	70,645
Expected weeks of sickness	0	146	2,417	5,746	11,995	21,535	29,827	38,388	42,826	36,929	189,809
Actual sickness rate	·000	·000	·010	·009	·017	·062	·128	·266	·552	1·280	
Actual/expected %	—	1·4	20·2	10·2	11·3	24·0	32·0	37·1	43·1	56·4	37·1

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 7. *Females—Deferred period* 1 *week*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 1/3										
Exposed to risk	2	177	505	367	397	360	662	461	275	3,206
Actual weeks of sickness	0	29	140	95	146	107	272	141	136	1,066
Expected weeks of sickness	1	87	235	173	194	187	373	283	189	1,722
Actual sickness rate	·000	·164	·277	·259	·368	·297	·411	·306	·495	
Actual/expected %	0·0	33·3	59·6	54·9	75·3	57·2	72·9	49·8	72·0	61·9
Sickness period 4/9										
Exposed to risk	1	164	493	360	394	355	660	459	273	3,159
Actual weeks of sickness	0	31	79	55	125	99	362	167	195	1,113
Expected weeks of sickness	0	24	83	69	88	100	230	202	155	951
Actual sickness rate	·000	·189	·160	·153	·317	·279	·548	·364	·714	
Actual/expected %	—	129·2	95·2	79·7	142·0	99·0	157·4	82·7	125·8	117·0
Sickness period 13/13										
Exposed to risk	1	144	472	349	387	351	656	458	272	3,090
Actual weeks of sickness	0	14	42	25	65	54	119	12	97	428
Expected weeks of sickness	0	11	40	33	47	55	134	130	109	559
Actual sickness rate	·000	·097	·089	·072	·168	·154	·181	·026	·357	
Actual/expected %	—	127·3	105·0	75·8	138·3	98·2	88·8	9·2	89·0	76·6
Sickness period 26/26										
Exposed to risk	1	114	440	332	379	344	650	456	272	2,988
Actual weeks of sickness	0	26	33	26	15	74	86	26	81	367
Expected weeks of sickness	0	5	26	23	34	43	109	111	111	462
Actual sickness rate	·000	·228	·075	·078	·040	·215	·132	·057	·298	
Actual/expected %	—	520·0	126·9	113·0	44·1	172·1	78·9	23·4	73·0	79·4

Table 7 (*continued*)

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 52/52										
Exposed to risk	0	67	373	298	359	330	638	453	270	2,788
Actual weeks of sickness	0	2	26	18	0	52	53	18	117	286
Expected weeks of sickness	0	2	14	15	26	32	90	97	107	383
Actual sickness rate	—	·030	·070	·060	·000	·158	·083	·040	·433	
Actual/expected %	—	100·0	185·7	120·0		162·5	58·9	18·6	109·3	74·7
Sickness period 104/all										
Exposed to risk	0	18	238	239	322	303	619	448	265	2,452
Actual weeks of sickness	0	0	0	0	0	85	462	104	520	1,171
Expected weeks of sickness	0	0	12	20	49	81	252	316	339	1,069
Actual sickness rate	—	·000	·000	·000	·000	·281	·746	·232	1·962	
Actual/expected %	0	—	0·0	0·0	0·0	104·9	183·3	32·9	153·4	109·5

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 8. *Females—Deferred period* 4 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–45	45–49	50–54	55–59	All ages
Sickness period 4/9										
Exposed to risk	29	502	1,186	902	908	858	699	443	160	5,687
Actual weeks of sickness	0	42	106	157	153	170	183	91	44	946
Expected weeks of sickness	4	75	201	173	203	239	240	192	89	1,416
Actual sickness rate	·000	·084	·089	·174	·169	·198	·262	·205	·275	
Actual/expected %	0·0	56·0	52·7	90·8	75·4	71·1	76·3	47·4	49·4	66·8
Sickness period 13/13										
Exposed to risk	24	450	1,138	871	883	842	687	436	158	5,489
Actual weeks of sickness	0	19	48	81	35	84	98	56	47	468
Expected weeks of sickness	2	34	97	84	108	133	140	124	63	785
Actual sickness rate	·000	·042	·042	·093	·040	·100	·143	·128	·297	
Actual/expected %	0·0	55·9	49·5	96·4	32·4	63·2	70·0	45·2	74·6	59·6
Sickness period 26/26										
Exposed to risk	18	379	1,068	825	850	820	669	429	156	5,214
Actual weeks of sickness	0	—	46	94	20	66	90	38	37	391
Expected weeks of sickness	0	18	64	58	79	102	111	103	62	597
Actual sickness rate	·000	·000	·043	·114	·024	·080	·135	·089	·237	
Actual/expected %	—	—	71·9	162·1	25·3	64·7	81·1	36·9	59·7	65·5
Sickness period 52/52										
Exposed to risk	9	260	925	738	785	774	636	417	153	4,697
Actual weeks of sickness	0	0	0	25	84	73	120	101	0	403
Expected weeks of sickness	0	7	36	39	54	76	88	89	59	448
Actual sickness rate	·000	·000	·000	·034	·107	·094	·189	·242	·000	
Actual/expected %	—	0·0	0·0	64·1	155·6	96·1	136·4	113·5	0·0	90·0

Table 8 (*continued*)

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 104/all										
Exposed to risk	2	109	646	587	661	682	572	387	145	3,791
Actual weeks of sickness	0	0	0	0	25	87	386	181	119	798
Expected weeks of sickness	0	2	31	50	100	178	228	272	182	1,043
Actual sickness rate	·000	·000	·000	·000	·038	·128	·675	·468	·821	
Actual/expected %	—	0·0	0·0	0·0	25·0	48·9	169·3	66·5	65·4	76·5

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 9. *Females—Deferred period* 13 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 13/13										
Exposed to risk	13	252	841	1,045	1,093	1,172	1,144	676	286	6,522
Actual weeks of sickness	0	13	28	55	44	143	66	126	47	522
Expected weeks of sickness	0	20	73	100	134	186	233	192	112	1,050
Actual sickness rate	·000	·052	·033	·053	·040	·122	·058	·186	·164	
Actual/expected %	—	65·0	38·4	55·0	32·8	76·9	28·3	65·6	42·0	49·7
Sickness period 26/26										
Exposed to risk	9	209	772	976	1,042	1,131	1,115	664	283	6,201
Actual weeks of sickness	0	15	30	63	38	133	36	153	58	526
Expected weeks of sickness	0	11	47	70	95	141	186	162	111	823
Actual sickness rate	·000	·072	·039	·065	·036	·118	·032	·230	·205	
Actual/expected %	—	136·4	63·8	90·0	40·0	94·3	19·4	94·4	52·3	63·9
Sickness period 52/52										
Exposed to risk	5	144	648	843	945	1,047	1,055	640	278	5,605
Actual weeks of sickness	0	0	16	34	21	116	47	139	101	474
Expected weeks of sickness	0	4	26	45	66	104	146	138	109	638
Actual sickness rate	·000	·000	·025	·040	·022	·111	·045	·217	·363	
Actual/expected %	—		61·5	75·6	31·8	111·5	32·2	100·7	92·7	74·3
Sickness period 104/all										
Exposed to risk	0	64	431	616	757	886	943	595	263	4,555
Actual weeks of sickness	0	0	0	8	58	100	612	104	319	1,201
Expected weeks of sickness	0	1	22	51	115	232	377	423	331	1,552
Actual sickness rate	·000	·000	·000	·013	·077	·113	·649	·175	1·213	
Actual/expected %	—	0·0	0·0	15·7	50·4	43·1	162·3	24·6	96·4	77·4

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 10. *Females—Deferred period* 26 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 26/26										
Exposed to risk	11	227	731	1,081	1,583	1,850	1,564	1,012	424	8,483
Actual weeks of sickness	0	0	7	32	127	92	86	96	48	488
Expected weeks of sickness	0	11	45	77	145	231	259	245	170	1,183
Actual sickness rate	·000	·000	·010	·030	·080	·050	·055	·095	·113	
Actual/expected %	—	0·0	15·6	41·6	87·6	39·8	33·2	39·2	28·2	41·3
Sickness period 52/52										
Exposed to risk	7	166	585	926	1,396	1,699	1,481	972	421	7,653
Actual weeks of sickness	0	0	0	73	141	31	52	111	60	468
Expected weeks of sickness	0	5	22	50	96	169	204	210	166	922
Actual sickness rate	·000	·000	·000	·079	·101	·018	·035	·114	·143	
Actual/expected %	—	0·0	0·0	146·0	146·9	18·3	25·5	52·9	36·1	50·8
Sickness period 104/all										
Exposed to risk	3	82	354	658	1,058	1,402	1,314	882	411	6,164
Actual weeks of sickness	0	0	0	0	23	40	0	15	252	330
Expected weeks of sickness	0	1	18	57	163	369	523	627	521	2,279
Actual sickness rate	·000	·000	·000	·000	·022	·029	·000	·017	·613	
Actual/expected %	—	0·0	0·0	0·0	14·1	10·8	0·0	2·4	48·4	14·5

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 11. *Females—Deferred period* 52 *weeks*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 52/52										
Exposed to risk	1	36	144	266	445	576	471	346	129	2,414
Actual weeks of sickness	0	0	0	0	51	39	34	0	29	153
Expected weeks of sickness	0	1	6	14	30	57	66	75	50	299
Actual sickness rate	·000	·000	·000	·000	·115	·068	·072	·000	·225	
Actual/expected %	—	0·0	0·0	0·0	170·0	68·4	51·5	0·0	58·0	51·2
Sickness period 104/all										
Exposed to risk	1	16	87	181	338	463	401	299	123	1,909
Actual weeks of sickness	0	0	0	0	0	65	30	9	9	113
Expected weeks of sickness	0	0	4	15	51	123	159	212	153	717
Actual sickness rate	·000	·000	·000	·000	·000	·140	·075	·030	·073	
Actual/expected %	—	—	0·0	0·0	0·0	52·8	18·9	4·2	5·9	15·8

Individual P.H.I. Policies Se 1972–75

Table 12 *(Females—All deferred periods combined)* is overleaf

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 12. *Females—All deferred periods combined*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 1/3										
Exposed to risk	2	177	505	367	397	360	662	461	275	3,206
Actual weeks of sickness	0	29	140	95	146	107	272	141	136	1,066
Expected weeks of sickness	1	87	235	173	194	187	373	283	189	1,722
Actual sickness rate	·000	·164	·277	·259	·368	·297	·411	·306	·495	
Actual/expected %	0·0	33·3	59·6	54·9	75·3	57·2	72·9	49·8	72·0	61·9
Sickness period 4/9										
Exposed to risk	30	666	1,679	1,262	1,302	1,213	1,359	902	433	8,846
Actual weeks of sickness	0	73	185	212	278	269	545	258	239	2,059
Expected weeks of sickness	4	99	284	242	291	339	470	394	244	2,367
Actual sickness rate	·000	·110	·110	·168	·214	·222	·401	·286	·552	
Actual/expected %	0·0	73·7	65·1	87·6	95·5	79·4	116·0	65·5	98·0	87·0
Sickness period 13/13										
Exposed to risk	38	846	2,451	2,265	2,363	2,365	2,487	1,570	716	15,101
Actual weeks of sickness	0	46	118	161	144	281	283	194	191	1,418
Expected weeks of sickness	2	65	210	217	289	374	507	446	284	2,394
Actual sickness rate	·000	·054	·048	·071	·061	·119	·114	·124	·267	
Actual/expected %	0·0	70·8	56·2	74·2	49·8	75·1	55·8	43·5	67·3	59·2
Sickness period 26/26										
Exposed to risk	39	929	3,011	3,214	3,854	4,145	3,998	2,561	1,135	22,886
Actual weeks of sickness	0	41	116	215	200	365	298	313	224	1,772
Expected weeks of sickness	0	45	182	228	353	517	665	621	454	3,065
Actual sickness rate	·000	·044	·039	·067	·052	·088	·075	·122	·197	
Actual/expected %	—	91·1	63·7	94·3	56·7	70·6	44·8	50·4	49·3	57·8

Table 12 (*continued*)

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Sickness period 52/52										
Exposed to risk	22	673	2,675	3,071	3,930	4,426	4,281	2,828	1,251	23,157
Actual weeks of sickness	0	2	42	150	297	311	306	369	307	1,784
Expected weeks of sickness	0	19	104	163	272	438	594	609	491	2,690
Actual sickness rate	0	·003	·016	·049	·076	·070	·071	·130	·245	
Actual/expected %	0	10·5	40·4	92·0	109·2	71·0	51·5	60·6	62·5	66·3
Sickness period 104/all										
Exposed to risk	6	289	1,756	2,281	3,136	3,736	3,849	2,611	1,207	18,871
Actual weeks of sickness	0	0	0	8	106	377	1,490	413	1,219	3,613
Expected weeks of sickness	0	4	87	193	478	983	1,539	1,850	1,526	6,660
Actual sickness rate	0	0	0	·004	·034	·101	·387	·158	1·010	
Actual/expected %	0	0	0	4·1	22·2	38·4	96·8	22·3	79·9	54·2

Individual P.H.I. policies Se 1972–75

All offices—Sickness experience 1972–75

Table 13. *Male claim inception rates per thousand exposed to risk*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All ages
Deferred period 1 week	250	138	115	122	123	132	132	135	159	213	136
Deferred period 4 weeks	5	15	15	17	19	26	29	30	38	49	22
Deferred period 13 weeks	0	3	2	2	3	4	6	7	13	21	5
Deferred period 26 weeks	0	1	0	1	1	1	2	3	5	9	1
Deferred period 52 weeks	0	0	0	0	0	0	1	1	2	5	—

Table 14. *Female claim inception rates per thousand exposed to risk*

Age group	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	All ages
Deferred period 1 week	0	136	173	181	218	179	198	149	213	183
Deferred period 4 weeks	0	12	14	25	30	36	44	32	50	27
Deferred period 13 weeks	0	4	4	3	5	13	8	18	17	8
Deferred period 26 weeks	0	0	1	0	4	2	3	4	7	3
Deferred period 52 weeks	0	0	0	0	2	0	2	0	8	1

Seg 1972–75 Individual P.H.I. Policies

Sickness experience—graduated rates 1972–75

Table 1. *Males—Deferred period 1 week*

Age	Sickness period 0/4	Sickness period 4/9	Sickness period 13/13	Sickness period 26/26	Sickness period 52/52	Sickness period 104/all
30	·162	·076				
31	·167	·081				
32	·171	·086				
33	·176	·092	·031	·025		
34	·180	·098	·037	·030		
35	·184	·104	·042	·036		
36	·189	·110	·046	·040		
37	·193	·116	·051	·045	·024	
38	·197	·123	·055	·049	·030	
39	·201	·130	·059	·054	·035	
40	·206	·137	·063	·058	·041	·100
41	·210	·145	·066	·062	·048	·123
42	·214	·152	·070	·065	·055	·145
43	·218	·161	·073	·069	·063	·166
44	·223	·169	·076	·072	·071	·186
45	·227	·178	·079	·076	·080	·205
46	·232	·187	·083	·080	·089	·224
47	·237	·197	·086	·084	·099	·243
48	·242	·207	·090	·088	·110	·263
49	·247	·218	·094	·093	·121	·284
50	·253	·230	·098	·099	·134	·308
51	·259	·243	·104	·105	·148	·334
52	·266	·257	·110	·113	·163	·366
53	·274	·272	·119	·123	·180	·404
54	·283	·289	·129	·135	·198	·450
55	·293	·307	·141	·150	·220	·508
56	·305	·329	·157	·168	·244	·580
57	·319	·353	·176	·191	·271	·671
58	·336	·381	·201	·220	·304	·785
59	·356	·413	·232	·256	·341	·930
60	·380	·451	·271	·301	·386	1·112
61	·409	·496	·320	·358	·439	1·342
62	·446	·549	·381	·429	·503	1.632
63	·490	·613	·459	·518	·580	1·997
64	·544	·690	·559	·630	·674	2·457

Seg 1972–75 Individual P.H.I. Policies

Sickness experience—graduated rates 1972–75

Table 2. *Males—Deferred period 4 weeks*

Age	Sickness period 4/9	Sickness period 13/13	Sickness period 26/26	Sickness period 52/52	Sickness period 104/all
30	·077	·033	·022	·019	
31	·082	·035	·024	·019	
32	·088	·037	·025	·019	
33	·093	·039	·027	·020	
34	·099	·042	·029	·022	
35	·105	·044	·030	·023	
36	·110	·047	·032	·025	
37	·115	·050	·034	·028	
38	·121	·053	·037	·030	
39	·126	·057	·039	·033	
40	·132	·060	·042	·037	
41	·137	·064	·044	·041	
42	·143	·068	·048	·045	·075
43	·148	·072	·051	·050	·100
44	·154	·077	·055	·055	·123
45	·159	·081	·059	·061	·145
46	·165	·086	·063	·067	·166
47	·171	·092	·068	·073	·186
48	·177	·097	·073	·081	·205
49	·183	·103	·080	·089	·224
50	·189	·110	·087	·097	·243
51	·196	·117	·094	·107	·262
52	·203	·124	·103	·117	·283
53	·211	·133	·113	·129	·305
54	·220	·141	·124	·142	·330
55	·229	·151	·137	·156	·359
56	·239	·162	·151	·173	·393
57	·251	·175	·167	·192	·435
58	·264	·189	·186	·213	·486
59	·280	·205	·207	·238	·549
60	·298	·224	·231	·268	·628*
61	·319	·245	·258	·303	·726*
62	·346	·271	·290	·345	·850*
63	·376	·301	·325	·395	1·007*
64	·413	·336	·366	·455	1·203*

* refer to paragraph 3.3.4

Seg 1972–75 Individual P.H.I. Policies

Sickness experience—graduated rates 1972–75

Table 3. *Males—Deferred period 13 weeks*

Age	Sickness period 13/13	Sickness period 26/26	Sickness period 52/52	Sickness period 104/all
30	·020		·014	
31	·020	·017	·014	
32	·021	·017	·015	
33	·021	·017	·015	
34	·022	·018	·015	
35	·023	·019	·016	·018
36	·025	·020	·016	·023
37	·026	·021	·017	·028
38	·028	·022	·017	·034
39	·030	·024	·018	·041
40	·033	·027	·019	·048
41	·035	·029	·020	·055
42	·038	·033	·022	·064
43	·041	·036	·024	·072
44	·045	·040	·026	·082
45	·049	·045	·029	·092
46	·053	·050	·033	·103
47	·058	·055	·037	·115
48	·063	·062	·043	·128
49	·068	·069	·050	·143
50	·074	·077	·059	·160
51	·081	·086	·070	·179
52	·089	·096	·084	·202
53	·097	·108	·100	·230
54	·106	·120	·121	·265
55	·116	·135	·146	·308
56	·127	·152	·178	·365
57	·139	·171	·216	·441
58	·153	·193	·264	·542
59	·168	·218	·323	·682
60	·185	·247	·395	·875
61	·203	·281	·484	1·144
62	·224	·320	·593	1·522
63	·248	·365	·727	2·056
64	·274	·418	·892	2·813

Seg 1972–75 Individual P.H.I. Policies

Sickness experience—graduated rates 1972–75

Table 4. *Males—Deferred period 26 weeks*

Age	Sickness period 26/26	Sickness period 52/52	Sickness period 104/all
30			
31			
32			
33	·010		
34	·010		·012
35	·010		·012
36	·010		·012
37	·010		·013
38	·011		·013
39	·012		·015
40	·013	·018	·017
41	·015	·020	·021
42	·017	·023	·026
43	·019	·026	·033
44	·022	·029	·043
45	·025	·033	·056
46	·028	·037	·072
47	·032	·041	·091
48	·036	·045	·114
49	·041	·051	·142
50	·047	·057	·175
51	·053	·064	·213
52	·060	·073	·257
53	·068	·083	·307
54	·076	·096	·364
55	·087	·111	·429
56	·098	·130	·501
57	·112	·153	·583
58	·127	·182	·673
59	·146	·217	·773
60	·167	·260	·884
61	·193	·315	1·006
62	·223	·382	1·140
63	·260	·465	1·286
64	·304	·569	1·446

APPENDIX 1

Card layouts for individual business

(1) In-force Card

Field	Columns	Description
		Block A
1	1	Type of Record 1 = individual record (2 = group record)
2	2–4	Contributor's 'office number'
3	5–6	Record Year The last two digits of the calendar year to the end of which the record refers.
4	7	Geographical Location 1 = United Kingdom 2 = Republic of Ireland 3 = Isle of Man 4 = Channel Islands (No other countries outside the British Isles have yet been specified by offices. The Sub-Committee will supply further codes on request.)
5	8	Please leave blank or code '0'
6	9	Age Definition Blank or zero if month and year of birth are given in field 11, otherwise 1 = nearest birthday, 2 = next birthday at the date referred to in field 3.
		Block B
7	16	Sex 1 = Male 2 = Female
8	17	Occupational Rating 0 = no rating 1 = rated
9	18–20	Period of Deferment. Code in weeks thus: 001 = 1 week, 052 = 52 weeks, etc., to nearest week, but use code 999 if the period of deferment is one *Calendar month.*
10	21–22	Year of Entry The last two digits of the calendar year in which the policy first went on the books. Code 00 if not known. Note: 'Continuation' policies—that is policies passing from group to individual under a continuation option—should not be included with the individual returns in

Field	Columns	Description
		cases where the disability started before the continuation policy was issued. In other cases the year of entry to be recorded is the year in which the continuation option was exercised. These policies should be coded '1' in column 1 and '3' in column 36
11	23–26	Month and Year of Birth or Office Year of Birth Contributors will have the option of showing the month of birth in columns 23–24 and the last two digits of the year of birth in columns 25–26, or of showing the office year of birth, which allows the calculation of the age next birthday or the nearest age at the date referred to in field 3, in columns 25–26 and zeros in columns 23–24. If possible, offices are requested to adopt the former method, since it is more accurate
12	27–28	Ceasing Year Last two digits of calendar year in which cover will cease.
13	29	Period of Benefit Payment Specify payment period to which rate shown in columns 30–34 relates: 1 = weekly 2 = monthly 3 = yearly 4 = special If the amount of business to which code 4 applies is a large proportion of the whole, the office is requested to approach the Sub-Committee for a separate code to be allocated.
14	30–34	Rate of Benefit Rate of benefit to the nearer £, gross of reinsurance. (*Excluding* waiver amount in every case if possible. Report 00 if the only benefit is waiver of premium, *e.g.* attached to life policy.) Note 1: Where code 2 or 3 applies in field 15, the initial rate of benefit should be shown. Note 2: If it is unnecessarily cumbersome to eliminate amounts of waiver of premium from office records, this need not be done. Please inform the Sub-Committee, however. Note 3: Reinsurances ceded to other offices are included in the ceding office's figures. Reinsurances accepted from other offices are not to be included in the investigation.

Field	Columns	Description
15	35	Type of Benefit 1 = level sickness benefit 2 = increasing sickness benefit 3 = decreasing sickness benefit 5 = lump sum benefit 9 = other type of benefit
16	36	Medical Evidence 1 = medical 2 = non-medical (with or without P.M.A. report) 3 = non-selection limit applies part or whole of benefit 4 = unknown (for existing business at 1 January 1972 only) Note: Medically substandard lives (other than those subject only to a special exclusion clause) are not to be included in the investigation.
17	37	Type of Premium 1 = level annual premium 2 = recurrent single premium 3 = increasing annual premium 4 = any other type, but see note for code 4 in field 13
18	38	Underwriting Impairment. (For cases dealt with by exclusions only. For occupational ratings see field 8. Other cases rated for health or dangerous pursuits, etc., should not be included in the investigation at all.) 0 = no extra risk 1 = exclusion relating to hypertension and disease of cardiovascular system 2 = exclusion relating to neurosis, psychoneuroses and psychosis (including anxiety state) 7 = exclusion may or may not be present (for business existing at 1 January 1972 only) 8 = exclusion present but related impairment not known (for business existing at 1 January 1972 only) 9 = all other exclusions Note: Codes 3–6 are being reserved for possible future use.
Block C		
19	71–80	Policy Number Note: This field is reserved for the policy number or any other means by which the particular record can be referred to in any communications between the C.M.I. Bureau and the contributing office for error indications, etc.

Further notes:

1. Block A contains fields which can probably be gang-punched by the contributing offices.

   Block B contains information relating to the particular record, which will have to be individually punched.

   Block C contains only an item of identification, requiring individual punching.

2. Where data are submitted in the form of punched cards, these will be returned by the Bureau after the data have been transferred to tape. It would therefore be possible for the contributing office to use some of the space on the card for its own purposes. Initially offices would be asked not to use columns other than 43–70 in this way and it would not be possible to transfer such data to the claims card because those columns are used for the details of the claim.

(2) Claims Card

Field	Columns	Description
		Block A
1	1	Type of Record 3 = claim under individual policy (4 = claim under group policy)
2–6	2–9	As for In-force Card
		Block B
7–18	16–38	As for In-force Card Offices are asked to ensure that the information shown in Blocks A and B is consistent with that recorded in the corresponding 'in-force' card. If fresh information should come to light when a claim arises, it should be ignored for the purpose of compiling the claims card. For example if code 4 is used in column 36 of the in-force card it should be repeated on the claims card and not amended in accordance with information discovered later.
		Block C
19	44–49	Date of falling sick (*i.e.* beginning of deferred period). If present card relates to an interrupted claim (including a change from total to partial disability) record date of first falling sick. Date to be coded in three groups of two digits, day–month–year.
20	50–53	Date payments commenced (in present record year) in benefit period to which present card relates (day and month only: 0000 if continuation from previous year). A new card should be prepared each time a claim is resumed after an interruption or a change in degree of disability.

Field	Columns	Description
21	54	Mode of commencement of present Benefit 0 = continuation from previous record year 1 = new claim 2 = new claim following interruption of sickness in the deferred period 3 = revival of claim following interruption (whether the benefit rate is the same as before the interruption or different) 4 = continuation of an existing claim but benefit rate changed from date recorded in field 20
22	55–56	Percentage the benefit under the current claim bears to the full rate of benefit (for partial disability claim). Punch zeros if full rate is being paid.
23	57–60	Date payments ceased in benefit period to which present card relates (day and month only: 9999 if claim in force at end of year).
24	61	Mode of cessation 1 = policy expired or void for reason other than death or lump sum payment 2 = death 3 = recovery 4 = lump sum payment terminating contract (add explanatory note) 5 = *ex gratia* commutation (add explanatory note) 6 = benefit rate altered but claim continues (continuation reported on further card) Note: In the case of code 4 or 5 please give amount of payment as well as circumstances, e.g. whether contract was withdrawn. If the *ex gratia* commutation is one month's payment or less punch an adjusted expiry date in field 23 which would give correct total claim. This will not be practicable if the adjusted expiry date is after the current year of claim and in such a case explain in relation to field 24 what has been done.
25	62–65	Cause of disability for current claim. (Abbreviated 'List C' in the eighth revision of the *Manual of the International Statistical Classification of Diseases*. See separate instructions.)
26	71–80	Policy number or other identification. (See note to corresponding field 19 of in-force card.)

APPENDIX 2

A Mathematical Approach to Inception Rates Note based on Chapter 4 of 'Introduction to Stochastic Processes in Biostatistics' by Chin Long Chiang

The terminology is similar to that for Markov chain theory. A population is divided into a number of 'illness states' (of which one could be the state of non-illness) and 'death states'. Illness states are transient whereas death states are absorbing states. In its simplest form for our purpose, there are two (transient) illness states, viz S_1 = entitled to sickness claim and S_2 = non-entitled. There is one 'death' state, viz, exit from the experience by lapsation or physical death. We then define the (constant) forces of decrement applying to the individuals in S_1 and S_2 respectively at time ξ in a small interval. The age is assumed constant within the interval, and future transitions are independent of past history. It is then possible to derive a pair of linear homogeneous first-order differential equations for P_{ab}, the probability that an individual now in state S_a will, at a defined future moment, be in state S_b ($a \neq b$, $a, b = 1, 2$). Satisfactory solutions take the form:

$$P_{ab}(\xi + t) = \lambda_1 \exp(\rho_1 t) + \lambda_2 \exp(\rho_2 t)$$

where the only variable is t.

APPENDIX 3

A computational description of least-squares curve fitting

The aim in a least-squares method of curve fitting can be stated very simply. If $z_x = \phi(x)$, where ϕ is a function whose form is known (*e.g.* a Makeham formula) but whose parameters are to be chosen, we choose values of the parameters such that $\sum_x (\hat{z}_x - \phi(x))^2$ is a minimum.

Straightforward application of the method relates to a linear model. Departure from linearity introduces computational and other difficulties. It will be shown that we do depart from the linear model, but to try to limit the complications of so doing, we first consider the fitting of

$$z_x = a + bx + cx^2$$

for ages $x = 30$ to $x = 64$.

To derive the partial differential equations which are solved for the parameters, the use of matrix notation is best.

Write $$\hat{\mathbf{z}} = \mathbf{X}\mathbf{a} + \boldsymbol{\varepsilon}$$

where $\mathbf{z}$ is the vector of the 35 rates, $\mathbf{X}$ is the matrix of coefficients

$$\begin{matrix} 1, 30, 30^2 \\ 1, 31, 31^2 \\ \cdots\cdots\cdots \\ 1, 64, 64^2 \end{matrix}$$

and $\mathbf{a}$ is the vector of the unknown parameters a, b and c. The final vector is a vector of residuals, *i.e.* the differences between the observed $\hat{z}_x$'s and the unknown graduated values. In theory, each element ε_i of the vector of residuals should have zero mean and variance σ_i^2 which has the same value σ^2 for all i. Moreover, the observations must be uncorrelated in pairs.

Denoting the transpose of a matrix by an accent, we choose the vector of parameters which minimizes the sum of squares.

$$s = (\mathbf{z} - \mathbf{X}a)'(z - X\mathbf{a})$$

by solving the equations $\frac{\partial s}{\partial a} = \frac{\partial s}{\partial b} = \frac{\partial s}{\partial c} = 0$. In matrix notation, the vector of parameters we require is

$$\mathbf{a} = (\mathbf{X}'\mathbf{X})^{-1}\,\mathbf{X}'\hat{\mathbf{z}}$$

In non-matrix form this is a system of three linear simultaneous equations in the unknowns a, b, and c. When we introduce the term df^x, however, $\frac{\partial}{\partial f}(df^x)$ is not linear in the parameter f. The practical approach in actuarial applications is to use trial values of f, and having solved for the other parameters, to calculate the appropriate s for each trial. We must arrive at minimum s. By identifying the region in which the optimum value of f occurs, a close approximation to that optimum (i.e. the value producing minimum s) can be found.

CONTINUOUS MORTALITY INVESTIGATION REPORTS
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Introduction iii
Sickness Experience 1972–75 for Individual Policies 1

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