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MORTALITY OF AUSTRALIAN ASSURED LIVES

[The following memorandum has been received from the Actuarial Society of Australasia.—Eds. *J.I.A.*]

IN 1953 the Actuarial Society of Australasia decided to undertake the collection of statistics relating to the mortality of assured lives in Australia with a view to publishing a mortality table when an adequate volume of data has been received. Twelve offices transacting business in Australia agreed to contribute to the investigation, the commencing data for ten offices being the numbers of policies in force at the end of the 1953 office year (31 December in most cases) and for the other two offices the corresponding figures for 1954.

2. The following is a brief summary of the policies included in the investigation and the methods employed in processing the data.

(*a*) The investigation is limited to Ordinary Department whole life participating assurances with premiums payable throughout life, or with premiums payable substantially throughout life where the usual whole life table of an office provides for cessation of premiums with or without payment of the sum assured at an advanced age.

(*b*) As far as practicable, the following classes of policy have been excluded from the statistics supplied:

Family Income policies.

Rated-up lives (including contingent debt cases) and policies subject to extra premiums or under which the normal sum assured is not payable where death results from certain specified causes.

Re-assurances received from other offices.

Children's Deferred Assurances.

Where rated-up lives have not been excluded, they have been included at the rated-up ages.

(*c*) All offices supplied the numbers of policies void by death according to nearest age at date of death and subdivided into curtate durations 0, 1, 2, 3, 4, and 5 and over. A number of different methods for determining ages were used by offices in the returns of the policies in force, which were shown according to duration in the same manner as the deaths; these variations in age classification necessitated adjustments to approximate to the policies in force at nearest ages.

(*d*) The exposed to risk at each age for each year of the experience has been obtained by taking the arithmetic mean of the numbers of policies in force at that age at the beginning and end of the office year, and adding thereto one-half of the deaths which occurred at that age during the year. Since the ages for the deaths and the in-force (after adjustment as in (*c*)) are in each case given as 'x nearest birthday', the resulting exposed and deaths relate to the exact year of age $(x-\frac{1}{2})$ to $(x+\frac{1}{2})$. This is reflected in the non-integral ages as shown in Tables 1–3.

3. Details of the combined experience from the commencement of the investigation up to office years ending in 1956, together with a comparison of the actual deaths with the expected deaths on the basis of the A 1949–52

Ultimate Table for the actual ages, and also for the ages rated down one year, are set out in the following Tables 1–3.

It should be noted that to obtain the expected deaths by the A 1949–52 Ultimate Table it has been necessary to multiply the exposed to risk by functions in the form $q_{x-\frac{1}{4}}$. The values of this function have been obtained for ages up to $41\frac{1}{2}$ by linear interpolation between values for integral ages and for ages $42\frac{1}{2}$ and over by the formula

$$q_{x-\frac{1}{4}} = \tfrac{1}{2}(q_{x-1}+q_x) - \tfrac{1}{16}(\Delta^2 q_{x-2} + \Delta^2 q_{x-1}).$$

Mortality of Australian assured lives, experience of three years ending in 1956.

Table 1

Duration	Total for all ages			
	Exposed to risk	Actual deaths	Expected deaths	
			By A 1949–52 Ultimate	By A 1949–52 Ultimate rated down one year
0	106,255	150	281·7	259·5
1	99,783	176	291·6	267·3

Table 2

Ages attained	Durations 2 and over					
	Exposed to risk	Actual deaths	Expected deaths by A 1949–52 Ultimate	Percentage ratio Actual / Expected	Actual deaths less expected deaths	
					+	−
$9\frac{1}{2}$–$11\frac{1}{2}$	733	—	·8	—		·8
$12\frac{1}{2}$–$16\frac{1}{2}$	12,122	9	13·5	66·7		4·5
$17\frac{1}{2}$–$21\frac{1}{2}$	30,315	52	33·7	154·3	18·3	
$22\frac{1}{2}$–$26\frac{1}{2}$	64,457	78	72·4	107·7	5·6	
$27\frac{1}{2}$–$31\frac{1}{2}$	105,547	126	122·8	102·6	3·2	
$32\frac{1}{2}$–$36\frac{1}{2}$	134,479	168	177·2	94·8		9·2
$37\frac{1}{2}$–$41\frac{1}{2}$	171,587	258	316·8	81·4		58·8
$42\frac{1}{2}$–$46\frac{1}{2}$	192,675	569	608·5	93·5		39·5
$47\frac{1}{2}$–$51\frac{1}{2}$	182,362	949	1,035·5	91·6		86·5
$52\frac{1}{2}$–$56\frac{1}{2}$	151,165	1,407	1,484·4	94·8		77·4
$57\frac{1}{2}$–$61\frac{1}{2}$	120,630	1,722	1,981·7	86·9		259·7
$62\frac{1}{2}$–$66\frac{1}{2}$	105,070	2,611	2,816·7	92·7		205·7
$67\frac{1}{2}$–$71\frac{1}{2}$	75,578	2,979	3,244·5	91·8		265·5
$72\frac{1}{2}$–$76\frac{1}{2}$	45,278	2,754	3,097·0	88·9		343·0
$77\frac{1}{2}$–$81\frac{1}{2}$	23,717	2,317	2,531·8	91·5		214·8
$82\frac{1}{2}$–$86\frac{1}{2}$	10,288	1,463	1,663·4	88·0		200·4
$87\frac{1}{2}$–$91\frac{1}{2}$	3,219	586	756·1	77·5		170·1
$92\frac{1}{2}$–$96\frac{1}{2}$	489	139	151·4	91·8		12·4
$97\frac{1}{2}$	3	—	1·2	—		1·2
Totals	1,429,714	18,187	20,109·4	90·4	27·1	1,949·5

Note. The exposures and deaths for the age-group denoted $12\frac{1}{2}$–$16\frac{1}{2}$ (for example) relate to the data for the 5 years of age commencing $12\frac{1}{2}$, $13\frac{1}{2}$, $14\frac{1}{2}$, $15\frac{1}{2}$ and $16\frac{1}{2}$.

Table 3

Ages attained	Durations 2 and over					
	Exposed to risk	Actual deaths	Expected deaths by A 1949–52 Ultimate rated down one year	Percentage ratio $\frac{\text{Actual}}{\text{Expected}}$	Actual deaths less expected deaths	
					+	−
9½–11½	733	—	·8	—		·8
12½–16½	12,122	9	13·5	66·7		4·5
17½–21½	30,315	52	33·7	154·3	18·3	
22½–26½	64,457	78	72·3	107·9	5·7	
27½–31½	105,547	126	121·5	103·7	4·5	
32½–36½	134,479	168	170·4	98·6		2·4
37½–41½	171,587	258	290·3	88·9		32·3
42½–46½	192,675	569	541·0	105·2	28·0	
47½–51½	182,362	949	921·1	103·0	27·9	
52½–56½	151,165	1,407	1,334·7	105·4	72·3	
57½–61½	120,630	1,722	1,793·2	96·0		71·2
62½–66½	105,070	2,611	2,555·1	102·2	55·9	
67½–71½	75,578	2,979	2,949·0	101·0	30·0	
72½–76½	45,278	2,754	2,822·8	97·6		68·8
77½–81½	23,717	2,317	2,317·6	100·0		·6
82½–86½	10,288	1,463	1,532·8	95·4		69·8
87½–91½	3,219	586	702·9	83·4		116·9
92½–96½	489	139	141·9	98·0		2·9
97½	3	—	1·2	—		1·2
Totals	1,429,714	18,187	18,315·8	99·3	242·6	371·4

Note. The exposures and deaths for the age-group denoted 12½–16½ (for example) relate to the data for the 5 years of age commencing 12½, 13½, 14½, 15½ and 16½.