

BLOOD PRESSURE AMONG STANDARD LIVES

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THERE are so many phases of the problem of blood pressure that I shall limit myself to dealing with a recent investigation of the mortality on lives accepted as "standard risks" by the New York Life Insurance Company.

The experience investigated was that of new policies issued from 1925 to 1936, inclusive, observed from entry until the anniversaries of the policies in 1937. The investigation was by policies and was divided into two groups, (a) those in which there was no impairment, and (b) those in which there appeared minor impairments but not of sufficient moment to place the policyholders in a substandard group. The expected deaths were obtained according to the company's standard experience for the same years of issue and exposure. The total number of policies emerging by death was 9552.

It is recognized that there may be differences in the blood pressure in the morning, at midday and at night, and that the emotions, especially those of apprehension over a medical examination, also have their effect. There may occasionally be slight variations when the pressure is taken at the same time by two physicians. A good deal has been made by some investigators of the effect of such differences, but the experience of life assurance companies generally shows that these factors "average up", as may be seen in the present study.

This investigation deals solely with the systolic pressure, but the diastolic must have been satisfactory, otherwise policies at the regular rate of premium would not have been granted. It is doubtful if any useful purpose could be served by studying the same group of lives by diastolic readings. Various investigations indicate that the average systolic pressure among persons insured in Great Britain is slightly higher than in the United States or in Canada, say from 3 to 5 mm. The effect on mortality, however, of departure from the average reading of the British companies is likely to be approximately the same as the corresponding variation from the American standard.

In the first place we shall present a table of the aggregate results, as follows:

Departure from average systolic	Actual deaths	Ratio of actual to expected deaths
mm.		%
- 22 to - 18	144	71
- 17 to - 13	364	90
- 12 to - 8	1000	82
- 7 to - 3	1525	91
- 2 to + 2	2691	97
+ 3 to + 7	1669	104
+ 8 to + 12	1288	119
+ 13 to + 17	536	148
+ 18 to + 27	335	159
All	9552	100

The group of those from - 3 to - 22 mm. showed a relative mortality of 86 %. There was included a comparatively small number of cases in the range + 23 to + 27, which were accepted as standard risks by reason of very favourable factors.

Before analysing the foregoing according to ages at entry or duration of policy, it might be well to give a subdivision according to whether there was no impairment or a minor one. Such minor impairments consist principally of histories of pleurisy, emphysema, renal colic, rheumatism and nervous troubles, of which no symptoms or effects were found at the date of examination; also hernia, albuminuria, partial deafness, defects in vision and functional heart murmurs among young persons, found on examination. The results were as follows:

Departure from average systolic	Without impairments—actual deaths	Ratio of actual to expected deaths	With minor impairments—actual deaths	Ratio of actual to expected deaths
mm.		%		%
- 22 to - 13	415	80	93	101
- 12 to - 8	851	81	149	93
- 7 to - 3	1342	91	183	94
- 2 to + 2	2315	93	376	130
+ 3 to + 7	1462	102	207	122
+ 8 to + 12	1114	117	174	140
+ 13 to + 17	463	146	73	166
+ 18 to + 27	291	155	44	197

For the whole group the relative mortality for the cases accepted without impairment was 98 % and for those with minor impairments 119 %. It is quite evident that under the latter there should be a more severe selection of applicants than under the former. Even in the group without impairments, it is probable and more in accordance with recent practice that cases with readings 15 points or more above the average should not be accepted as standard risks.

It may be mentioned at this point that in all the groups the deaths were analysed by policies, by lives and by amounts insured so as to determine whether there was an undue proportion of policies to lives or of large sums assured. No adjustments were found necessary.

As the effect of blood pressure by age is known to be different among those below than among those above the average, three tables have been prepared for deviations from the average of (a) -8 to -22, (b) -7 to +7, and (c) +8 to +27 mm. As it is desired to determine the trend, the cases with and without minor impairments have been combined:

Ages at entry	Departure from average systolic pressure					
	-22 to -8 mm.		-7 to +7 mm.		+8 to +27 mm.	
	Actual deaths	Ratio of actual to expected deaths	Actual deaths	Ratio of actual to expected deaths	Actual deaths	Ratio of actual to expected deaths
10-29	363	107	1868	106	319	119
30-39	306	92	1577	98	428	127
40-49	482	72	1540	92	780	144
50 and over	357	74	900	89	632	125
All	1508	83	5885	97	2159	130

It appears from the foregoing that there is an increasing advantage from a low blood pressure with advancing age while the reverse is true with readings above the average. A subdivision into the two groups, with or without minor impairments, shows the same trend.

A synopsis now appears of the aggregate results by duration of

insurance, subdivided into three groups of departure from the average systolic pressure:

Policy year	Departure from average systolic pressure					
	-22 to -8 mm.		-7 to +7 mm.		+8 to +27 mm.	
	Actual deaths	Ratio of actual to expected deaths	Actual deaths	Ratio of actual to expected deaths	Actual deaths	Ratio of actual to expected deaths
1-5	1005	% 88	3765	% 99	1244	% 125
6-10	468	75	1924	93	828	136
11-12	35	70	196	106	87	159
All	1508	83	5885	97	2159	130

The deduction to be drawn from the above table is practically the same as from the synopsis by age at entry.

The following table shows the proportionate death rates for heart disease and nephritis in relation to the normal for the age where the readings were 8 mm. or more above the average:

Mm. over average	Proportion of normal mortality	
	Heart disease	Nephritis
+ 8 to +12	1½	1½
+ 13 to +17	2½	1¾
+ 18 to +27	2½	3

In 1923 an investigation (*T.A.S.A.* Vol. XXIV, p. 383) of cases of high systolic blood pressure combined with marked over-weight indicated a mortality ratio higher than covered by the sum of the ratings for the separate impairments, though the data were small. A review of the distribution of under-weight and over-weight among the cases in the present study, without impairments, indicates the following:

Among persons with low systolic pressure and favourable mortality there is a larger proportion of under-weights, while among those with high readings and less favourable mortality, there is a larger proportion of over-weights.

Distribution of Build Groups among death claims

Deviation from average weight	Systolic blood-pressure reading					
	8-22 mm. under average		Average		8-27 mm. over average	
	Claims	%	Claims	%	Claims	%
10 % or more under-weight	379	30	881	17	180	10
Average weight	639	50	2932	57	996	53
10 % or more over-weight	248	20	1306	26	692	37
Total	1266	100	5119	100	1868	100
Mortality ratio	81 %		95 %		128 %	

The following conclusions may be drawn:

(1) That the favourable mortality among persons with systolic pressure below the average is confirmed, while the evidence indicates that it is favourable at points as much as 15-20 mm. below the average.

(2) That the favourable effect of low blood pressure increases with advancing age and that readings approximating to the average also show a slightly more favourable relative mortality as the age advances.

(3) That evidence has accumulated until it is now beyond doubt that a blood pressure of 15-19 points above the average for the age results in a distinctly higher mortality than normal and that cases from 20 to 25 mm. above the average have a decidedly substandard mortality.

(4) That minor impairments, which would not in themselves warrant treating the applicant for insurance as a substandard risk, add appreciably to the relative mortality.