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REPORT ON THE "1979 BUILD AND BLOOD PRESSURE STUDY" SUPPLEMENTARY OBSERVATIONS

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Our remarks are intended to present the findings of a supplementary study of the material assembled for the Build and Blood Pressure Studies of 1979. This supplementary study was made to answer a number of specific questions raised by medical directors and actuaries of life insurance companies as well as by some prominent physicians and research scientists. Much of the information developed has major impact on medicine and public health. Some of it will shortly receive extensive publicity in medical and public health journals.

Build Study

First we address ourselves to the questions raised about underweight and overweight.

1. The Build Study 1979 up-dated the information needed to underwrite underweights and overweights more accurately, but referred only briefly to optimal weights. Optimal weights are of major importance in the practice of medicine because physicians are called upon to advise people how much they should weigh. They are also of great interest to drug manufacturers and to many organizations such as Weight Watchers. Until recently the several large intercompany investigations of build constituted virtually the sole source of statistical information on the subject. These investigations have since 1931 indicated clearly that the lowest mortality occurs at weights somewhat below average in both sexes. In 1960 Metropolitan Life published a set of desirable weight tables based on the Build and Blood Pressure Study of 1959. These tables have been widely used by the medical profession as a standard. Their validity has recently been borne out by the 1950-76 experience in the Framingham Study and the detailed evidence will soon be published in the Journal of the American Medical Association. Another paper prepared for this journal will attest to the great value for medicine of life insurance company statistics on build.

2. The findings of life insurance company investigations that optimal weights lie at weights somewhat below average and that even a small degree of overweight is associated with increased mortality have been challenged in the last two or three years by a Dr. Reubin Andres of the National Institute for Aging and by a few others. They cited papers purporting to show that the lowest mortality may occur either near average weight or even at

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weights above average. However, the studies cited have paid little attention to the health status of the subjects, having generally covered short periods of time, have often dealt with older persons only and in many instances have pertained to special groups with ethnic socio-economic and personal characteristics markedly different from those of middle class Americans in ostensibly good health. Moreover, these studies have, with few exceptions, been based on rather small numbers.

3. The supplementary study here reported on, considered together with the American Cancer Society's Study of 750,000 men and women according to variations in weight and with the 26 Year Follow-Up of the Framingham Study, indicates clearly that even though optimal weights may have increased in absolute terms, they remain definitely at levels somewhat below average weights, up to about age 60 or 70. More specifically they show that-

a. The range of weights associated with the lowest mortality depends on the proportion of individuals in impaired health, because persons underweight by reason of illness may experience the lowest mortality at weights considerably above average.

b. The length of the observation period significantly affects the levels of mortality associated with underweight and overweight. Studies of short duration overstate the excess mortality in underweights and understate the excess mortality in overweights.

c. The age distribution of a population also affects the mortality levels associated with underweight and overweight. The optimal weights at the older ages have been found to be closer to average weight.

d. The socio-economic, ethnic and personal characteristics of the subjects also have a pronounced influence on mortality by weight.

4. A slight or even moderate degree of underweight may reflect a naturally wholesome mode of living, springing from disciplined diet and exercise, or it may be an early symptom of underlying disease not manifested by other symptoms. Inasmuch as persons applying for life insurance are screened for the more serious medical impairments, insured underweights represent essentially a healthy population. Furthermore, in conducting mortality studies of build among insured lives it has been customary to exclude individuals who would have been issued substandard insurance for any reason other than build. Hence, experience among insured lives reflects the effects on mortality of variations in weight apart from the effects of other impairments, except for smoking habits concerning which life insurance companies did not until recently obtain information.

It is obvious that in order to measure accurately the effects on mortality of underweight by itself, it is necessary to study populations free from preexisting conditions such as may affect health significantly. It is also necessary to take the duration of the observations into account, inasmuch as the extra mortality associated with underweight is more pronounced in the years immediately following the beginning of a study, whereas the effects of overweight are usually deferred for ten years or longer. It is advisable to analyze mortality among underweights by age, because it is difficult to screen elderly persons for preexisting conditions or obscure

pathological status, so that populations at the older ages are likely to include higher proportions of individuals with undetected health impairments.

Table 1 presents the findings of the American Cancer Society study as to the differences in mortality by weight between ostensibly healthy persons and persons in impaired health. Persons in impaired health were those who at entry into the study were sick, had a history of heart disease, stroke or cancer, or had lost 10 or more pounds in the preceeding twelve months. The remaining population was considered as ostensibly healthy. The table indicates that the lowest mortality among ostensibly healthy men was at weights 5 to 10 percent below average and in ostensibly healthy women at weights 10 to 20 percent below average. Among men in impaired health the optimum weights were in the range 10 to 20 percent overweight while among women in impaired health the optimum weights were close to average.

Table 2 shows the corresponding findings in the 26 Year Follow-up of the Framingham Study. The table indicates that among healthy subjects, defined essentially by the same criteria as those used for standard ordinary life insurance, the optimum weights for both sexes combined were in the range 5 to 15 percent underweight, whereas among subjects in impaired health (men and women combined) the optimum weights were among those 5 to 15 percent overweight. The optimum weights in the entire Framingham Study population are difficult to discern.

Table 3, drawn from the Build Study 1979, demonstrates clearly that among underweights of both sexes mortality is relatively high in the early durations, but declines steadily with time elapsed to nearly normal after 15 years. Among overweights mortality is relatively low in the early durations and increases to distinctly higher levels in men after 15 years but to a much lesser extent in women.

Table 4 presents the corresponding experience for both sexes combined in the 26 Year Follow-up of the Framingham Study, separately for the healthy subjects and for the entire Framingham Study population. It indicates that among the healthy subjects and the subjects in impaired health the mortality of underweights was rather high in the early years and decreased sharply with the passage of time. Among healthy overweights the mortality was relatively low in the early durations but increased significantly at the longer durations. However, among overweights in impaired health mortality was relatively high in the early durations and decreased with the passage of time.

Table 5 shows the experience according to variations in weight by age in the American Cancer Society's Study. It indicates that optimal weights occur at weights below average in healthy men up to age 70 and in healthy women up to age 80 and that only at the advanced ages are the optimal weights closer to average or even somewhat above average weights.

Table 6, drawn from the Build Study 1979, shows the corresponding experience among insured lives by age. It indicates that among men under 50 the optimal weights lie in the range 5 to 15 percent underweight, but that ages 50 and older the optimum weights lie closer to average. Among women the optimum weights are found in the weight range 5 to 15 percent underweight virtually at all ages (20 through 69).

5. It is now reasonably well established that smokers tend to be leaner than non-smokers. Inasmuch as smokers are subject to distinctly higher mortality than non-smokers, the effects of variations in weight on mortality can be confounded with and obscured by the effects of smoking.

The American Cancer Society's Study was large enough to permit analysis of the experience by weight separately for those smoking 20 or more cigarettes a day, those who never smoked and others. This analysis demonstrated that in each smoking habits classification, optimal weights were found at weights somewhat below average up to age 70.

This analysis is presented in Table 7. The essential findings were summarized in the original paper about the American Cancer Society's Study, as follows:

"Male and female non-smokers registered the lowest mortality from all causes combined in virtually all weight index categories, whereas male and female smokers of 20 or more cigarettes per day recorded by far the highest mortality from all causes in all weight index categories. Among those in the under 80 and 80-89 weight index categories the mortality of smokers of 20 or more cigarettes per day was nearly double that of non-smokers; among those in the 130-139 and 140 plus weight index categories, the excess mortality among overweight smokers of 20 or more cigarettes per day ranged from 30 to 40% in males, but from 60 to 70% in females."

Table 7 indicates clearly that the lowest mortality among both men and women who never smoked occurred in the weight index category 80-89 for ages up to 70 in men and up to 80 in women. The lowest mortality among men smokers was found at slightly greater weights, but for the most part at below average weights. The lowest mortality in women smokers was generally in the weight index category 80-89 for ages up to 70.

6. A separate analysis focussed on the effects of socio-economic status on mortality by weight. It showed that mortality among male underweights in five large "mass market" companies was 13 to 20 percentage points higher than that in five companies catering to a more selected clientele. The corresponding differential among male overweights was only 6 to 13 percentage points. Other mortality investigations of build have also shown that overweight carries with it higher mortality at the lower socio-economic levels.

7. The significance of various degrees of underweight and overweight can be highlighted by considering the reductions in 25 year temporary life expectancies associated with them. Table 8 shows such temporary life expectancies for men and women at ages 40, 50 and 60, assuming normal mortality to follow recent (1975-79) death rates among employed persons covered by group life insurance and extra mortality associated with various degree of underweight and overweight as observed in the Build Study 1979. The 25 year temporary life expectancies more nearly reflect the actual experience in the Build Study 1979 and do not involve major extrapolations such as would be required to compute total life expectancies.

The figures show that in the case of men the reductions in longevity over a 25 year period are generally less than a year for overweights in the range 15 to 35 percent above average as well as for underweights in the range 15 to 35 percent under average, in the case of women the corres-

ponding reductions in longevity are generally half a year or less.

Blood Pressure

Next, we comment on the questions arising from the findings of the Blood Pressure Study 1979.

1. This study provided highly pertinent statistics on the effects on mortality of treatment for high blood pressure. These statistics support strongly the evidence from clinical studies that antihypertensive treatment can be very beneficial.

There was no really effective treatment for high blood pressure during the period covered by the Build and Blood Pressure Study 1959. Increasingly effective antihypertensive drugs came to be used more and more widely in the late 1960's and early 1970's, so that the Blood Pressure Study 1979 reflects the beneficial effects of the new drugs only to a limited extent. It is safe to conjecture that materially greater reductions in mortality associated with hypertension have taken place after the close of the Blood Pressure Study 1979.

It needs to be kept in mind that the findings of this study relate to a highly selected group of insured men. These men, whose blood pressures were lowered by treatment to normotensive levels, experienced virtually normal mortality. More generally, these carefully selected male risks who had been treated for hypertension before applying for life insurance experienced mortality corresponding to their post-treatment blood pressures. This may appear puzzling at first glance, since it implies that any pre-treatment damage to heart and blood vessels was reversed by treatment, a result considered to be improbable in the light of our knowledge of the pathological changes in hypertension. The only reasonable explanation is that the individuals treated for hypertension who were accepted for insurance were those who by and large had not suffered any heart or blood vessel damage, while those found to have significant heart or blood vessel damage were either very highly rated or rejected outright.

2. Other analyses dealt more intensively with the mortality on low blood pressures.

The extensive data in the Blood Pressure Study 1979 indicate clearly that the lower the blood pressure the lower the mortality experienced. However, the gains in longevity resulting from lowering blood pressures below 115mm systolic or below 75mm diastolic are very small. This is indicated in Figures 1 and 2.

3. One of the questions raised pertained to the mortality of lean hypertensives. Detailed tabulations showed that hypertensives who were underweight had experienced somewhat higher mortality than corresponding hypertensives who were overweight.

Particulars of this experience are presented in Table 9.

Elevated blood pressure associated with leanness may be a more serious condition than elevated blood pressure associated with obesity, which is contrary to prevailing impressions and current underwriting practice. It is possible that hypertension associated with obesity represents a different

and milder disease than that associated with underweight. Alternately, the higher mortality in lean hypertensives may reflect a sizeable proportion of underweights in whom this condition is a symptom of undetected illness. It appears unlikely that variations in arm size between lean and obese individuals which sometimes distort blood pressure readings could account for the differential in mortality between lean and obese hypertensives.

4. Another question related to the mortality experience for unusual combinations of systolic and diastolic pressures. It was found that mortality in isolated systolic hypertension, that is elevated systolic pressure with near normal diastolic pressure, was associated with increased mortality at ages 40 and older comparable to that in combined systolic-diastolic hypertension. This is indicated in Table 10.

Little is known about isolated systolic hypertension, except that it is fairly common at ages over 50 and that it is associated with an increased risk of cardiovascular disease. There is no information whether treatment of isolated systolic hypertension would be as effective as for other kinds of hypertension, because virtually all major clinical investigations of hypertension have reported their findings in reference to diastolic pressures only.

5. An analysis of the experience between the five large "mass market" companies and the five companies catering to a more select clientele indicated that the mortality among both normotensive men and men with bordering blood pressures was 15 to 30 percentage points higher in the mass market companies than in the more selected clientele companies. The corresponding differential for men with definite hypertension was quite small.

6. The value of an ECG in underwriting elevated blood pressure is indicated by the experience presented in Table 11 for hypertension in the pressure of a normal or somewhat abnormal ECG. The table indicates that when systolic and diastolic pressures are both slightly elevated the mortality experienced was lower whenever an ECG was obtained as compared with the experience where no ECG was obtained. This was true even when the ECG was somewhat abnormal, but it should be kept in mind that cases with serious ECG findings were excluded from the investigation.

7. The significance of various degrees of hypertension can be highlighted by considering the reductions in 25 year temporary life expectancies associated with them. Table 12 shows such temporary life expectancies for men and women at ages 40, 50 and 60, assuming normal mortality to follow recent (1975-79) death rates among employed persons covered by group life insurance and extra mortality associated with various degrees of hypertension as observed in the Blood Pressure Study 1979.

The figures show that the reductions in longevity over a 25 year period are quite substantial for men with blood pressures as low as 140 systolic with 85 diastolic, ranging from .8 year at age 40 to 1.5 years at age 60, and increase sharply with rise in blood pressure as well as with age; in the case of women the corresponding reductions in longevity for blood pressures below 160 systolic with 95 diastolic are generally less than a year.

Methodology

Insofar as methodology of medico-actuarial studies is concerned, the supplementary study indicates that it is essential to begin with initially healthy populations in order to reach meaningful conclusions about the mortality associated with specific characteristics found mainly among ostensibly healthy people. It is also highly important to check for possible confounding factors such as smoking or the effects of certain life styles.

The Build and Blood Pressure Studies 1979 and the supplementary study demonstrate the economics and effectiveness of a capably staffed central bureau for compiling medico-actuarial statistics. These studies were carried out by the Ad Hoc Committee on a New Build and Blood Pressure Study working through the instrumentality of the Center for Medico-Actuarial Statistics established in the Medical Information Bureau.

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TABLE 1

Variations in Mortality by Weight and Health Status

American Cancer Society

Weight Classification	Mortality Ratios in relation to death rates of those 90 - 109% of average weight			
	Healthy Persons		Impaired Lives	
	Male	Female	Male	Female
.80 of average weight	1.25	1.19	1.54	1.47
.80 - .89	1.05	.96	1.15	1.10
.90 - 1.09	1.00	1.00	1.00	1.00
1.10 - 1.19	1.15	1.17	.99	1.04
1.20 - 1.29	1.27	1.29	1.08	1.14
1.30 - 1.39	1.46	1.46	1.16	1.22
1.40 +	1.87	1/87	1.29	1.56

TABLE 2

Variations in Mortality by Weight and Health Status

Framingham Study (26 yrs)

Weight Classification	Mortality Ratios in Relation to Mortality of Insured Lives		
	Healthy Persons	Impaired Lives	Total
	Males and Females	Males and Females	Males and Females
25% or more underweight	139%		176%
15 - 25% underweight	106	210%	131
5 - 15% underweight	68	183	96
5% underweight to 5% overweight	70	164	98
5 - 15% overweight	72	128	95
15 - 25% overweight	112	137	126

TABLE 3

Variations in Mortality by Weight and Duration

Build Study 1979

	Mortality Ratios			
	Duration 1-5	Duration 6-10	Duration 11-15	Duration 16-22
Men 15 - 69				
25 - 35% underweight	127%	119%	114%	105%
15 - 25 underweight	110	103	99	93
5 - 15 underweight	98	97	92	93
5% underweight to 5% overweight	94	96	95	95
5 - 15% overweight	103	103	109	111
15 - 25% overweight	106	114	123	131
Women 15 - 69				
25 - 35% underweight	167	128	134	90
15 - 25 underweight	114	105	102	107
5 - 15 underweight	92	90	94	94
5% underweight to 5% overweight	91	94	97	97
5 - 15% overweight	95	99	103	102
15 - 25% overweight	106	103	113	112

TABLE 4

Variations in Mortality by Weight and Duration

Framingham Study 26 Yr. Follow-Up

	Mortality Ratios In Relation to Mortality of Insured Lives			
	Healthy Lives In Framingham Study		Total Population In Framingham Study	
	Duration 1-14	Duration 14-26	Duration 1-14	Duration 14-26
Over 25% underweight	243%	107	585%	129
15 - 25% underweight	145	112	165	118
5 - 15 underweight	102	57	147	77
5% underweight to 5% overweight	93	63	138	84
5 - 15% overweight	67	73	110	90
15 - 25% overweight	97	118	144	119

TABLE 5

Variations in Mortality by Weight and Age

American Cancer Society - Healthy Lives

Weight Classifications

	Ages 40 - 49	Ages 50 - 59	Ages 60 - 69	Ages 70 - 79	Ages 80 - 89
Men					
.80 of average weight	1.09	1.24	1.24	2.31	1.40
.80 - .89	1.01	1.02	1.06	1.12	1.05
.90 - 1.09	1.00	1.00	1.00	1.00	1.00
1.10 - 1.19	1.24	1.18	1.12	1.06	1.11
1.20 - 1.29	1.63	1.34	1.23	1.08	
1.30 - 1.39	1.81	1.64	1.38	1.30	
1.40 +	2.19	2.09	1.85	1.41	
Women					
.80 of average weight	1.20	1.19	1.19	1.20	1.21
.80 - .89	.94	.02	.96	.97	1.07
.90 - 1.09	1.00	1.00	1.00	1.00	1.00
1.10 - 1.19	1.09	1.18	1.27	1.08	.95
1.20 - 1.29	1.38	1.34	1.37	1.15	.99
1.30 - 1.39	1.51	1.64	1.59	1.34	
1.40 +	2.02	2.09	1.85	1.65	

TABLE 6

Variations in Mortality by Weight and Age

Build Study 1979

Weight Classifications	Mortality Ratios				
	Ages 20 - 29	Ages 30 - 39	Ages 40 - 49	Ages 50 - 59	Ages 60 - 69
Men					
25% or more underweight	102%	105%	112%	128%	135%
15 - 25% underweight	94	93	98	113	120
5 - 15% underweight	95	92	93	100	100
5% underweight to 5% overweight	98	95	96	94	95
5 - 15% overweight	103	112	109	100	99
15 - 25% overweight	125	128	118	109	101
Women					
25% or more underweight			117	146	134
15 - 25% underweight	118	124	110	105	106
5 - 15% underweight	88	101	92	93	90
5% underweight to 5% overweight	112	86	96	97	101
5 - 15% overweight	90	99	103	99	102
15 - 25% overweight	118	110	115	103	103

TABLE 7

American Cancer Society Study

Death Rates by Weight Classification and Smoking Habits

Males	Weight Index													
Age Group	Under 80		80-89		90-109		109-119		120-129		130-139		140 +	
	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR
Never Smoked														
30-39	3.3	182%	1.4	75%	1.8	100%	2.4	136%	2.5	139%				
40-49	5.1	133	3.6	95	3.8	100	4.5	119	6.9	131	8.5	223%	10.8	282%
50-59	10.1	103	8.7	88	9.8	100	12.5	127	13.5	137	16.3	166	28.8	293
60-69	27.1	106	24.9	98	25.4	100	31.8	125	32.0	126	38.9	153	54.0	213
70-79	70.6	109	67.6	104	64.8	100	72.1	111	81.3	126	86.0	133	98.4	152
80-89			148.3	104	142.0	100	160.6	113						
All Ages		117		92		100		124		145		174		260
20 or more Cigarettes per day														
30-39	5.3	143%	4.3	118%	3.7	100%	5.1	137%	6.3	171%	5.2	140%	9.1	247%
40-49	10.3	107	9.6	100	9.6	100	11.7	121	14.9	155	16.9	176	18.1	187
50-59	24.0	124	19.9	103	19.4	100	22.4	116	24.1	124	30.9	160	31.6	163
60-69	53.9	127	45.5	108	42.3	100	44.7	106	54.7	129	52.9	125		
70-79	116.4	143	91.5	112	81.4	100	84.2	103	84.6					
80-89	258.1	161	201.2	126	160.1	100								
All Ages		120		102		100		118		142		159		186
Others														
30-39			2.7	117%	2.3	100%	3.1	137%	4.6	203%				
40-49	5.9	107%	5.8	106	5.5	100	7.2	130	9.0	164	8.7	157%	12.9	234%
50-59	16.2	124	13.8	105	13.0	100	15.1	116	18.3	140	20.3	156	26.5	204
60-69	40.8	128	34.3	107	32.0	100	34.8	109	36.6	114	44.0	137	60.0	188
70-79	98.7	140	81.4	115	70.3	100	73.9	104	73.0	104	92.4	131		
80-89	164.3	116	143.4	101	141.0	100	150.3	106						
All Ages		122		106		100		119		141		152		211

TABLE 7

American Cancer Society Study

Death Rates by Weight Classification and Smoking Habits

Weight Index

Females	Under 80		80-89		90-109		110-119		120-129		130-139		140 +	
Age Group	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR	qx	MR
Never Smoked														
30-39	1.3	102%	1.2	96%	1.25	100%	1.5	121%	1.7	136%	1.8	142%	2.7	213%
40-49	2.8	112	2.3	92	2.5	100	2.7	106	3.4	137	4.2	166	5.2	206
50-59	5.5	100	4.7	86	5.4	100	7.0	128	8.2	152	8.9	164	12.5	230
60-69	17.6	116	14.3	94	15.2	100	19.1	125	20.7	136	23.8	156	27.4	180
70-79	55.5	122	43.8	97	45.3	100	49.3	109	52.6	116	62.1	137	72.5	160
80-89	139.8	113	124.2	106	117.3	100	112.7	96	118.3	101	122.0	104	126.5	108
All Ages		110		91		100		118		142		160		211
20 or more Cigarettes per day														
30-39	3.0	134%	2.1	93%	2.2	100%	3.1	136%	4.8	214%				
40-49	5.9	115	4.8	93	5.2	100	5.6	108	7.4	144	6.9	134%	7.7	149%
50-59	13.8	139	9.0	99	10.0	100	12.0	120	11.6	116	11.5	115	20.2	202
60-69	24.9	105	22.8	96	23.7	100	24.7	104	35.3	149	45.2	191		
70-79	69.3	131	59.4	113	52.7	100	56.8	108						
80-89														
All Ages		125		95		100		115		151		132		168
Others														
30-39	2.2	134%	1.5	95%	1.6	100%	2.7	165%	1.9	119%	2.9	180%		
40-49	4.6	137	3.3	97	3.4	100	3.9	117	4.4	131	3.6	108	7.2	216%
50-59	9.5	138	6.8	98	6.0	100	9.2	132	9.3	135	11.9	172	13.4	193
60-69	25.3	146	18.9	108	17.4	100	24.6	142	23.4	135	28.4	164	32.3	186
70-79	59.1	119	50.0	100	49.6	100	48.3	97	57.0	115	73.1	147		
80-89			135.0	110	122.4	100	114.9	94						
All Ages		138		98		100		130		133		143		206

TABLE 8

REDUCTIONS IN 25 YEAR TEMPORATY LIFE EXPECTANCY
ASSOCIATED WITH UNDERWEIGHT AND OVERWEIGHT

25 Year Temporary Life Expectancies

Employed persons covered by group life insurance 1975-79

Age	Males	Females
40	23.6 years	24.3 years
50	21.4	23.3
60	17.1	20.3

	Reductions in 25 Year Temporary Life Expectancy			Corresponding Mortality Ratio		
	Age 40	Age 50	Age 60	Age 40	Age 50	Age 60
Weight		Males			Males	
25-35% under	.1 year	.6 year	1.4 years	110%	120%	130%
15-25% under	.1 year	.2 year	.7 year	95	105	115
15-25% over	.3 year	.4 year	.2 year	125	115	105
25-35% over	.5 year	.9 year	.9 year	140	130	120
35-45% over	1.2 years	1.7 years	2.2 years	170	160	150
		Females			Females	
25-35% under	.1 year	.5 year	1.3 years	120%	130%	140%
15-25% under	.1 year	.1 year	.1 year	110	110	105
15-25% over	.1 year	.1 year	.1 year	115	110	105
25-35% over	.2 year	.3 year		125	120	
35-45% over	.3 year	.4 year		140	135	

TABLE 9

Mortality Experience Among Underweight and Overweight Hypertensives

Blood Pressure Study 1979

Men Aged 15 - 69

	Underweight			Overweight		
	25-35%	15-25%	5-15%	5-15%	15-25%	25-35%
	Mortality Ratios					
Systolic Pressure						
148 - 157	237%	188%	168%	164%	169%	223%
158 - 167	292	222	210	197	206	231
168 - 177	324	198	203	212	283	234
178 - 187	421	219	230	243	291	280
Diastolic Pressure						
88 - 92	216	148	142	136	134	136
93 - 97	435	184	158	174	151	249
98 - 102	329	219	210	193	174	254
103 - 107		351	271	277	239	371

TABLE 10

Mortality Experience Among
Systolic and Diastolic Hypertensives

Blood Pressure Study 1979

Men Aged 15 - 69

	Mortality Ratios	
	Ages 15 - 39	Ages 40 - 69
Isolated Systolic 158-167 / 82-87	149	208
Isolated Diastolic 128-137 / 98-102	150	145
Combined Systolic and Diastolic 158-167 / 98-102	265	223

TABLE 11

MORTALITY IN HYPERTENSION WITH ECG

Excluding ECG with Serious Findings

Men Aged 15-69

Blood Pressure	No ECG Mortality Ratio	With ECG Mortality Ratio	With Somewhat Abnormal ECG Mortality Ratio
Systolic under 138			
Diastolic unver 83	93%	91% (1333)	125% (215)
83-97	115	111 (395)	95 (48)
98 and over	160		
Systolic 138 and over			
Diastolic under 83	145	113 (155)	87 (18)
83-97	160	123 (276)	116 (31)
98 and over	215	165 (16)	
Total	100	99	115

TABLE 12

REDUCTIONS IN 25 YEAR TEMPORARY LIFE EXPECTANCY
ASSOCIATED WITH UNTREATED BLOOD PRESSURES

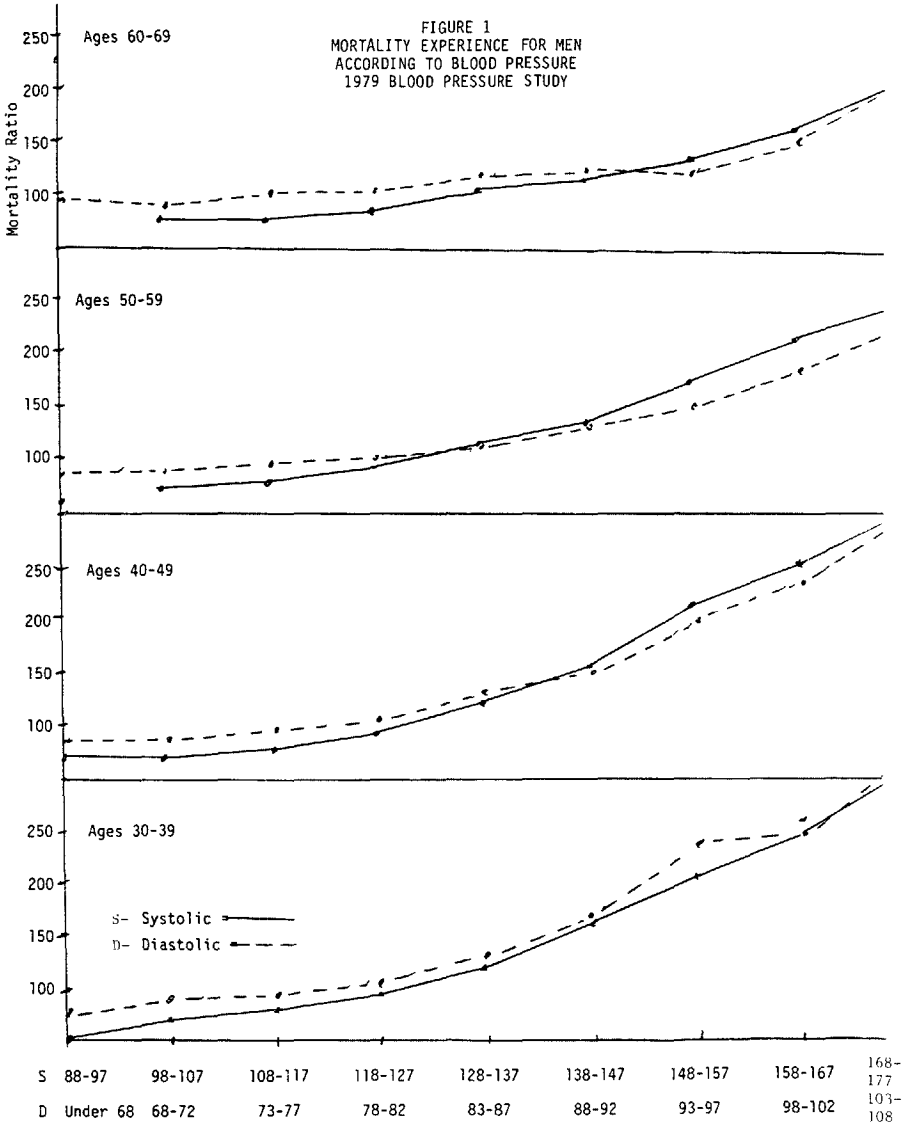
25 Year Temporary Life Expectancies

Employed persons covered by group life insurance 1975-79

Age	Males	Females
40	23.6 years	24.3 years
50	21.4	23.3
60	17.1	20.3

	Reductions in 25 Year Temporary Life Expectancy			Corresponding Mortality Ratios		
	Age 40	Age 50	Age 60	Age 40	Age 50	Age 60
Blood Pressure		Males			Males	
140/85	.8 year	1.2 years	1.5 years	160% est.	140% est.	130% est.
150/90	1.3 years	2.0 years	2.3 years	200	170	150
160/95	2.0 years	3.0 years	3.3 years	260	210	180
170/100	2.9 years	4.3 years	4.7 years	350	275	225
		Females			Females	
140/85	.3 year	.3 year	.3 year	150% est.	125% est.	110% est.
150/90	.5 year	.6 year	.8 year	175	145	125
160/95	.8 year	1.1 years	1.5 years	225	175	150

FIGURE 1
MORTALITY EXPERIENCE FOR MEN
ACCORDING TO BLOOD PRESSURE
1979 BLOOD PRESSURE STUDY



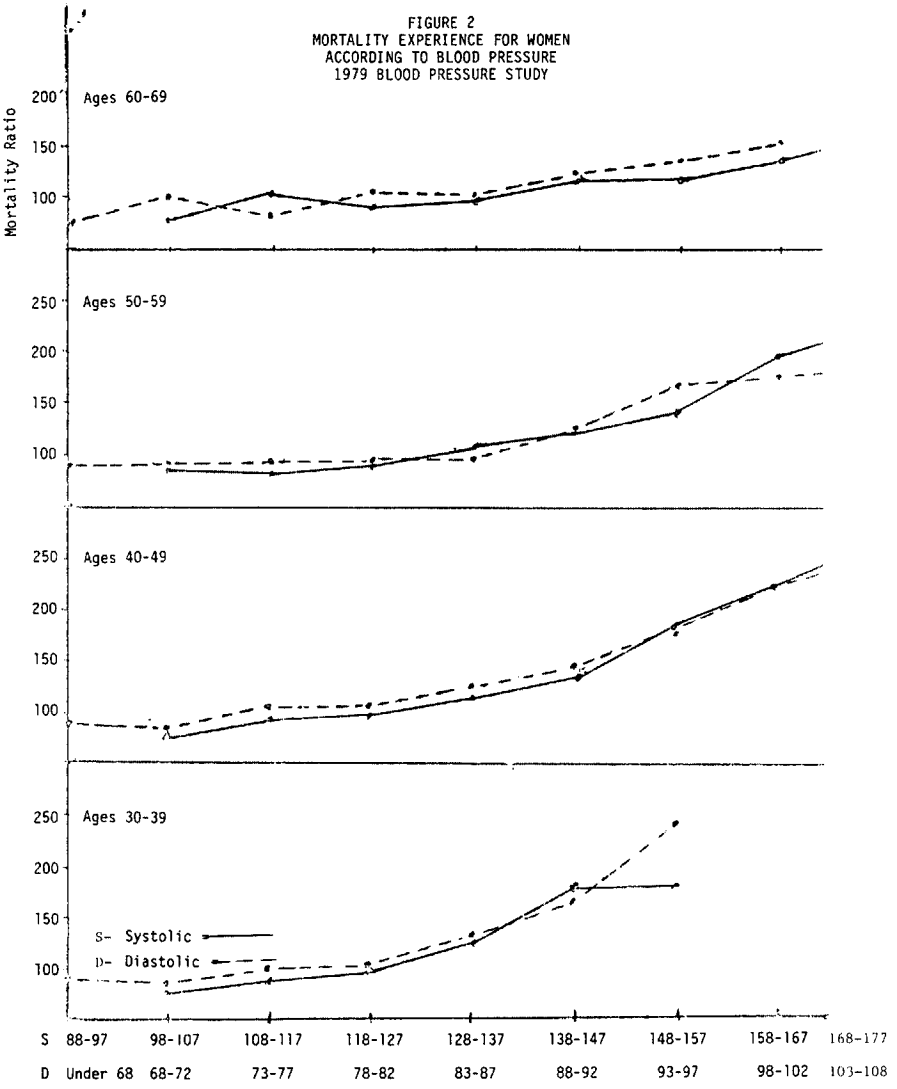


FIGURE 2
MORTALITY EXPERIENCE FOR WOMEN
ACCORDING TO BLOOD PRESSURE
1979 BLOOD PRESSURE STUDY
Mortality Ratio
Ages 60-69
Ages 50-59
Ages 40-49
Ages 30-39
S- Systolic
D- Diastolic
S 88-97 98-107 108-117 118-127 128-137 138-147 148-157 158-167 168-177
D Under 68 68-72 73-77 78-82 83-87 88-92 93-97 98-102 103-108