

## CHRONIC DISEASE AMONG SPOUSES<sup>1</sup>

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THE leading position of the chronic diseases as causes of disability and death has served in recent years to broaden the scope of public health activities. In some localities the program now includes preventive and therapeutic measures for the control of the crippling effects and early fatality of conditions such as cancer, diabetes, and heart disease. But a comprehensive program of control and alleviation of chronic conditions requires more knowledge than is now available of particular diseases and their causes.

This need for more knowledge of chronic conditions has been described by Ryle in a letter to *The Lancet*:<sup>2</sup> "More intimate socio-medical investigations of all the prevailing chronic diseases of our age are now needed. The 'multiple stress' diseases and accidental injuries in the western world are as worthy of epidemiological inquiry as the diseases due to infective agents. They now cause more loss of life and efficiency and call for a greater expenditure of time and money than the communicable diseases. Like these they are due to a complexity of causes which vary with time and place and social change and which can, by appropriate methods, be unravelled. Unlike them they lack a specific factor which can sometimes be specifically countered. But social conditions and modes of work and habits are—albeit slowly—alterable things."

To learn more about the chronic diseases was the major objective of a study of morbidity carried on in the Eastern Health District of Baltimore from June, 1938, to May, 1943. Since the population of the study consisted of family units, it was possible to observe the prevalence of conditions which are usually nonfatal, as well as those which are among the

<sup>1</sup> From the Milbank Memorial Fund and The Division of Public Health Methods of the United States Public Health Service.

<sup>2</sup> Ryle, John A.: Coronary Disease. *The Lancet*, No. XIX of Vol. II, 1946, pp. 692-693.

leading causes of death in a group of adults composed of husbands and their wives. Accordingly, this particular report presents an analysis of the prevalence and incidence of chronic disease and the association of specific chronic conditions among a sample of married pairs. Husbands and their wives constitute a unique group in this study because it was possible to observe the event of chronic disease in young, middle-age, and old-age couples who had shared the same environment over varying periods of years.

A previous study has indicated an association in age at death and cause of death of husbands and wives. In an analysis of the causes of death among a sample of 2,571 husbands and wives who died in Washington County, Maryland, during the period 1898 to 1938, Ciocco found a tendency for husbands and wives to die from the same cause when one spouse died from either tuberculosis, influenza and pneumonia, heart disease, or cancer.<sup>3</sup> This tendency was most striking relative to tuberculosis and was statistically significant with respect to all four causes. Ciocco was inclined to explain the association observed with respect to age at death and causes of death as probably due to conscious or unconscious marital selection and to spread of infection in a closely shared environment.

Preliminary analysis of illness in the chronic-disease families in the Eastern Health District indicated that members of families selected on the basis of a case of chronic disease had an excess rate of illness compared with the remaining population.<sup>4</sup> This was true for both chronic-disease patients and for other members of the family. A consideration of factors of the social environment, such as occupational class of the household head and the amount of medical care in relation to the amount of illness, aside from chronic disease, revealed no striking differences between the two groups of families. A study of chronic disease among husbands and wives in these families offers an

<sup>3</sup> Ciocco, Antonio: On the Mortality in Husbands and Wives. *Human Biology*, 12: No. 4, December, 1940.

<sup>4</sup> Downes, Jean: Illness in the Chronic Disease Family. *American Journal of Public Health*, 32: No. 6, June, 1942.

AGE GROUP	TOTAL MARRIED PAIRS	A SECOND MARRIAGE FOR EITHER HUSBAND OR WIFE OR FOR BOTH	PER CENT OF PAIRS WITH A SPOUSE MARRIED MORE THAN ONCE
TOTAL	1,488	199	13.4
20-34	427	37	8.7
35-44	372	50	13.4
45-64	561	87	15.5
65 +	128	25	19.5

Table 1. Per cent of pairs with a spouse married more than once.

marriage. This group of 255 included young married sons or daughters of the head of the household and parents of either the household head or his wife. These were excluded from the analysis because of an incomplete marriage history. An additional 30 pairs (married once only) had to be excluded from the analysis since information concerning present chronic illness was available for only one member of the pair because of divorce or separation from the spouse.

In 199 of the remaining 1,488 married pairs, either the husband or the wife, or both, had had a previous marriage.<sup>8</sup> Table 1 shows the 1,488 married pairs arrayed according to the age of the husband, and the per cent in each age group that were second marriages. The proportion of second marriages among married pairs increased with age. At ages 20-34 in almost 9 per cent of the pairs one or both spouses had had more than one marriage and at ages 65 and over, 20 per cent were in this class.

To study the association of chronic illness in husbands and wives it was considered essential to eliminate these pairs where there had been more than one marriage on the part of either one or both of the spouses chiefly because, in the study of illness in the Eastern Health District of Baltimore, specific information concerning chronic illness was not obtained for spouses of previous marriages.

<sup>8</sup> In a total of 199 pairs there had been a previous marriage; in 114 only the wife had been married more than once; in 48 only the husband had had a previous marriage; in 37 instances both the husband and the wife had been married more than once.

In all, 484 married pairs were excluded from the study of chronic illness for the reasons which have been described. Among the remaining 1,289 married pairs (one marriage only) there were 150 widows and 30 widowers. Thus it is possible to study chronic disease for 1,109 pairs where both husband and wife were living, and for the 1,289 pairs including those where one member was deceased at the time the family unit was first observed.

### ECONOMIC BACKGROUND

As far as the white population is concerned the Eastern Health District of Baltimore was considered as fairly representative of the localities in the city in which the wage-earning population lived; that is, it contained some families in relatively poor economic circumstances, wage-earning families in moderate circumstances, relatively few families in the professional class, and no families that could be classed as wealthy. The district cannot be considered as strictly representative of Baltimore as a whole, but it is probably representative of the population which forms the great majority in the City.

Table 2 shows the distribution of the 1,289 pairs, married

Table 2. Percentage distribution of 1,289 married pairs according to home ownership and by age of husband (married once only).

AGE OF HUSBAND	TOTAL	HOME OWNER	RENTER
	PER CENT		
ALL AGES	100.0	55.9	44.1
20-34	100.0	27.9	72.1
35-44	100.0	59.0	41.0
45-64	100.0	71.2	28.8
65 +	100.0	82.4	17.6
NUMBER OF MARRIED PAIRS			
ALL AGES	1,289	721	568
20-34	390	109	281
35-44	322	190	132
45-64	474	337	137
65 +	103	85	18

In Appendix Table 1, all cases of the various chronic diseases are shown for living pairs by age of husband. Appendix Table 2 shows data for certain chronic diseases among both groups of spouses, living and dead.

The rate of prevalence of chronic disease by specific cause is shown in Table 8 for the 1,109 husbands and their wives living at the time of observation. There was a higher prevalence of tuberculosis, malignant neoplasms, psychoses, and hernia among husbands than among their wives. Ulcer of the stomach and duodenum occurred among husbands only. For all other causes of illness, the rates were higher among wives than among

Table 8. Prevalence of chronic disease by cause among husbands and wives at different ages (rate per 1,000 population).

CLASSIFICATION OF CHRONIC DISEASE	ALL AGES (1,109 PAIRS)	20-34 (377 PAIRS)	35-44 (295 PAIRS)	45-64 (377 PAIRS)	65 + (60 PAIRS)
		Age Groups			
<i>Tuberculosis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	9.9	2.6	10.2	15.9	16.7
Wife Only	3.6	8.0	0	2.6	0
<i>Neoplasm (Malignant)</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	6.3	0	0	13.3	33.3
Wife Only	4.5	0	0	8.0	33.3
<i>Diabetes</i>					
Both Husband and Wife	1.8	0	0	5.3	0
Husband Only	4.5	0	6.8	8.0	0
Wife Only	9.0	0	3.4	21.2	16.7
<i>Psychoses</i>					
Both Husband and Wife	0.9	0	0	2.6	0
Husband Only	5.4	5.3	6.8	5.3	0
Wife Only	3.6	0	3.4	8.0	0
<i>Psychoneuroses</i>					
Both Husband and Wife	0.9	0	0	2.6	0
Husband Only	6.3	8.0	10.2	0	16.7
Wife Only	22.5	21.2	27.1	21.2	16.7
<i>Circulatory Disease<sup>1</sup></i>					
Both Husband and Wife	17.1	0	0	29.2	133.3
Husband Only	43.3	8.0	23.7	74.3	166.7
Wife Only	59.5	15.9	23.7	108.8	200.0

Table 8—Continued

CLASSIFICATION OF CHRONIC DISEASE	ALL AGES (1,109 PAIRS)	20-34 (377 PAIRS)	35-44 (295 PAIRS)	45-64 (377 PAIRS)	65 + (60 PAIRS)
		Age Groups			
<i>Heart Disease</i>					
Both Husband and Wife	5.4	0	0	8.0	50.0
Husband Only	37.0	5.3	13.6	66.3	166.7
Wife Only	41.5	10.6	16.9	69.0	183.3
<i>Hypertensive Vascular Disease</i>					
Both Husband and Wife	3.6	0	0	8.0	16.7
Husband Only	14.4	2.6	10.2	21.2	66.7
Wife Only	26.1	5.3	6.8	53.0	83.3
<i>Varicose Veins</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	4.5	0	6.8	5.3	16.7
Wife Only	17.1	0	13.6	29.2	66.7
<i>Ulcer of Stomach and Duodenum</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	8.1	10.6	10.2	5.3	0
Wife Only	0	0	0	0	0
<i>Gall-Bladder Disease</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	1.8	0	3.4	2.6	0
Wife Only	21.6	10.6	13.6	34.5	50.0
<i>Nephritis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	0	0	0	0	0
Wife Only	0.9	0	0	2.6	0
<i>Arthritis</i>					
Both Husband and Wife	9.0	0	3.4	23.9	0
Husband Only	25.2	2.6	30.5	37.1	66.7
Wife Only	52.3	10.6	23.7	87.5	233.3
<i>Hernia</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	27.0	2.6	20.3	45.1	100.0
Wife Only	5.4	2.6	0	13.3	0
<i>Asthma</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	9.9	2.6	10.2	13.3	33.3
Wife Only	9.9	2.6	13.6	13.3	16.7

<sup>1</sup> Includes only heart disease and hypertensive vascular disease.

husbands with the exception of asthma where the rates were the same for both groups. In the case of both husbands and wives chronic illness was concentrated chiefly among those aged 45 and over. However, the rate of psychoneurosis among wives showed little variation with age.

Among these living pairs, there was no instance where active tuberculosis was known to be present in both husband and wife. The same was true for malignant neoplasms, varicose veins, ulcer of the stomach and duodenum, gall-bladder disease, nephritis, hernia, and asthma. In two instances diabetes was

Table 9. Prevalence of chronic disease by cause among husbands and wives at different ages (both husband and wife married once only—includes widowed).

CLASSIFICATION OF CHRONIC DISEASE	TOTAL (1,289 PAIRS)	20-34 (390 PAIRS)	35-44 (322 PAIRS)	45-64 (474 PAIRS)	65 + (103 PAIRS)
	Rate Per 1,000 Population				
<i>Tuberculosis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	13.2	5.1	12.4	21.1	9.7
Wife Only	4.7	7.7	0	6.3	0
<i>Neoplasm (Malignant)</i>					
Both Husband and Wife	0.8	0	0	0	9.7
Husband Only	19.4	0	9.3	40.1	29.1
Wife Only	9.3	0	3.1	14.8	38.8
<i>Diabetes</i>					
Both Husband and Wife	1.6	0	0	4.2	0
Husband Only	7.2	2.6	9.3	8.4	0
Wife Only	14.0	0	9.3	19.0	58.3
<i>Circulatory Disease</i>					
Both Husband and Wife	27.2	0	3.1	42.2	135.9
Husband Only	71.4	12.8	37.3	109.7	223.3
Wife Only	68.3	17.9	31.1	111.8	174.8
<i>Heart Disease</i>					
Both Husband and Wife	11.6	0	0	16.9	68.0
Husband Only	68.3	10.3	31.1	105.5	233.0
Wife Only	49.7	10.3	24.8	78.1	145.6
<i>Hypertensive Vascular Disease</i>					
Both Husband and Wife	3.9	0	0	8.4	9.7
Husband Only	14.7	2.6	9.3	21.1	48.5
Wife Only	30.3	7.7	9.3	50.6	87.4

present in both husband and wife; in one instance both husband and wife were diagnosed as psychotic; also in one instance both were considered as psychoneurotic. Heart disease, hypertensive vascular disease, and arthritis occurred in both members of a pair with greater frequency than was noted for other chronic diseases.

Table 9 shows for the total 1,289 pairs, including the widowed and their spouses, the prevalence of the specific chronic diseases which are leading causes of death. Inclusion of the spouses where one member of the pair was deceased affects chiefly the prevalence of malignant neoplasm and heart diseases. For example, the rate of malignant neoplasm among males was more than three times as great as the rate noted where both spouses were living, and the rate among females was more than doubled. Males suffered more frequently from these conditions than did females, especially in the middle and old-age group.

Inclusion of the widowed and the deceased spouses did not have such a marked effect upon the rates for diabetes except for females where the prevalence was 44 per cent above that based only upon the living pairs. Slighter changes were noted for tuberculosis and hypertensive vascular disease.

It is interesting to note that the sex distribution of chronic disease by cause in this study is in general agreement with medical experience. For example, in medical experience diabetes has been noted to be less common among males than among females, especially after age 40.<sup>9</sup> This was true in the living married pairs studied in the Eastern Health District. Also, both rheumatoid and degenerative arthritis have been noted to occur more frequently among women than among men.<sup>10, 11</sup> In this study the prevalence of arthritis among wives (both husband and wife living) was 61 per 1,000, compared with a rate of 34

<sup>9</sup> Duncan, Garfield G.: *DISEASES OF METABOLISM: DETAILED METHODS OF DIAGNOSIS AND TREATMENT. A TEXT FOR THE PRACTITIONER.* Philadelphia, W. B. Saunders Company, 1942. (p. 708.)

<sup>10</sup> Cecil, Russell L.: *A TEXTBOOK OF MEDICINE BY AMERICAN AUTHORS.* Philadelphia, W. B. Saunders Company, 1943, 6th ed. (p. 765.)

<sup>11</sup> Musser, John H.: *INTERNAL MEDICINE: ITS THEORY AND PRACTICE.* Philadelphia, W. B. Saunders Company, 1938, 3rd ed.



among husbands.<sup>12</sup> Also, ulcer of the stomach and duodenum has been found to occur more frequently among males than females. This again corresponds with data from this study. The percentage with chronic gall-bladder disease has been found to be much higher among females than among males. In the present study the rate among wives at all ages was 22 compared with 2 per 1,000 among husbands.

#### ASSOCIATION OF CHRONIC DISEASE AMONG HUSBANDS AND WIVES

Chronic disease occurred infrequently among husbands and wives under 45 years of age. In this small sample, therefore, it is impossible to study the association of specific diagnoses of chronic illness in married pairs under middle age. However, if the presence of chronic disease in one or both spouses be considered without respect to specific cause of chronic illness, the association of these illnesses in husbands and their wives can

Table 10. Observed and expected number of cases of chronic disease among husbands and wives (both husband and wife married once only—includes widowed).

CLASSIFICATION WITH RESPECT TO CHRONIC DISEASE	AGE GROUP			
	20-34 (390 Pairs)	35-44 (322 Pairs)	45-64 (474 Pairs)	65 + (103 Pairs)
OBSERVED NUMBER				
<i>Chronic Disease In:</i>				
Both Husband and Wife	5	18	84	36
Husband Only	19	36	74	14
Wife Only	26	23	81	24
Neither Husband Nor Wife	340	245	235	29
EXPECTED NUMBER				
Both Husband and Wife	1.9	6.8	55.0	29.1
Husband Only	22.1	47.2	103.0	20.9
Wife Only	29.1	34.1	110.0	30.9
Neither Husband Nor Wife	336.9	233.9	206.0	22.1

<sup>12</sup> The 68 cases of arthritis among wives were divided as follows: rheumatoid 9; osteoarthritis 19; chronic degenerative 40; the 38 cases among husbands—rheumatoid 5; osteoarthritis 8; and chronic degenerative 25.

be shown. Here again it was considered advisable to include the 180 widowed pairs. Table 10 shows the observed and expected number of persons with chronic disease in each age group.

Table 11. Values of chi-square and P calculated from four-fold tabulations on the concurrent frequency of chronic disease in husbands and wives.

Age of Husband	Chi-Square	P
20-34	5.78	.01-.02
35-44	24.89	< .0001
45-64	35.21	< .0001
65 +	7.56	< .01

Table 11 shows the chi-square values calculated from fourfold tabulations on the concurrent frequency of chronic disease in husbands and their spouses.

The expected numbers of husbands and wives both having chronic disease, as shown in Table 10, result from the cross-products of the rates for all males and the rates for all females in a specific age group. For example, at ages 20-34 there were 390 married pairs; of these 24 of the husbands and 31 of the wives had chronic disease. The resulting rates were .062 and .079 for husbands and wives, respectively. The cross-product of these rates, .005, is the rate at which chronic disease would be expected to be present in both members of a pair if such conditions occurred at random among husbands and wives. Application of this rate to the 390 pairs gives the expected number of 1.9 pairs (both with chronic disease).

To obtain the expected number of married pairs where the husband only had chronic disease, the rate of .005 was subtracted from the rate .062, that is, the rate of chronic disease among all husbands, and the resulting value .057 was applied to the total 390 pairs. This gave the expected number, 22.1. The same procedure was followed to obtain the expected number of pairs where the wife only had chronic disease.

The chi-square test was then applied to test the hypothesis that the difference between the observed and expected frequencies may be due solely to chance.

In every age group the observed number of instances where both the husband and his wife had chronic disease was con-

siderably greater than the number expected to occur concurrently. For example, at ages 20–34 there were five instances where both the husband and his wife had a chronic illness. If the hypothesis that chronic disease occurred independently in these two population groups composed of 390 husbands and the 390 wives held true, only from one to two instances would be expected where both the husband and his wife would be affected. The chi-square for each age group is statistically significant and indicates that some factor other than a normal or expected variation is responsible for the association noted.

It is appropriate here to point out that inclusion of the widowed and their spouses is not a factor in producing association of chronic disease among husbands and their wives. In fact, if only the living pairs are considered, the chi-square values are slightly higher at ages 20–34 and at 65 and over than are the values shown in Table 11. The values obtained for the other two age groups were not greatly altered by exclusion of the widowed.

Since the chi-square values increase with age, and it will be recalled from Table 4 that the shared environment of the married pairs (average years married) also increased with age, there is some suggestion that socio-environmental factors may play a part in producing some form of chronic illness in both husband and wife. However, environment may be one of several factors operating to produce such results.

Physicians interested in psychosomatic medicine have emphasized the importance of environment as a conditioning factor in producing chronic illness. Ruesch, in discussing the social and cultural factors in delayed recovery from illness, made the following statement: "In the past, many diseases were believed to afflict a random sample of the population and a sick individual was just a person with bad luck. In recent years, however, a change of attitude has come about and such diseases as fractures, hypertension, rheumatic disease, coronary sclerosis, diabetes, and others are conceived as conditions which, if not caused by, at least are related to the personality structure

of the individual. It has long since been pointed out that personality is the result of the interaction between the environment and the individual."<sup>13</sup>

Table 12. Observed and expected number of cases of chronic disease among 99 husbands and wives where one spouse has been married more than once (both husband and wife living).

Classification With Respect to Chronic Disease	Observed Number	Expected Number
<i>Chronic Disease In:</i>		
Both Husband and Wife	26	16.1
Husband Only	11	20.9
Wife Only	17	26.9
Neither Husband Nor Wife	45	35.1
Chi-Square 17.32 P = < .0001		

Many of the chronic illnesses included in this study of married pairs are in the group which may be related to the reaction of the individual to his environment. In addition to some of those cited by Ruesch are: peptic ulcer, gall-bladder disease, the psychoneuroses, and

asthma. The sample studied is too small to afford more definite data on this point.

The force of suggestion also may be a possible factor affecting the degree of association of chronic illness among husbands and wives. It may be that because one member of a pair has been found to have chronic disease, the other member is more apt to seek a medical examination or to develop symptoms resulting in a diagnosis of illness. If this be a factor, there is no way of describing the extent of its effect upon the data presented.

One hundred and ninety-nine pairs were excluded from the main study because either the husband or the wife had been married more than once. Data of chronic disease are available for 99 of these pairs since in these instances both present spouses were living and observed for morbidity. The association of chronic disease without respect to cause of illness or age of husband among these pairs is shown in Table 12. The age distribution of this group was weighted by middle and old-age persons

<sup>13</sup> Ruesch, Jurgen: CHRONIC DISEASE AND PSYCHOLOGICAL INVALIDISM. The American Society for Research in Psychosomatic Problems. New York, 1946.

so it was considered suitable to show the data for all ages combined. Again, there is a significant association of chronic disease among husbands and wives. The first marriage of some of these pairs ended in divorce. Since information on chronic disease was lacking for one member of these pairs, it was impossible to study both first marriages and subsequent marriages for this group of spouses.

Chronic disease by specific cause can be considered only for the couples 45 years of age and over. A significant association was found for all circulatory diseases, for hypertensive vascular disease, and for arthritis. The data are shown in Table 13. When heart disease alone is considered, no significant association was noted. The chi-square value for heart disease when based upon living pairs only was 1.19 with a P of around 27 out of 100. When the widowed are included, the chi-square value was raised to 2.82 with a P of 9 out of 100. The degree of association for those causes of chronic disease shown in Table 13 were not markedly affected by the inclusion of the widowed and their spouses.

#### ASSOCIATION OF THE CHRONIC DISEASES

Among the living husbands and wives aged 45 and older,

Table 13. Observed and expected number of concurrent cases of circulatory disease, hypertensive vascular disease, and arthritis among 577 husbands and wives 45 years of age and older (husband and wife married once only and including widowed).

CLASSIFICATION WITH RESPECT TO CHRONIC DISEASE	HYPERTENSIVE VASCULAR DISEASE		TOTAL CIRCULATORY DISEASE		ARTHRITIS <sup>1</sup>	
	Ob- served	Ex- pected	Ob- served	Ex- pected	Ob- served	Ex- pected
<i>Chronic Disease In:</i>						
Both Husband and Wife	5	1.3	34	19.8	9	3.5
Husband Only	15	18.7	75	89.2	18	23.5
Wife Only	33	36.6	71	85.2	47	52.5
Neither Husband Nor Wife	524	520.4	397	382.8	363	357.5
Chi-Square	11.28	P = .0008	15.21	P = < .0001	10.89	P = .001

<sup>1</sup> Based upon 437 married pairs, both living.

there were 73 who had multiple chronic diseases. It is possible therefore to study the association of certain types of diseases in the same person. In this analysis the 150 widows and the 30 widowers are included, but their dead spouses are excluded. The total population consisted of 1,014 persons.

The conditions which occurred most frequently were arthritis, 10 per cent of the total persons; heart disease, 11 per cent; and hypertensive vascular disease, 5 per cent. It is also of interest to consider diabetes even though only 2 per cent of the persons studied had this condition. Table 14 shows the observed and expected number of persons with both arthritis and heart disease and those with both arthritis and hypertensive vascular disease. Arthritis and heart disease showed no statistically significant association; the observed number of persons with both chronic conditions was 13 and the expected number was 11. The association of arthritis and hypertensive vascular disease, however, was found to be statistically significant. The association of these two chronic conditions in the same person may be partly due to the fact that persons who have hypertensive disease or chronic degenerative arthritis have been found in many instances to be overweight or obese. Overweight places special stress upon the weight-bearing joints and upon the

Table 14. Observed and expected number of persons with multiple chronic disease (1,014 living persons aged 45 and over).

CLASSIFICATION WITH RESPECT TO CHRONIC DISEASE	OBSERVED NUMBER	EXPECTED NUMBER	CHI-SQUARE	P
Both Arthritis and Heart Disease	13	11.3	} 2.77	.09
Arthritis Only	100	101.7		
Heart Disease Only	88	89.7		
Neither Arthritis Nor Heart Disease	813	811.3		
Both Arthritis and Hypertensive Vascular Disease	10	5.5	} 4.38	.04
Arthritis Only	91	95.5		
Hypertensive Vascular Disease Only	45	49.5		
Neither Arthritis Nor Hyperten- sive Vascular Disease	868	863.5		

arterial system. These facts have been pointed out by Cecil<sup>14</sup> and by Morgan.<sup>15</sup> It will be recalled that the category "arthritis" in this study included chiefly the chronic, degenerative types of the disease.

Data which show the occurrence of diabetes with arthritis, and diabetes with heart disease are presented in Table 15. In the experience of this study the association of diabetes with arthritis was not found to be statistically significant. The actually observed concurrent frequency of these two conditions was not significantly different from the theoretical concurrent frequency when there is no association between the two.

In middle and old age, diabetes is usually accompanied by arteriosclerosis and some cases develop complications such as perforating ulcer of the foot and gangrene. About 50 per cent of the 21 diabetic patients in this study had diagnoses which indicated the presence of some form of arterial disease. Since the prevalence of arterial disease was relatively high among these patients, it is not unreasonable to expect some association of heart disease with diabetes. Table 15 shows that 6 persons had both diabetes and heart disease. On the assumption that

Table 15. Observed and expected number of persons with multiple chronic diseases (1,014 living persons aged 45 and over).

CLASSIFICATION WITH RESPECT TO CHRONIC DISEASE	OBSERVED NUMBER	EXPECTED NUMBER	CHI-SQUARE	P
Both Diabetes and Arthritis	4	2.1	} 1.87	0.17
Diabetes Only	97	98.9		
Arthritis Only	17	18.9		
Neither Diabetes Nor Arthritis	896	894.1		
Both Diabetes and Heart Disease	6	2.3	} 6.62	> 0.01
Diabetes Only	15	18.7		
Heart Disease Only	107	110.6		
Neither Diabetes Nor Heart Disease	886	882.4		

<sup>14</sup> Cecil, Russell L.: *TEXTBOOK OF MEDICINE BY AMERICAN AUTHORS*. Philadelphia, W. B. Saunders Company, 1942, 5th Edition, p. 1431.

<sup>15</sup> Morgan, Hugh J.: *Hypertension*. *CECIL'S TEXTBOOK OF MEDICINE BY AMERICAN AUTHORS*. Philadelphia, W. B. Saunders Company, 1942, 5th Edition, p. 1234.

these two conditions occur independently, only 2.3 instances would be expected where both were present in the same person. The chi-square value, 6.62, indicates that diabetes and heart disease were found in this study to be significantly associated.

The general results of this study of chronic disease among married pairs indicate that there is a tendency for chronic disease to be concentrated among spouses in family units. This fact emphasizes the need for greater consideration and study of the patient in his social setting with particular attention to the family environment. In a program for prevention of chronic disease it may even be necessary for the physician to undertake or direct some form of treatment of the family unit in addition to concentrating attention upon the member of the family who has a chronic condition.

#### SUMMARY

This report has presented a study of chronic disease in a population composed of 1,289 husbands and their wives. The prevalence of persons with such illness increased markedly with age. At ages 65 and over the rate for each spouse group was about 4 times as great as the rate at ages 20-34. There were no important sex differences in prevalence in any age group.

The annual incidence of chronic disease among living married pairs increased as age increased. For all age groups combined the rate among wives was 25 per cent higher than that among husbands.

When chronic illness by specific cause or diagnosis was considered, there was some variation in the rates for husbands and wives. There was a higher prevalence of tuberculosis, malignant neoplasm, psychoses, and hernia among husbands than among their wives. Ulcer of the stomach and duodenum occurred among husbands only. For all other causes of illness, except asthma, the rates were higher among wives than among husbands. Chronic illness was concentrated chiefly among husbands and wives aged 45 and over.

The association of chronic disease without respect to cause was studied for husbands and their wives in four different age



groups. In each age group the observed number of instances where both the husband and his wife had a chronic disease was considerably greater than the number expected to occur concurrently. These differences were statistically significant.

Chronic disease by specific cause was considered only for the married pairs 45 years of age and over. A significant association of illness in both husband and wife was found for all circulatory diseases combined, for hypertensive vascular disease and for arthritis. When heart disease alone was considered, there was no indication of a significant association.

The association of certain multiple chronic diseases in the same person was studied. Arthritis and heart disease showed no significant association. The association of arthritis and hypertensive vascular disease, however, was found to be statistically significant. Diabetes and heart disease occurred in the same person more frequently than expected, and the association of the two conditions was considered significant.

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Appendix Table 1. Number of cases of chronic disease by causes among husbands and wives at different ages (both husband and wife living, married once only).

CLASSIFICATION OF CHRONIC DISEASE	TOTAL 1,109	20-34 <sup>1</sup> (377 PAIRS)	35-44 (295 PAIRS)	45-64 (377 PAIRS)	65 + (60 PAIRS)
<i>Tuberculosis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	11	1	3	6	1
Wife Only	4	3	0	1	0
<i>Neoplasm (Malig.)</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	7	0	0	5	2
Wife Only	5	0	0	3	2
<i>Diabetes</i>					
Both Husband and Wife	2	0	0	2	0
Husband Only	5	0	2	3	0
Wife Only	10	0	1	8	1
<i>Psychoses</i>					
Both Husband and Wife	1	0	0	1	0
Husband Only	6	2	2	2	0
Wife Only	4	0	1	3	0
<i>Psychoneuroses</i>					
Both Husband and Wife	1	0	0	1	0
Husband Only	7	3	3	0	1
Wife Only	25	8	8	8	1
<i>Heart Disease</i>					
Both Husband and Wife	6	0	0	3	3
Husband Only	41	2	4	25	10
Wife Only	46	4	5	26	11
<i>Hypertensive Vas. Dis.</i>					
Both Husband and Wife	4	0	0	3	1
Husband Only	16	1	3	8	4
Wife Only	29	2	2	20	5
<i>Circulatory Disease</i>					
Both Husband and Wife	19	0	0	11	8
Husband Only	48	3	7	28	10
Wife Only	66	6	7	41	12
<i>Varicose Veins</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	5	0	2	2	1
Wife Only	19	0	4	11	4
<i>Ulcer of Stom. &amp; Duod.</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	9	4	3	2	0
Wife Only	0	0	0	0	0
<i>Gall-Bladder Disease</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	2	0	1	1	0
Wife Only	24	4	4	13	3
<i>Nephritis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	0	0	0	0	0
Wife Only	1	0	0	1	0

(Continued on page 358)

Appendix Table 1—Continued

CLASSIFICATION OF CHRONIC DISEASE	TOTAL 1,109	20-34 <sup>1</sup> (377 PAIRS)	35-44 (295 PAIRS)	45-64 (377 PAIRS)	65 + (60 PAIRS)
<i>Arthritis</i>					
Both Husband and Wife	10	0	1	9	0
Husband Only	28	1	9	14	4
Wife Only	58	4	7	33	14
<i>Hernia</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	30	1	6	17	6
Wife Only	6	1	0	5	0
<i>Asthma</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	11	1	3	5	2
Wife Only	11	1	4	5	1

<sup>1</sup> At ages 20-34 among husbands there were in addition 2 cases of chronic disease of the prostate, one of renal calculi, and one case of syphilis.

Among wives there was one case of toxic goiter and one case of syphilis.

Appendix Table 2. Number of cases of chronic disease by cause among husbands and wives at different ages (both husband and wife married once only—includes widowed).

CLASSIFICATION OF CHRONIC DISEASE	TOTAL 1,289	20-34 (390 PAIRS)	35-44 (322 PAIRS)	45-64 (474 PAIRS)	65 + (103 PAIRS)
<i>Tuberculosis</i>					
Both Husband and Wife	0	0	0	0	0
Husband Only	17	2	4	10	1
Wife Only	6	3	0	3	0
<i>Neoplasm (Malignant)</i>					
Both Husband and Wife	1	0	0	0	1
Husband Only	25	0	3	19	3
Wife Only	12	0	1	7	4
<i>Diabetes</i>					
Both Husband and Wife	2	0	0	2	0
Husband Only	8	1	3	4	0
Wife Only	18	0	3	9	6
<i>Circulatory Disease</i>					
Both Husband and Wife	35	0	1	20	14
Husband Only	92	5	12	52	23
Wife Only	88	7	10	53	18
<i>Heart Disease</i>					
Both Husband and Wife	15	0	0	8	7
Husband Only	88	4	10	50	24
Wife Only	64	4	8	37	15
<i>Hypertensive Vascular Disease</i>					
Both Husband and Wife	5	0	0	4	1
Husband Only	19	1	3	10	5
Wife Only	39	3	3	24	9