

OHIO AGRICULTURAL EXPERIMENT STATION  
Wooster, Ohio

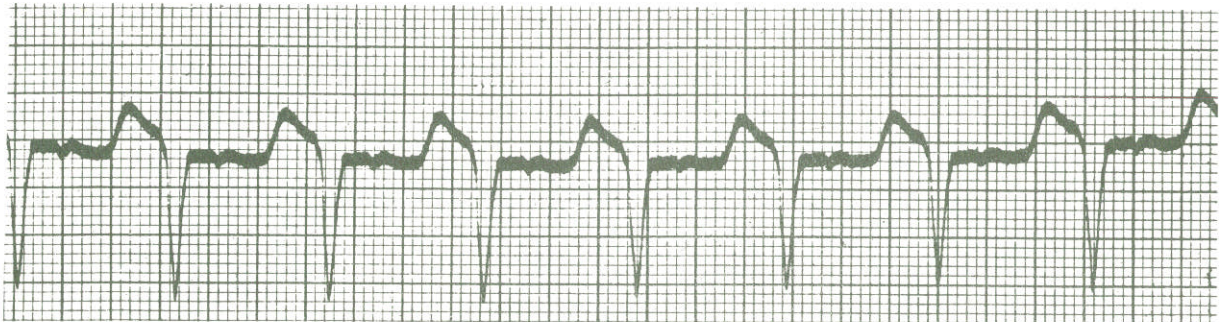
SAAD Z. NAGI

• AN EPIDEMIOLOGICAL ANALYSIS  
OF MORTALITY DATA

# Factors Related To Heart Disease Among Ohio Farmers

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FACTORS RELATED TO HEART DISEASE AMONG OHIO FARMERS\*  
An Epidemiological Analysis of Mortality Data

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SUMMARY

This publication reports the findings of an epidemiological analysis of heart disease mortality data of rural Ohio. Prevalence rates of death by five types of heart disease were obtained from the Division of Vital Statistics of Ohio Department of Health. These types are: rheumatic heart diseases, arteriosclerotic including coronary heart diseases, other degenerative heart diseases, hypertensive heart diseases and other diseases of the heart. Data descriptive of several demographic, occupational, sociological and economic community characteristics were obtained from other secondary sources.

The variables used to describe these characteristics are: social control, density of population, population stability, per cent of rural non-farm population, per cent employed in agriculture of total population employed, farm operator level of living, the level of rural farm housing conveniences, median years of schooling completed by farm people of 25 years of age and over, \*Supported in part by a grant from the Central Ohio Heart Association.

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martial status and place of residence are presented. Crude and age-adjusted rural death rates by the different types of heart disease for all Ohio counties are also incorporated in Appendices I and II. Several important points should be noted. Age-adjusted rates exhibited a different pattern than that of crude rates. The association between age and heart disease fatality rates is clear in the data presented. Urban rates were consistently higher than the rural ones except in the category of "other diseases of the heart." It should be noted also that "arteriosclerotic including coronary heart diseases" accounted for over two-thirds of total deaths by diseases of the heart.

The last category of findings deals with results of the correlation analysis. Several variables showed significant correlations with arteriosclerotic including coronary heart diseases and other degenerative diseases of the heart. Two variables showed significant correlations with hypertensive heart diseases. No significant correlations were found between either rheumatic or other diseases of the heart and any of the variables used in the analysis.

Some explanations and hypotheses are advanced as possible interpretations for the results obtained. These interpretations are limited to arteriosclerotic and hypertensive diseases of the heart. Findings of this part of the analysis were found consistently to support the general hypothesis that links emotional stress and

Findings deals with the relationship between the levels of health services and the reported heart diseases' death rates. The third and final group of findings deals with the relationship of certain socio-economic, environmental and occupational factors to the prevalence rates of mortality by the important diseases of the heart.

Prevalence Rates of Mortality by Heart Disease

Before focusing the attention upon heart disease fatality rates in rural Ohio it is felt advantageous to give a brief description of these rates in the state as a whole. This description includes a discussion of specific rates by age, sex, race, marital status and place of residence.

Crude rates of mortality by diseases of the heart (410-443)

For the state were found to range from a high of 571.73 per 100,000 population in Brown County, to a low of 232.08 in Greene County. The average rate for the state was 369.24 per 100,000 population. When adjusted to age, these rates exhibited a somewhat different pattern. Age-adjusted rates for the same diseases of the heart

(410-443) ranged from 437.86 in Jefferson County to 222.86 in Paulding County. The average rate for the state was 342.88 per 100,000 population.

Age-Specific Mortality Rates

Mortality rates by the different types of heart diseases specified by age groups are presented in Table 1, which shows the high degree of association between age and death by diseases of the heart. Rates of fatalities by these diseases increase considerably after the age of 25 and accelerate rapidly after the age of 45.

Table 2. Crude and Age-Adjusted Heart Disease Death Rates in Ohio, by Sex and Race

(Rates are per 100,000 Population)

Average Rates	Sex and Race				Types of Heart Diseases
	White		Non-White		
	Male	Female	Male	Female	
12.41	12.25	11.70	12.59	11.30	Rheu. H.D. (110-116)
11.83	11.70	11.69	12.59	13.37	Crude Rate
261.24	312.04	196.56	167.59	211.99	Arter. H.D. (120)
242.70	321.35	167.59	167.59	270.89	Age-Adjusted
45.76	37.24	46.25	40.10	93.15	Hyper. H.D. (110-113)
42.37	34.86	40.10	40.10	117.60	Crude Rate
49.83	51.74	48.39	41.70	74.81	Age-Adjusted
45.98	48.45	41.70	41.70	56.17	Other H.D. (121-134)
369.24	413.27	300.79	261.08	372.61	Crude Rate
342.88	416.36	300.79	261.08	467.67	Age-Adjusted
				309.41	Total (110-113)
				50.23	Crude Rate
				114.17	Age-Adjusted
				111.72	Other H.D. (121-134)
				204.03	Crude Rate
				147.18	Age-Adjusted
				13.05	Arter. H.D. (120)
				15.31	Crude Rate
				113.74	Age-Adjusted
				342.88	Total (110-113)

Mortality Rates by Marital Status:

Due to the lack of tabulations of marital status-age-specific death rates by heart diseases, age-adjusted rates by marital status could not be computed. Table 3 shows the crude rates of heart disease deaths by four marital status categories, i.e., single, married, widowed and divorced. Rates presented are for population of 14 years of age and over. It should be noted that this table does not present sound age basis for comparison between the different categories of marital status. For example, the category of single is expected to be over-loaded by younger

<sup>16</sup>In order to obtain population bases for these rates, percentages representing four categories of marital status for population of 14 years of age and over in the 1950 census were projected into 1956 estimates of population of the same ages. The number of heart disease fatalities below 14 years of age were all deducted from the single category.

Crude and age-adjusted rates of deaths by the different types of heart diseases for the rural parts of Ohio counties are included in

Mortality Rates in Rural Ohio

\*Places of less than 5,000 population.  
 \*\*Places of 5,000 population and over.

Type of Heart Disease	Rural*	Urban**	State Average
Rheumatic H.D. (410-416)	11.37	13.03	12.41
Crude Rate			
Age-Adjusted	11.38	12.11	11.83
Arter. Inc. Coronary H.D. (420)			
Crude Rate	244.13	271.41	261.24
Age-Adjusted	228.81	250.78	242.70
Hyper. H.D. (440-443)			
Crude Rate	37.15	50.87	45.76
Age-Adjusted	34.09	47.02	42.37
Other H.D. (421-434)			
Crude Rate	54.17	47.25	49.83
Age-Adjusted	45.73	43.81	45.98
Total (410-443)			
Crude Rate	346.82	382.56	369.24
Age-Adjusted	320.01	353.70	342.88

(Rates are per 100,000 population)

Table 4. Crude and Age-Adjusted Death Rates by Diseases of the Heart in the Rural and Urban Parts of Ohio

For which rural rates, both crude and age adjusted, were higher. the state, except in the case of "other diseases of the heart (421-434)" urban figures exhibit higher rates than those of the rural parts of place of residence are included in Table 4. It should be noted that Crude and age-adjusted rates of death by diseases of the heart by

Mortality Rates by Place of Residence

pronounced in regard to heart diseases that are more associated with age such as the arteriosclerotic and hypertensive types.

#### The Level of Health Services and Mortality Rates

As mentioned before, the second methodological step in this analysis was aimed at testing the relationship between the level of health services available and the rates of mortality by diseases of the heart. The purpose of this step was to determine whether or not the level of health services affects the accuracy of diagnosing and reporting heart disease deaths enough to introduce serious bias in mortality rates.

Results obtained show that no significant correlations exist between the level of health services and rheumatic heart diseases ( $r = .03$   $P > .05$ ), hypertensive heart diseases ( $r = .17$   $P > .05$ ) or the category of other diseases of the heart ( $r = .07$   $P > .05$ ).

A positive correlation was obtained between the level of health services and the death rates of arteriosclerotic (including coronary)

heart diseases (420) ( $r = .22$   $P < .05$ ). Other degenerative heart diseases (421 and 422) were found to be negatively correlated with the level

of health services ( $r = -.26$   $P < .05$ ). These correlations may suggest a lack of distinction in diagnosing and reporting these two categories of heart diseases in places with poorer health services, which

results in reporting some cases of (420) under (421 and 422). If that is the case, a negative correlation would be expected to exist

between the two categories of disease, (421, 422) and (420). However, the correlation coefficient obtained between them, as shown in Table 6,

were found to be significantly correlated with eight variables.

Finally, mortality rates by total diseases of the heart (410-413) analysts.

of the heart (430-434) and any of the variables included in the

If significant correlations were found between other diseases

coronary heart diseases in their relationships to other variables.

the similarities between hypertensive and arteriosclerotic including

average size of farms ( $r = -.36$   $P < .01$ ). It is interesting to note

density of population ( $r = .22$   $P < .05$ ), and a negative one with the

correlations with two variables only; a positive correlation with the

hypertensive diseases of the heart (410-413) showed significant

whole milk production per farm.

the value of farm products sold per farm and the average pounds of

people of 25 years of age and over, the value of farm land and buildings,

farm housing conveniences, median years of schooling completed by farm-

population and negatively with farm operators level of living, rural-

positively with social control and the percentage of rural non-farm

county characteristics. Rates of (421, 422) were found to correlate

varied independently from those of (420) in their relationships to

Rates of degenerative diseases of the heart (421 and 422)

cent of farms classified as commercial and the average size of farms.

land and buildings, average value of farm products sold per farm, per

people employed in agriculture, proportion of tenancy, value of farm

were found to correlate negatively with social control, per cent of



They were correlated positively with part-time farming and mechanization per acre, and negatively with proportion of rural non-farm population, per cent of people employed in agriculture, proportion of tenancy, value of farm land and buildings, average value of farm products sold per farm, and the average size of farms. The correlation coefficients found between total death by diseases of the heart (410-413) and the socio-economic variables are largely the function of mortality by arteriosclerotic including coronary heart disease (420), which constitutes over two-thirds of the total rates. The matrix of intercorrelations was completed beyond these first six variables in search for possible interpretations for the relationships between heart disease fatality rates and the other socio-economic variables.

#### SUGGESTED INTERPRETATIONS AND HYPOTHESES

Interpretations presented here will be limited to findings related to arteriosclerotic, including coronary, diseases of the heart (420). This is due to the importance of this category of diseases and its statistically significant mortality rates. However, interpretations advanced, can be applied also to findings related to hypertensive diseases of the heart (410-413). In their relationships to the demographic, occupational and socio-economic characteristics of counties, death rates of hypertensive heart diseases exhibited a pattern very similar to that of arteriosclerotic diseases of the heart.

Sociological Factors:

Sociological data pertinent to this type of study are hard to ob-

tain from secondary sources. However, two of the variables included in

the analysis can be used as indicators of sociological stresses. These

variables are social control and density of population. As previously

explained, social control is measured by an inverted index of crime and

delinquency rates. Since crime and delinquency constitute two impor-

tant sources of sociological stresses, the degree of such stresses

should be expected to vary negatively with the degree of social control.

The second variable with important sociological implications is

that of the density of population. Certain sources of sociological

stresses such as complexities in life situations and role conflicts

are characteristic of urbanization which is highly associated with the

density of population.

In view of the general hypothesis relating arteriosclerotic heart

diseases to emotional stresses, mortality rates by these diseases should

be expected to correlate negatively with the degree of social control

and positively with the density of population. Results obtained in the

analysis and presented in Table 6 substantiate these hypotheses. Corre-

lation coefficients found to exist between the counties' ranks on age-

adjusted death rates by arteriosclerotic including coronary heart dis-

eases (120) and their ranks on social control and population density

were ( $r = -.24$ ,  $P < .05$ ) and ( $r = .25$ ,  $P < .05$ ) respectively. It should

be noted that death rates by hypertensive diseases of the heart (140-

143) followed a similar pattern in their relationships to these two

sociological variables.

size farms than the ones they operate. This fact is clearly demonstrated  
maintain farm equipment that can be used more efficiently on larger  
this analysis provides a case in illustration. Most small farmers  
of production. The level of mechanization as measured and used in  
cies are imposed by capital limitations or an imbalance in other means  
results can be considered an important source of worry. Some inefficient-

Inefficient farm operations: Inefficient operations and their

( $r = .23$   $P > .05$ ) and ( $r = .25$   $P > .05$ ) respectively, were obtained.  
farming. As indicated in Table 6, significant correlation values of  
otic heart disease rates and each of dairy and intensive types of  
a positive correlation would be expected to exist between arterioscler-  
In view of the emotional strains and stresses such risks may create,

tions of weather, labor supply, and markets.  
vegetables. These crops are more susceptible to the uncontrolled condi-

in the case of crops requiring intensive farming, such as fruits and  
and market uncertainties present other sources of high risks, especially  
investment as in the case of dairy and intensive farming. Production

ent degrees of risks. Such risks may be connected with high capital  
High operational risks: Different types of farming involve differ-

complex variables.

must take into consideration cultural differences and a host of other  
in the United States with those of other countries. Such a comparison  
as a basis for comparing the prevalence of heart disease among farmers  
It is also important to notice that these findings should not be used

that of unskilled or semi-skilled labor, which requires more physical effort than most other non-farm occupations. Therefore, a positive association would be anticipated between rates of arteriosclerotic heart disease and part-time farming. Results obtained and presented in Table 6 substantiate this hypothesis, ( $r = .26 P < .01$ ). Elements of occupational stresses can be detected also in work schedules of dairy farmers as well as the type and amount of work required in intensive farming. As mentioned above and illustrated in Table 6, these two types of farming were found to be correlated positively with arteriosclerotic heart disease death rates. It should be emphasized at this point that correlation coefficients in themselves do not establish causal explanations. The above suggested interpretations relating emotional and occupational stresses to arteriosclerotic including coronary diseases of the heart are advanced only as hypotheses for further investigation.

APPENDIX I (Continued)

Mortality by Types of Heart Disease in Ohio Counties,  
 General Health Jurisdictions\*  
 Crude Rates Per 100,000 Population

County	410-416**	420	421,422	440-443	423-434	410-413
Types of Heart Disease						
Geauga	11.44	211.69	65.80	28.61	22.89	340.42
Greene	4.56	166.31	15.95	6.83	11.39	205.04
Guernsey	4.48	295.55	35.82	53.74	22.39	411.98
Hamilton	14.21	245.69	29.10	41.96	8.12	339.09
Hancock	16.25	195.03	5.42	70.43	27.09	314.21
Hardin	4.72	264.36	28.32	23.60	14.16	335.17
Harrison	25.75	319.26	36.05	25.75	30.90	437.69
Henry	5.90	230.22	94.45	35.42	35.42	401.42
Highland	20.48	258.01	77.81	49.14	4.10	409.53
Hocking	0	203.33	60.25	15.06	22.59	301.23
Holmes	20.76	238.71	51.89	20.76	5.19	337.31
Huron	7.11	345.04	85.37	28.46	17.79	483.76
Jackson	11.00	225.52	16.50	22.00	5.50	280.53
Jefferson	15.01	294.55	54.41	30.02	15.01	408.99
Knox	4.07	223.74	69.16	44.75	4.07	345.71
Lake	10.11	225.82	16.85	37.08	11.80	301.66
Lawrence	8.51	258.17	51.07	45.39	2.84	365.98
Licking	9.55	322.29	38.20	69.23	9.55	448.82
Logan	17.53	232.21	61.34	48.19	13.14	372.42
Lorain	4.71	197.67	23.53	37.65	7.06	270.62
Lucas	11.19	195.83	27.04	30.77	19.58	284.42
Madison	13.88	235.94	32.38	13.88	9.25	305.33
Manhning	9.35	273.89	28.06	38.75	4.01	354.06
Marion	15.93	228.27	47.78	74.32	5.31	371.61
Medina	9.16	268.71	30.54	27.48	6.11	341.99
Meigs	4.39	298.38	83.37	43.88	35.10	465.12
Mercer	12.17	223.04	52.72	40.55	24.33	352.81
Miami	2.77	259.92	35.95	52.54	11.06	362.23
Monroe	14.08	267.53	84.48	91.52	49.28	506.90
Montgomery	11.30	234.35	27.88	21.10	12.06	306.69

\*Data are of 1956 obtained from the records of the Division of Vital Statistics of the Ohio Department of Health.

\*\*Figures refer to types of heart disease as explained in pages 4-5 of the text.

APPENDIX II

Mortality by Types of Heart Disease in Ohio Counties\*  
 General Health Jurisdictions\*  
 Age-Adjusted Rates Per 100,000 Population

County	410-416**	420	421,422	440-443	423-434	410-443
Types of Heart Disease						
Adams	23.54	230.23	60.03	35.45	6.27	355.51
Allen	2.70	240.69	70.73	24.83	4.86	343.81
Ashland	0	210.21	55.24	15.63	25.80	306.89
Ashtabula	3.89	225.32	35.50	29.56	18.88	313.14
Athens	9.23	212.98	33.24	31.86	18.94	306.25
Auglaize	13.74	196.91	54.34	36.53	8.77	310.30
Belmont	8.03	250.38	58.53	21.55	9.88	348.35
Brown	0	242.71	71.73	69.40	2.70	386.53
Butler	4.22	254.21	38.61	61.78	6.37	365.19
Carroll	10.50	270.51	61.02	18.27	11.66	371.95
Champaign	3.73	199.65	13.02	26.05	11.19	253.64
Clark	11.08	339.97	11.19	16.28	11.80	390.32
Clermont	4.56	192.33	25.64	29.32	9.22	261.07
Clinton	24.32	213.43	20.46	10.97	20.32	289.50
Columbiana	21.57	310.48	24.44	45.52	3.72	405.73
Coshocton	0	245.34	120.39	8.39	16.79	390.91
Crawford	13.48	186.22	34.11	15.16	7.58	256.56
Cuyahoga	16.47	196.82	22.18	33.43	7.69	276.59
Darke	6.57	229.24	44.89	53.84	2.19	336.74
Defiance	0	257.45	44.99	11.12	29.03	342.58
Delaware	0	214.18	38.51	30.81	11.55	295.06
Erle	6.76	229.27	26.36	53.95	8.40	324.73
Fairfield	15.38	205.10	31.48	49.58	7.27	308.80
Fayette	14.33	179.29	43.51	6.22	6.22	249.55
Franklin	17.12	216.51	24.42	52.60	13.44	324.09
Fulton	7.06	214.63	67.10	56.92	2.54	348.25
Gallia	16.85	252.01	16.07	16.07	0	301.01

\*Data are of 1956 obtained from the records of the Division of Vital Statistics of the Ohio Department of Health.

\*\*Figures refer to types of heart disease as explained in pages 4-5 of the text.

APPENDIX II (Continued)

Mortality by Types of Heart Disease in Ohio Counties,  
 General Health Jurisdictions\*  
 Age-Adjusted Rates Per 100,000 Population

County	Types of Heart Disease				
	410-416	420	421, 422	440-443	423-434 410-443
Miami	2.92	240.14	33.23	47.60	334.69
Monroe	7.94	173.53	57.79	54.46	321.71
Montgomery	13.88	333.21	41.43	29.28	434.09
Morgan	31.80	226.57	44.97	28.57	360.49
Morrow	5.74	222.47	23.67	42.49	320.57
Muskingum	22.80	305.26	18.24	41.45	405.19
Noble	15.16	312.13	15.63	45.41	403.96
Ottawa "	13.72	212.39	49.46	20.76	304.94
Paulding	10.81	168.75	21.65	8.66	222.86
Perry	21.03	252.47	104.87	45.89	435.57
Pickaway	4.09	210.26	41.58	21.26	302.41
Pike	4.77	145.86	34.72	29.07	224.84
Portage	14.16	166.19	40.65	27.06	251.93
Preble	11.49	211.21	49.67	35.73	318.47
Putnam	12.74	189.40	44.58	64.65	318.07
Richland	13.05	218.71	51.62	43.93	348.11
Ross	3.15	145.57	56.14	29.75	240.47
Sandusky	3.25	227.61	27.56	27.26	287.90
Scioto	6.37	127.13	56.61	26.26	220.70
Seneca	26.24	252.89	45.68	29.74	358.00
Shelby	5.57	180.55	45.16	25.08	269.39
Stark	13.55	226.49	28.26	29.10	305.41
Summit	15.96	239.35	36.55	25.27	331.86
Trembuhl	12.49	265.34	28.08	37.54	354.01
Tuscarawas	17.13	274.19	46.56	36.32	390.74
Union	21.84	206.57	39.07	42.20	315.69
Van Wert	4.59	168.76	13.76	22.94	219.21

\*Data are of 1956 obtained from the records of the Division of Vital Statistics of the Ohio Department of Health.

\*\*Figures refer to types of heart disease as explained in pages 4-5 of the text.

APPENDIX III

Ranks of Ohio Counties on the Demographic, Occupational, Sociological and Economic Variables  
Used in the Analysis\*

County	Variables**										
	1	2	3	4	5	6	7	8	9	10	11

Adams	4	32	11	34	66.5	19	47	83	67	14	1
Allen	82	27	5	62	72	28	51	15	76	67	71
Ashland	85.5	58	18	79	6	56	24	43	45	73	48
Ashtabula	75	43	52	46	18	50	38	28	21	64	64
Athens	51	54	56	41	17	57	21	40	55	19	57
Auglaize	28	67	20	30	54	53	30	45	14	49	30
Belmont	54	21	13	68	49	23	57	19	22	33	69
Brown	85.5	24	4	1	83	13	27	79	55	11	3
Butler	73	16	44.5	3	65	16	87	10	84	70	78
Carroll	48	12	9	75	39	14	33	73	58	42	32
Champaign	76	65	86	58	43	78	41	61	65	45	25
Clark	44	1	87	77	37	12	85	12	79	75	76
Clermont	71	70	68	47	51	76	41	39	69	1	42
Clinton	3	52	78	84	16	65	28	61	81	32	22
Columbiana	10	5	70	19	78	4	17	17	13	69	72
Coshocton	85.5	23	1	87	22	10	13	66	25	40	40
Crawford	32	75	54	80	61	77	63	35	8	86	54
Cuyahoga	19	68	73	37	60	71	81	1	58	88	88
Darke	61	38	35	9	87	33	35	50	17	34	17
Defiance	85.5	14	33	83	1	29	57	58	35	83	33
Delaware	85.5	50	46	43	40	63	67	55	61	59	29
Erle	59	37	66	8	56	38	79	16	81	60	73
Fairfield	22	62	58	14	63	55	75	33	57	50	51
Fayette	25	78	37	88	68	81	22	67	77	71	23
Franklin	15	47	71	12	31	40	67	5	86	84	83
Fulton	58	49	7	5	85	24	12	58	10	16	18
Gallia	16	20	82	78	88	61	77	70	52	74	10

\*Sources of data are explained in pages 4 to 9 of the text.  
\*\*Variables are referred to by numbers at the head of each column, see pages 4 to 9 of the text.



APPENDIX III (Continued)

Ranks of Ohio Counties on the Demographic, Occupational, Sociological and Economic Variables Used in the Analysis\*

County	Variables**										
	1	2	3	4	5	6	7	8	9	10	11
Miami	80.5	29	57	16	44	34	48	20	71	51	63
Monroe	55	79	15	7	3	43	25	84	2	22	2
Montgomery	27	2	41	48	21	3	80	6	83	55	84
Morgan	1	40	34	53	2	17	66	86	27	12	6
Morrow	64	44	72	22	5	44	15	81	15	10	9
Muskingum	6	6	81	25	20	5	72	28	42	54	67
Noble	23	4	83	20	27	6	15	87	2	17	4
Ottawa	29	55	27	71	55	59	39	28	74	3	60
Paulding	45	82	75	86	35	86	8	82	35	4	15
Perry	11	19	2	18	41	2	9	47	5	6	53
Pickaway	74	57	40	70	7	60	69	65	63	24	16
Pike	69	86	53	51	46	85	23	85	64	7	7
Portage	26	83	42	55	77	79	55	24	85	37	65
Preble	40	56	25	33	47	45	11	58	74	13	26
Putnam	35	73	36	2	64	46	5	71	5	23	8
Richland	33	45	22	21	14	25	65	18	54	52	74
Ross	78	87	17	44	69	83	60	43	79	27	50
Sandusky	77	39	65	54	86	66	54	26	27	62	59
Scioto	62	88	16	56	74	87	59	22	59	43	70
Seneca	2	18	30	45	80	18	54	35	38	78	56
Shelby	65	77	32	61	34	73	78	49	41	66	31
Stark	31	41	63	50	57	58	37	8	37	58	81
Summit	20	30	49	60	28	37	83	4	33	85	87
Trembulla	37	13	64	29	45	20	75	13	43	41	80
Tuscarawas	13.5	11	28	31	23	11	21	23	2	56	68
Union	8	61	43	23	70	47	19	75	23	39	13
Van Wert	70	81	84	64	52	88	4	55	19	76	36

\*Sources of data are explained in pages 4 to 9 of the text.

\*\*Variables are referred to by numbers at the head of each column, see pages 4 to 9 of the text.

APPENDIX III (Continued)

Ranks of Ohio Counties on the Demographic, Occupational, Sociological and Economic Variables  
Used in the Analysis\*

		Variables**											
		12	13	14	15	16	17	18	19	20	21	22	23
County													
Adams	84	87	84	81	39	75	68	35	34	41	41	86	83
Allen	11	20	19	45	28	28	46	37	69	56	56	70.5	68
Ashland	55	39	10	36	50	61	53	41	43	48	48	22	40
Ashtabula	62	35	16	17	88	64	63	74	72	12	12	1	12
Athens	77	75	50	42	70	78	84	79	42	18	18	51.5	27
Auglaize	25	28	44	71	23	37	19	45	27	76	76	39	87
Belmont	68	66	74	39	65	73	74	72	65	65	33	38	24
Brown	72	83	75	69	44	68	64	26	61	53	53	85	84
Butler	28	30	45	30	33	19	31	45	56	34	34	15	69
Carroll	70	50	57	34	83	72	70	56	31	36	44.5	38	38
Champaign	33	46	36	68	8	22	11	30	17	62	62	9	76
Clark	4	17	17	24	27	15	5	42	27	54	14	58	58
Clermont	56	64	58	22	57	54	72	69	77	17	57.5	28	28
CClinton	15	55	48	80	6	12	4	24	11	65	87	10	80
Columbiana	49	21	51	35	79	63	59	64	76	10	21	10	10
Coshocton	69	65	39	61	62	66	57	48	10	51	56	32	32
Crawford	12	10	23	57	29	36	23	23	19	77	50	53	53
Cuyahoga	19	1	13	19	87	8	9	81	88	1	12	1	1
Darke	45	51	59	62	16	39	34	20	73	52	70.5	65	65
Defiance	22	44	30	51	25	34	35	15	16	71	78	51	51
Delaware	29	36	4	67	47	43	42	40	41	57	23	71	71
Erle	14	11	24	63	42	29	38	45	60	24	17	8	8
Fairfield	26	47	34	18	38	46	45	43	58	40	48	48	48
Fayette	2	58	60	88	1	2	2	13	2	84	81	77	77
Franklin	5	12	3	40	26	30	51	68	39	39	7	36	36
Fulton	8	5	44	30	24	6	11	62	58	58	34	21	21
Gallia	63	45	9	9	67	41	56	71	67	27	2	17	17

\*Sources of data are explained in pages 4 to 9 of the text.

\*\*Variables are referred to by numbers at the head of each column, see pages 4 to 9 of the text.

Nagi, Saad Z.  
Factors Related to Heart Disease  
Among Ohio Farmers  
1959

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