

Cardiovascular Disease Field Study in Evans County, Ga.

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The following report, the first in a series, presents the characteristics of the population in the Evans County (Ga.) cardiovascular disease study. Subsequent papers will report the findings.

A CARDIOVASCULAR disease field study began in Claxton, Evans County, during 1958-60. The study developed from observation by one of the authors (C. G. H.), a medical practitioner living in Claxton, that coronary heart disease seemed to occur less commonly among Negro than white patients.

Evans County (fig. 1) is located on the coastal plain about 60 miles inland from the port city of Savannah, Ga. The county is 19 miles in greatest diameter, and consists of flat or slightly rolling terrain of red clay and sand soils. Much of the county is covered by pine forests, which are harvested for pulpwood, turpentine, and lumber. About half of the population live on farms; the other half live in a few small villages including the town of Claxton (popula-

tion 2,000). About 40 percent of the population are Negro.

The study was designed basically around three questions:

1. Is the observation valid, that is, does coronary heart disease occur more commonly among whites than Negroes living in Evans County; if so, what is the extent of the difference?

2. Presupposing an affirmative answer, what is the reason for the difference?

3. What further data should be gathered to enable study of other cardiovascular diseases and conditions among the population?

A morbidity survey was done to measure the prevalence of clinical cases of coronary heart disease. A nutrition survey of a 10 percent random sample of the population was also carried out. A detailed review of mortality in Evans County, undertaken prior to the morbidity survey, revealed higher age-standardized coronary death rates among white than among Negro males.

Age-specific prevalence rates reported from other studies were used to estimate the expected number of cases of coronary heart disease among white males and females in the Evans County population (1-4). Prevalence rates for Negroes have not been reported in the literature, although an extensive review summarizes the clinical studies (5).

The white population of Evans County seemed large enough to provide an adequate number of "prevalence" cases, but the Negro population was considered too small. Therefore, a portion of adjoining Bulloch County was included in the census to provide a larger number of Negroes for the study population.

Dr. McDonough, epidemiologist and examining physician, Miss Stulb, nutritionist, and Dr. Garrison, examining physician, were assigned to Evans County by the Public Health Service Heart Disease Control Program. Dr. Hames is a medical practitioner in Claxton and chairman of the Evans County Board of Health. Support for the study is from Public Health Service grant H-3341 and a contract of the Georgia State Health Department Cardiovascular Disease Control Service and the Heart Disease Control Program of the Public Health Service. Dr. McDonough and Miss Stulb are currently assigned to the department of epidemiology, University of North Carolina School of Public Health, for further analyses of the data.

Evans County and five General Militia Districts (44, 45, 1340, 1547, and 1803) of Bulloch County were enumerated by special census for the heart research project during January and February 1960. The census was conducted by five enumerators and a supervisor, all living in the area. They were given a training course in the use of the census form prior to working in the field. Each enumerator spent the first day in the field under close supervision, and daily supervision was continued for the duration of the census period. Enumerators were paid 50 cents per completed household census card, and the supervisor was paid \$15 per day. Total cost, including transportation and printing, was \$1,900.

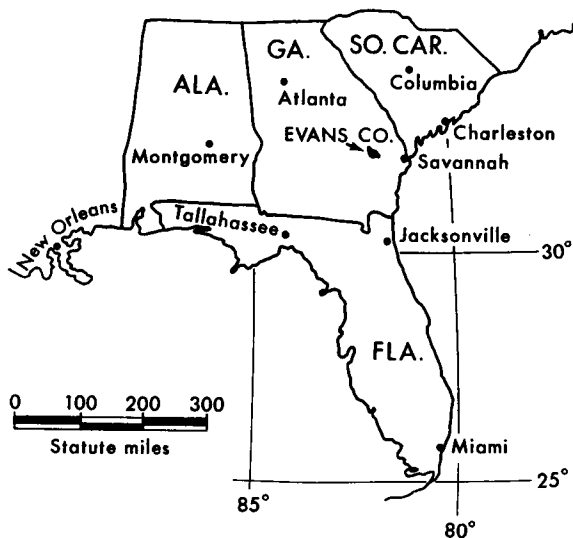
There were 6,596 persons tabulated in Evans County and 3,921 in Bulloch County by age, race, and sex (table 1). The Federal decennial census which was conducted 2 months later (April 1960) provided a means of evaluating the accuracy of the first census. A comparison was made to determine similarities. The first census under-enumerated whites by about 6 percent and Negroes by 3 or 4 percent. There was no appreciable sex difference within race groups. Furthermore, the two enumerations agreed closely by age within race-sex specific groups. This degree of under-enumeration was considered unimportant in terms of its influence upon the results of the morbidity survey.

Study Population

The study population was selected from the census list. It consisted of the entire Evans County population (Negro and white) aged 40-74 years, plus the Bulloch County population (five General Militia Districts) aged 40-74 years (Negro only). A randomly selected 50 percent sample of the Evans County population aged 15-39 years was also included. The population segment aged 40-74 years was chosen principally to determine the prevalence of coronary heart disease, while the 15- to 39-year age group was included for other studies.

The population was divided into 10 random samples. The technique employed was to consider the household as the sampling unit and to sample separately the whites and Negroes in Evans and Bulloch Counties. Random num-

Figure 1. Location of Evans County, Ga., in southeastern United States



bers were used, and a running count of persons aged 15-74 (Evans) or 40-74 years (Bulloch) was kept as the basis for dividing the population into 10 approximately equal-sized random samples. A 50 percent random sample of persons in the age group 15-39 years was obtained by including all such persons in that age group from the first five samples only (tables 2 and 3). The sampling sequence was maintained throughout the study; that is, all available persons from sample 1 were examined before moving to sample 2 and so on.

The sampling procedure had at least four advantages:

1. Drift, occasioned by possible aging of laboratory reagents, changes in diagnostic acumen, and so forth, was randomized. (Although no drift was noted, subtle changes during the 2-year period of data collection could theoretically produce an important bias.)
2. Possible secular trends in disease pattern including seasonal influences (6) were randomized.
3. Small random samples of the larger study population were readily available for other studies.
4. Record control was tighter for samples of 300 to 400 than would have been the case for an unsampled population of 3,400. For example, maintenance of response rates for each sample provided an opportunity for earlier and more

Table 1. Population of Evans County and Bulloch subcounty areas, special census, heart research project, January-February 1960¹

Age group (years)	White male	White female	Negro male	Negro female	Total	Age group (years)	White male	White female	Negro male	Negro female	Total
<i>Evans County</i>						<i>Bulloch subcounty</i>					
0-4	213	200	169	214	796	0-4	116	84	143	134	477
5-9	214	217	180	191	802	5-9	121	116	150	131	518
10-14	246	190	168	162	766	10-14	133	118	119	124	494
15-19	183	160	115	120	578	15-19	112	85	105	103	405
20-24	106	118	64	84	372	20-24	51	43	54	43	191
25-29	114	123	56	59	352	25-29	53	66	22	31	172
30-34	111	116	48	69	344	30-34	59	48	30	37	174
35-39	130	131	46	64	371	35-39	67	55	31	37	190
40-44	141	147	55	60	403	40-44	71	89	30	38	228
45-49	140	126	59	80	405	45-49	89	78	37	40	244
50-54	127	125	53	45	350	50-54	84	68	44	26	222
55-59	94	94	32	63	283	55-59	61	74	20	12	167
60-64	85	100	30	34	249	60-64	59	62	4	13	138
65-69	59	85	35	35	214	65-69	48	40	15	17	120
70-74	45	52	18	22	137	70-74	33	32	6	10	81
75-79	23	32	21	15	91	75-79	19	17	4	5	45
80-84	14	18	5	9	46	80-84	8	11	2	3	24
85-89	10	9	2	8	29	85-89	2	5	1	1	9
90+		2			2	90+		1			1
Unknown	1	4	1		6	Unknown	6	2	7	6	21
Total	2,056	2,049	1,157	1,334	6,596	Total	1,192	1,094	824	811	3,921

¹ General Militia Districts 44, 45, 1340, 1547, and 1803.

Table 2. Sampling distribution of Evans County and Bulloch subcounty populations by age group, within households

Population	Sample										Total
	1	2	3	4	5	6	7	8	9	10	
<i>Evans County Whites</i>											
Households	126	130	128	125	136	124	127	131	138	124	1,289
Persons	421	420	437	422	408	416	395	397	406	378	14,100
0-14 years	141	134	156	140	115	139	106	111	122	116	1,280
15-39 years	126	144	145	130	128	130	114	118	132	125	1,292
40-74 years	143	129	128	145	145	143	161	155	141	130	1,420
75+ years	11	13	8	7	20	4	14	13	11	7	108
<i>Evans County Negroes</i>											
Households	66	61	64	67	67	60	70	65	61	63	644
Persons	236	251	246	232	245	250	245	255	274	256	12,490
0-14 years	94	108	105	94	102	112	102	118	134	115	1,084
15-39 years	75	76	72	65	76	73	69	68	79	72	725
40-74 years	63	58	62	68	59	62	66	66	55	62	621
75+ years	4	9	7	5	8	3	8	3	6	7	60
<i>Bulloch County Negroes</i>											
Households	34	30	30	27	31	35	33	28	31	36	315
Persons	176	163	131	152	186	167	157	157	151	182	1,622
0-39 years	141	130	98	121	154	134	123	126	118	149	1,294
40-74 years	32	31	32	30	31	31	31	31	32	31	312
75+ years	3	2	1	1	1	2	3		1	2	16

¹ Age unknown for 5 whites and 1 Negro in Evans County and 13 Negroes in Bulloch County.

systematic attention to be directed to non-respondents than would otherwise have been possible.

Response to examination. Examination consisted of a rather complete cardiovascular examination by one of two physicians and included history and physical, blood pressure determination, standard electrocardiogram and chest X-ray, and cholesterol determination. (Details of the examinations will be given in a subsequent report.)

Of the 3,377 persons in the study population, 3,102 (92 percent) were examined (table 4). Response rates were higher among the age group 40-74 years than among the age group 15-39 years, owing almost entirely to higher migration

rates for the younger age group. Higher death rates among Negroes than whites coupled with a migration rate of 3 percent for Negro males aged 40-74 resulted in a somewhat lower response rate (90 percent) for this group compared with other race-sex specific groups of the same age. Refusal rates ranged from 2 to 5 percent and were rather similar in age, race, and sex.

Factors which contributed to the high response rate were: (a) an excellent acceptance of the study by people living in the county, due largely to the efforts of C. G. H.; (b) a mapping system whereby every dwelling unit at time of census was numbered on a spot map, which facilitated finding persons who were eli-

Table 3. Evans County and Bulloch subcounty area study population, by race, sex, and age group

Age group (years)	Evans County				Bulloch subcounty		Total
	White male	White female	Negro male	Negro female	Negro male	Negro female	
15-39.....	336	337	171	193	-----	-----	1,037
40-74.....	691	729	282	339	156	156	2,353
Total.....	1,027	1,066	453	532	156	156	3,390

Table 4. Examination status of study population ¹

Age group (years)	Examined		Not examined						Total	
			Deceased		Moved		Refused			
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
<i>White Male</i>										
15-39.....	284	88.7	1	0.3	22	6.9	13	4.1	320	100
40-74.....	664	93.9	7	1.0	13	1.8	23	3.3	707	100
<i>White Female</i>										
15-39.....	285	88.2	-----	-----	26	8.0	12	3.7	323	99.9
40-74.....	685	92.2	12	1.6	12	1.6	34	4.6	743	100
<i>Negro Male</i>										
15-39.....	142	88.7	-----	-----	14	8.7	4	2.5	160	99.9
40-74.....	395	90.4	16	3.7	15	3.4	11	2.5	437	100
<i>Negro Female</i>										
15-39.....	175	93.6	-----	-----	9	4.8	3	1.6	187	100
40-74.....	472	94.4	11	2.2	2	.4	15	3.0	500	100
Total.....	3,102	91.9	47	1.4	113	3.3	115	3.4	² 3,377	100

¹ Age at time of examination. Median elapsed time from enumeration was 18 months.

² 13 persons excluded from study population because of incorrect age, place of residence, or duplication on census record.

gible for examination and was especially useful for persons living in open country; (c) examinations in the home for those individuals unable or unwilling to come to the research building; (d) a sampling system that provided a means for an earlier and more systematic approach to nonresponse; and (e) persistent revisits to persons who refused the examination or were not at home on the first visit.

Characteristics of the Population

Of prime concern in evaluating racial differences in cardiovascular disease is whether an observed difference is principally constitutional and inherited along racial lines or due to essentially different ways in which racial groups live. The obvious way-of-life differences between Negroes and whites in Evans County suggested that these differences should be considered in the evaluation of racial patterns of disease.

The census schedule was used to define the twin subpopulation for special study (7) and to characterize the population on selected variables in an attempt to evaluate way-of-life differences between and within the major comparison groups. Occupation, educational attainment, source of income, and a derived index of social status were obtained on heads of households. Therefore, these data are given only for males, and only the age group 40-74 years is used. Smoking data were obtained for males and females aged 40-74 years.

All data are from the examined population only. The number of nonexamined in the age group 40-74 years was too small to make a detailed comparison between examined and nonexamined segments of the study population; however, inspection of the data reveals no important differences in social status, occupation, source of income, educational attainment, or cigarette smoking.

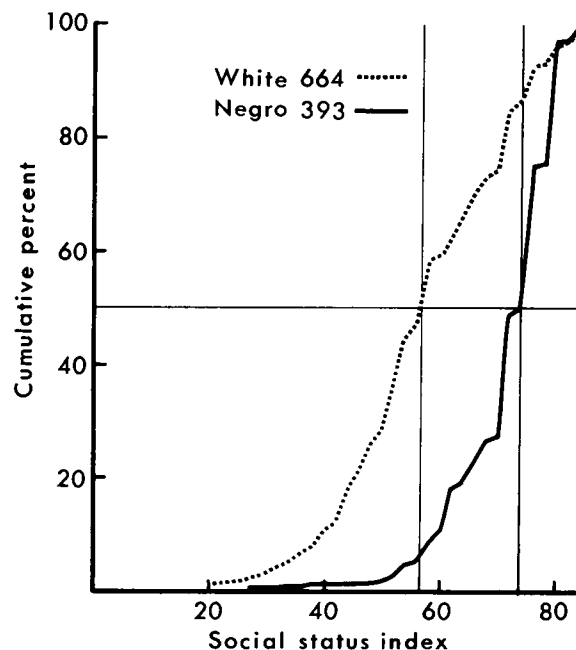
Social status. A modification of the Warner social status scale was used (8). Data on occupation, educational attainment, and source of income were obtained for all heads of households; the combined scale had a possible range from 12 to 84. The grading system and the weighting values (occupation = 5, source of income = 4, and educational attainment = 3) as

specified in the paper by McGuire and White were followed (8). A person with a low score had a higher education, a more prestigious occupation, and income from a fee or salary; while a person with a high score had little or no education, was unemployed or working at a menial occupation, and received an income from odd-job work or from the welfare agency.

A comparison of white and Negro males aged 40-74 years who were examined (fig. 2) shows large differences between the two groups. The median values for both white and Negro males are plotted to illustrate these differences. Thus, it can be seen that white males above their median value occupy an interval on the scale shared by only a small proportion (5 percent) of Negro males. Conversely, Negro males below their median value occupy a scale interval shared by only 14 percent of white males.

Occupation. Occupation is best considered as the various kinds of nonfarm and farm employment (figs. 3 and 4). Nearly all white-collar workers were found to be white. Among blue-collar workers, the larger proportion of tradesmen and service workers were white and the larger proportion of laborers were Negro. Large- and average-sized farms were owned

Figure 2. Social status classification of white and Negro males aged 40-74 years



and managed mostly by whites, while the larger proportion of small-farm owners, sharecroppers, and farm laborers were Negro. It is noteworthy that in the kinds of occupations

involving little expenditure of physical energy (professionals, business men, office workers, large farm owners), there were few Negroes, while in the occupations with the heaviest ex-

Figure 3. Nonfarm employment of white and Negro males aged 40-74 years

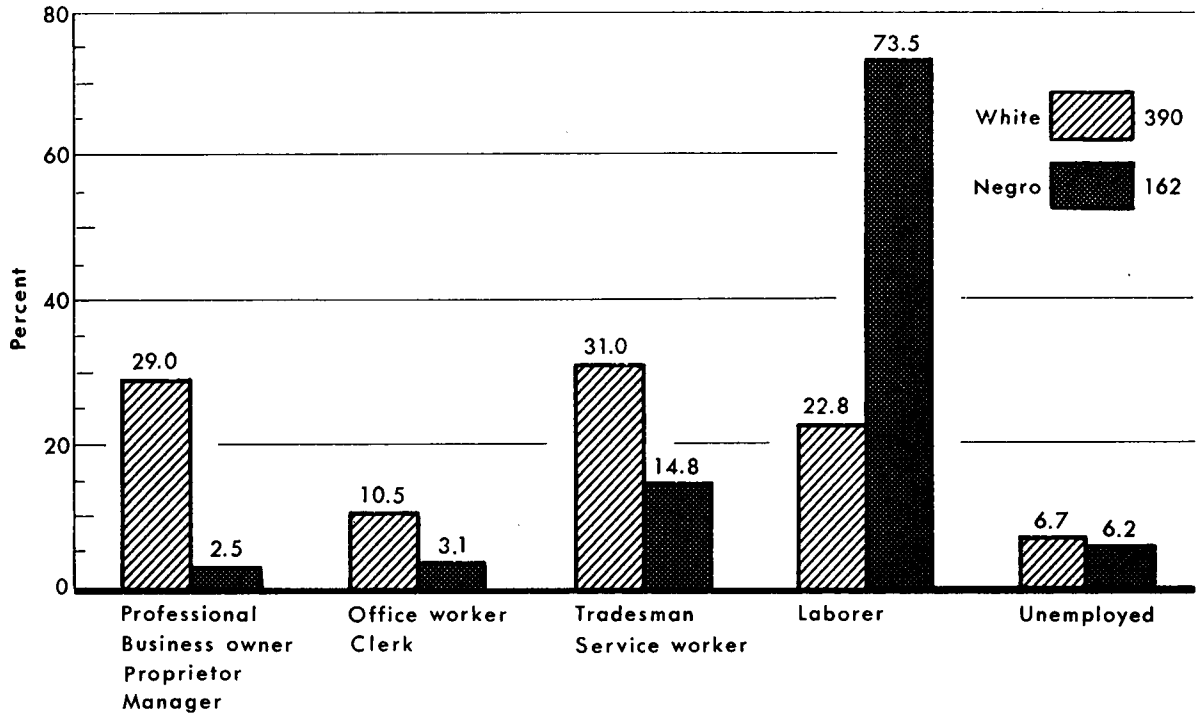
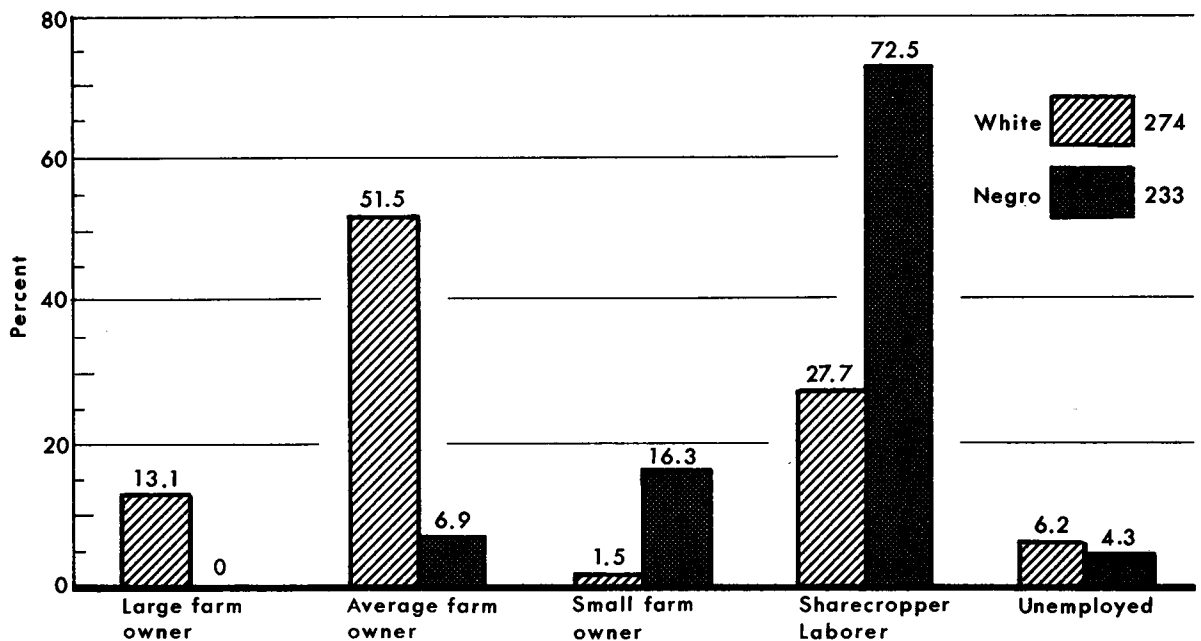


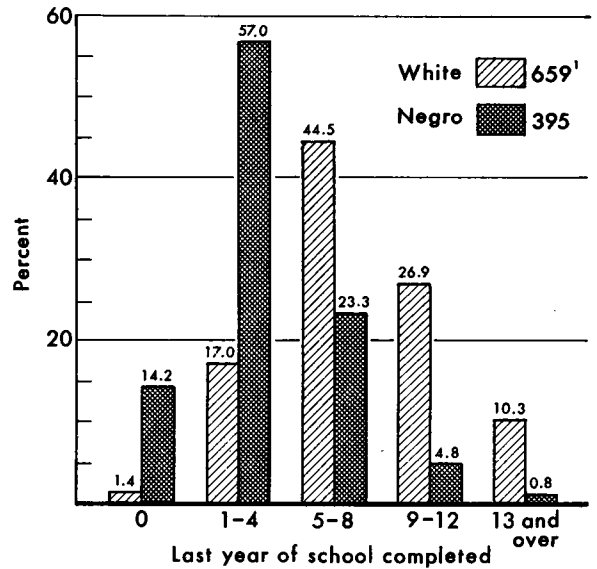
Figure 4. Farm employment of white and Negro males aged 40-74 years



penditure of energy (farm and nonfarm laborers, sharecroppers) Negroes predominated.

Source of income. Nonfarm income was scored according to the method in McGuire's paper (8). Farm income, however, was not readily categorized into the classes suggested; for example, earned or inherited wealth, fee or royalties, salary, wage, odd-job income, and public relief or charity. Farm income was distributed among four categories: (a) the sale of farm-owned crops, scored as salary; (b) hourly or day income paid farm laborers, scored as wage; (c) the sale of crops by sharecroppers, scored as odd-job income; and (d) income from relief or charity, scored the same as for the nonfarm category. As shown in figure 5, a higher proportion of white than Negro males (53 versus 19 percent) derived an income from fees, salary, or the sale of farm-owned crops. Conversely, a much larger proportion of Negro males (40 versus 12 percent) obtained an income from doing odd-job work or the sale of sharecropped farm products. The wage earners consisted almost entirely of farm and nonfarm laborers among Negroes but included other blue collar and some white collar workers

Figure 6. Educational attainment of white and Negro males aged 40-74 years¹

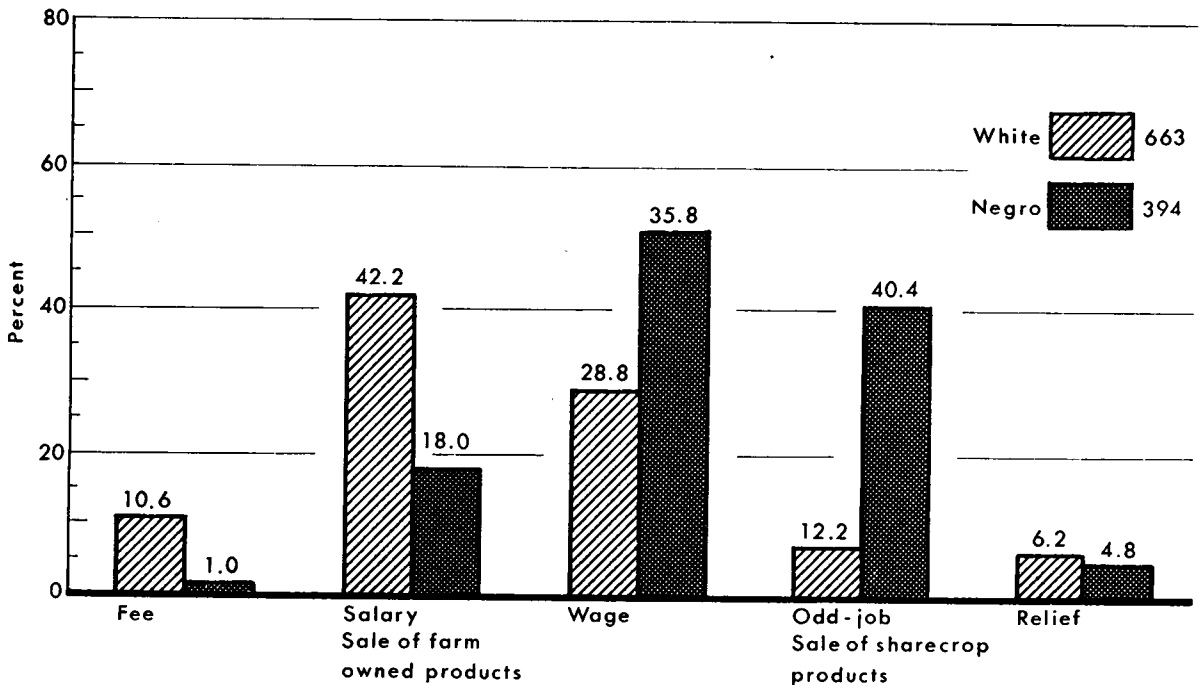


¹ No data for 5.

among whites. The proportions comparing white with Negro males (29 versus 36 percent) were not too different.

Educational attainment. Among persons

Figure 5. Source of income of white and Negro males aged 40-74 years¹



¹ No data for 1 white and 1 Negro.

aged 40-74 years, a far larger proportion of Negro than white males (71 versus 18 percent) had not advanced beyond the fourth grade (fig. 6). Only 37 percent of white males and 6 percent of Negro males had gone to school beyond the eighth grade. Younger persons are known to have a higher educational attainment.

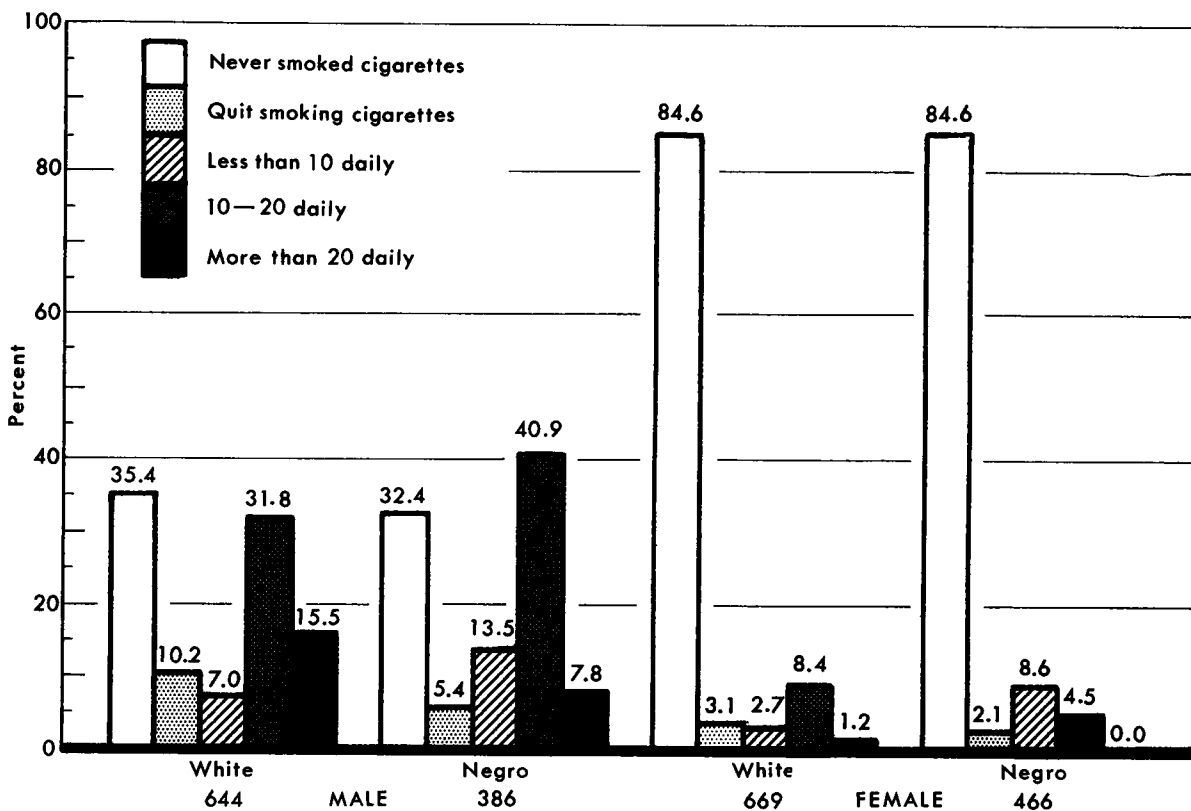
Cigarette smoking. The major differences in cigarette smoking were found to be between males and females and not between Negroes and whites (fig. 7). The proportions having never smoked cigarettes were 85 percent for white and Negro females, 35 percent for white males, and 32 percent for Negro males. Among the smokers, males smoked proportionately more cigarettes daily than females, and white males smoked proportionately more cigarettes than Negro males. The proportions smoking in excess of 20 cigarettes per day were 15 percent for white males, 8 percent for Negro males, 1 percent for white females, and none for Negro females. Interestingly, nearly all male smokers

inhaled the smoke (97 percent of both whites and Negroes), while fewer female smokers inhaled (86 percent of white and 80 percent of Negroes). These data are in agreement with those presented by Haenszel, Shimkin, and Miller on race and sex differences in smoking patterns in the rural southern United States (9).

Summary

A study of cardiovascular disease in the Evans County, Ga., population developed consequent to the observation that coronary heart disease seemed to be occurring more commonly among white than Negro patients in the area. The population was enumerated by special census, and the population for study defined as the entire segment aged 40-74 years, a 50 percent random sample aged 15-39, and the entire segment of Negroes aged 40-74 years from an adjoining subcounty geopolitical area encompassed by five General Militia Districts.

Figure 7. Current daily cigarette smoking patterns of whites and Negroes aged 40-74 years, by sex¹



¹ No data for 20 white males, 9 Negro males, 16 white females, and 6 Negro females.

Evaluation of the population aged 40-74 years according to type of occupation, educational attainment, source of income, and a derived index of social status, revealed large differences between whites and Negroes. A larger proportion of whites were in occupations which included the professions, ownership of businesses and farms, managerial work, office and clerical work, the trades and service work; while the larger proportion of Negroes were farm or nonfarm laborers, or farm sharecroppers. Income and education patterns were similar to the occupation pattern in that a larger proportion of whites derived an income from fee, salary, or the sale of crops, and had completed more years of school; while Negroes had less education and obtained an income largely from wage, odd-job work, or the sale of sharecrops. Analysis of the derived social status indices clearly indicated the degree of these differences: 95 percent of Negro males had higher index numbers (lower social status) than the median level for white males.

The major difference in cigarette smoking patterns was between males and females and not between Negroes and whites: 85 percent of females and 32 to 35 percent of males had never smoked cigarettes. Of those who smoked, males used proportionately more cigarettes daily than females, and white males somewhat more than Negro males.

Despite large differences between white and Negro males in occupation, source of income, educational attainment, and social status, there appeared to be sufficient points of overlap to allow meaningful comparisons of cardiovascular disease prevalence between Negroes and

whites when these other variables were held constant.

REFERENCES

- (1) Dawber, T. R., Moore, F. E., and Mann, G. V.: Coronary heart disease in the Framingham study. *Amer J Public Health* 47: 4-24 (1957).
- (2) Doyle, J. T., et al.: A prospective study of degenerative cardiovascular disease in Albany: report on three years' experience. I. Ischemic heart disease. *Amer J Public Health* 47: 25-32 (1957).
- (3) Chapman, J. M., et al.: The clinical status of a population group in Los Angeles under observation for two to three years. *Amer J Public Health* 47: 33-42 (1957).
- (4) Drake, R. M., Buechley, R. W., and Breslow, L.: An epidemiological investigation of coronary heart disease in the California health survey population. *Amer J Public Health* 47: 43-57 (1957).
- (5) Phillips, J. H., Jr., and Burch, G. E.: Cardiovascular diseases in the white and Negro races. *Amer J Med Sci* 238: 97-124 (1959).
- (6) Thomas, C. B., Holljes, H. W. D., and Eisenberg, F. F.: Observations on seasonal variations in total serum cholesterol level among healthy young prisoners. *Ann Intern Med* 54: 413-430 (1961).
- (7) McDonough, J. R., et al.: Observations on serum cholesterol levels in the twin population of Evans County, Georgia. *Circulation* 25: 962-969 (1962).
- (8) McGuire, C., and White, G. D.: The measurement of social status. Research Paper in Human Development No. 3 (revised). Department of Educational Psychology, University of Texas, 1955.
- (9) Haenszel, W., Shimkin, M. B., and Miller, H. P.: Tobacco smoking patterns in the United States. PHS Publication No. 463 (Public Health Monograph No. 45). U.S. Government Printing Office, Washington, D.C., 1956.

Program Notes

Respiratory Disease Viruses

The proceedings of the Conference on Newer Respiratory Disease Viruses, held October 3-5, 1962, in Los Angeles, Calif., appear in a supplement to the September 1963 issue of the *American Review of Respiratory Diseases*. The National Institute of Allergy and Infectious Diseases, Public Health Service, and the University of Southern California School of Medicine, Los Angeles, co-sponsored this conference.

Diet Counsel for Homebound

In Newark, N.J., a nutritionist, provided through the Visiting Nurse Association, teaches homebound patients how to select and prepare foods for new or modified diets. The fee charged for the service is adjusted for patients unable to pay full or partial costs.

APHA Papers, Southern Branch

Copies of papers presented at the general sessions of the 1963 meeting of Southern Branch, American Public Health Association, Biloxi, Miss., May 8-10, are for sale from the Regional Office, Southern Branch, APHA, P.O. Box 2591, Birmingham, Ala., at \$1.00 each.

VD Reporting

In Hamilton County, Ohio, a survey by the Cincinnati Health Department in October 1962 showed that only 1 of every 10 venereal disease cases diagnosed by private physicians was reported to the health department, although venereal disease was a major problem in the county. The total number of syphilis cases of all kinds, both diagnosed and undiagnosed, seen in Hamilton County in 1962 "must have been well in excess of 1,000," while there were also several thousand gonorrhea cases, health department officials concluded. This conclusion is based on replies of 753 private physicians to a department questionnaire which

did not ask the physicians to identify themselves.

The Cincinnati Health Department encourages reporting by assuring confidentiality. It encourages a physician who prefers not to sign cards on venereal disease patients to phone either the commissioner of health, or the assistant commissioner, giving name and address of patient, disease, and patient's present status, contacts and addresses if known. Department investigators call on the physician or patient only if a check indicates the physician's followup of contacts was inadequate. In that event, the investigator requests the physician's cooperation.

Alcoholic Treatment Clinic

Baltimore's first city alcoholic treatment clinic began admitting patients on September 15, 1963, with a budget of \$56,000. Clients are treated on an outpatient basis unless they require hospitalization.

National Driver Register

Forty-six States notify the U.S. Bureau of Public Roads' National Drivers Register Service in Washington, D.C., whenever they revoke a license for drunken driving or contributing to a fatality. To determine whether license applicants have had their licenses revoked for such causes in any other jurisdiction, these States request daily an average of 10,000 searches of the register, which contains 350,000 names.

Hospital Emergency Rooms

Of 330 hospitals surveyed recently by the Cornell University Medical Center, 225 "frankly admitted their emergency rooms were inadequate." As a result, emergency patients may be ignored, brushed off, shunted aside to suffer unattended for hours, or even turned out into the street without being told where to seek treatment. With no residents or

interns in more than 79 percent of the emergency rooms, unqualified persons often determine the patient's need for professional care.

In Hartford, Conn., however, one year of planning a new emergency department, one year of construction, and \$500,000, combined with around-the-clock staffing, has enabled the Hartford Hospital to handle an emergency load of more than 100 patients a day "with speed and concern." A surgeon is in charge of patient care 24 hours a day, and every patient is seen by a doctor within 15 minutes regardless of the patient's condition. (*Parade* magazine, July 28, 1963.)

Buffalo With Brucellosis

Reporting that there are approximately 12,000 buffalo on about 400 separate ranges in the United States, the U.S. Department of Agriculture proposes controls on interstate movement of the animals to check the spread of brucellosis. Many small buffalo herds, the Department said, contain infected animals that could spread brucellosis to cattle.

Yellow Fever Vaccinations

The Washington Heights Health Center of New York City offers free yellow fever vaccinations for travelers, supplementing the free inoculations available at the U.S. Public Health Service clinic in downtown Manhattan.

Home Nursing Film

A motion picture series of 10 half-hour films, entitled "The Home Nursing Story," makes it easier for persons to learn how to safeguard family health, to know what to do when illness strikes and how to care for the sick and injured if disaster disrupts family life. The series was made for the American Red Cross by the Army Signal Corps, with funds provided by the Office of Civil Defense.

A companion workbook contains tips on teacher preparation and how to present the films. It also lists possible followup activities. Information about loan or purchase of the film series may be obtained through local American Red Cross chapters.