THE EPIDEMIOLOGY OF CORONARY HEART DISEASE IN BLACKS

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Coronary heart disease (CHD) is the leading cause of death among US blacks whose CHD mortality rates are among the highest in the world. Important to the advance of understanding the etiology, pathogenesis, and prevention of coronary heart disease is an examination of the epidemiology of coronary heart disease in blacks.

An examination of the epidemiology of coronary heart disease in blacks is important to the advance of understanding the etiology, pathogenesis, and prevention of coronary heart disease. This paper will review the state of the art.

PHILOSOPHY FOR EPIDEMIOLOGISTS

By way of introduction, a review of some of Dr. Karl Popper's[1] philosophy for epidemiologists provides some valuable insights into the author's motivation. Popper has said that knowledge is advanced by testing hypotheses, discarding or revising those that fail. Predictions are made from these hypotheses and attempts are made to refute them. A useful hypothesis predicts phenomena that are open to observation. A useful hypothesis identifies many phenomena that would be incompatible with it. A current hypothesis is discarded if a new hypothesis does one or more of the following things: makes more precise predictions, explains more of the previous observations, explains them in more detail, has passed more tests than the old hypothesis has failed, makes new predictions not suggested by the old hypothesis, or has unified or connected phenomena not previously considered to be related.

Key to the process is to imaginatively search for all of the refutable consequences of the hypothesis. A physiological mechanism is often useful in suggesting a means of refuting the hypothesis. Developing multiple hypotheses, and then using refutability to choose among them, is a fruitful strategy. We must discard an old hypothesis when it is refuted and a superior new hypothesis is presented.

This philosophy of science relates to the epidemiology of coronary heart disease in several key ways: Replications of studies done to confirm observations, which may have had spurious associations, should attempt to reproduce the original study as exactly as possible. This is the *statistical* purpose of replication. For example, observations of the relationship of race to coronary heart disease (CHD) mortality and morbidity in prospective studies are so few that confirmation is still required. Confirmation is still needed of the relationships of all major risk factors and CHD mortality and incidence in blacks.

Replications attempting to refute a hypothesis should be done in a population as different as possible from the original one. This is the *deductive* purpose of a replication. For example, high-density lipoprotein (HDL) cholesterol and CHD risk in blacks should be studied in an attempt to refute the current hypothesis of the protective effect of high HDL levels, which has been tested so far only in whites. The results may suggest alternative hypotheses to be pursued. Wasteful replications with no statistical or deductive impetus must be avoided.

The current hypotheses about the etiology, pathogenesis, treatment and prevention of coronary heart disease in blacks must be tested against previous observations. We must define observations that need confirmation, testable predictions that might refute old hypotheses, alternative hypotheses suggested by failure of old hypotheses to predict previous observations, and testable predictions that help in selecting among old and new hypotheses.

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CORONARY HEART DISEASE MORTALITY IN BLACKS

The state-of-the-art knowledge about coronary heart disease mortality in blacks has been detailed in the literature.[2-3] This paper will highlight some of the points on mortality and morbidity and include some new information published since the spring of 1984.

Coronary heart disease, or ischemic heart disease, is the leading cause of death among blacks in the United States. It accounted for almost 60,000 deaths, or 25 percent of the total number of deaths in 1977. Second was cancer, followed by stroke, and then all other causes. On an international scale, US blacks have one of the highest coronary heart disease mortality rates in the world, although the statistics are scanty from areas where there are large black populations. These data also indicate an interesting U-shaped relationship when CHD mortality is related to per capita income, with very low rates at the bottom of the scale, the highest rates at intermediate levels, and falling rates in very affluent segments of postindustrial societies.

In the United States, 1940-1968,[3] there was a steady increase in coronary heart disease mortality among nonwhite men and nonwhite women. (United States mortality statistics were published only for nonwhites vs whites during this period.) There was also an increase for white men, but no increase and actually a mild decrease during this period for white women, aged 35 to 74. During most of this period, white men had a higher rate than black men, whereas after the late 1940s, black women had a higher rate than white women. What are some possible explanations for this? The trends between 1940 and 1968 could be due in part to one or more of the following: trends in diagnostic classification, increased access to diagnosis and reporting, rising incidence due to increased affluence, increased urbanization, increased smoking, decreased physical activity, and other risk-factor changes.

The picture is quite different after 1968.[3] For all the race-sex groups, an impressive decline in coronary heart disease mortality occurred. Another interesting point is that after 1968 coronary heart disease mortality rates were very similar in black men and white men aged 35 to 74 years, but black women continued to have much higher coronary heart disease mortality rates than white women.

A recent look at the statistics for Minneapolis–St. Paul revealed that in the population of blacks, which is rather small (50,000 to 60,000), a pattern emerged similar to the national data. For men, rates leveled during the 1960s, but there was a downward trend from 1968 to 1981. There was a decline during the entire period for white men.[5] For women in the Twin Cities, there seemed to be a steady fall for black women starting in the early 1960s, similar to what was seen for white women. Throughout the period, however, black women had higher rates than white women.

Some of the possible causes for the fall in CHD mortality rates between 1968 and 1978,[6,7] particularly among blacks, may be attributed to improved hypertension control,[8-10] improved access to medical care, which may have led to a decline in case fatality, and increased affluence, which may mean that blacks had more access to medical care and adopted more preventive behaviors. Access to diagnosis was probably stable or increased; diagnostic classification over this period had not changed much. Also, urbanization was relatively stable during this period.

There are a number of problems in the examination of national mortality trends in blacks. First, until recently, statistics were reported for blacks grouped with other nonwhites in most publications. Even though blacks made up about 80 percent of US nonwhites, this factor still introduced some error. Differing age structures and color ratios at various ages make single-summary rates misleading for black-white comparisons. The black population is younger than the white population, and the mortality ratios are different by age. Further problems have to do with the possibility that inaccuracies in death certificate diagnoses are probably greater for blacks than for whites. Changes in disease classifications seem to affect CHD rates more in blacks than in whites. For recent changes, there are no race-specific comparability ratios. Influenza and pneumonia epidemics have a greater affect on the total CHD mortality rates in blacks than in whites.

Another interesting and little-studied problem is that of sudden coronary heart disease death rates in blacks. During the period of the 1960s and early 1970s, it appeared that the sudden death rates may have been higher for blacks than for whites, especially for women. Autopsy studies have indicated extensive coronary atherosclerosis in blacks, with blacks having more at younger ages and whites more at older ages.[11-13] Limited autopsy data and mortality statistics indicate very low rates of mortality in blacks in nonindustrialized nations.

Important new information on CHD mortality rates was presented at the Symposium on Coronary Heart Disease in Black Populations held in March 1983, in San Diego. Dr. Paul Leaverton and colleagues[14] reported that marked variations of levels and trends of CHD mortality in blacks existed among the various states in the period 1968-1978; this finding confirms other reports.[10,15,16] Dr. Tyroler and associates[17] reported that black and lower socioeconomic status (SES) white men in the Evans County (Georgia) cohort had almost identical 20-year survival curves for all causes, each being less favorable than higher SES white men. For CHD mortality, the black-to-white lower SES mortality ratio was 0.79. In other words, less CHD mortality for black men. Dr. Strong and associates[18] reported similar coronary-morphologic correlates of black and white men, aged 24 to 44 years. The extent of coronary lesions in men dying of accidents or violence was almost identical in blacks and in whites. The extent of coronary lesions seems to have decreased between 1960-1964 and 1969-1978 in young white men, but no such decrease was seen in blacks.

Dr. James Neaton and colleagues[19] reported a black-white mortality ratio of 0.88 after adjustment for smoking, serum cholesterol levels, and blood pressure in men aged 35 to 57, followed five years after Multiple Risk Factor Intervention Trials (MR FIT) screening. Unadjusted ratios were 0.89 for myocardial ischemia (MI) and 0.80 for CHD. Dr. Julian Keil and colleagues[20] reported a 14-year incidence rate of sudden CHD death in black men three times that of white men in Charleston, South Carolina. The rate for black women was 1.5 times that of white women. Garfinkel[21] reported black-white CHD mortality ratios of 0.78 for men and 1.07 for women in the American Cancer Society's 12-year follow-up of one million Americans.

CORONARY HEART DISEASE PREVALENCE

The National Health Examination Survey of 1960-62 showed that for all ages taken together black men had slightly less prevalence of definite CHD than white men, and there is virtually no racial difference among women.[2] There were differences by age, however, with blacks having higher rates under age 55 and lower rates over age 55. If these prevalence rates still applied in 1980, 365,083 black Americans would have had clinically manifest coronary heart disease in that year. Other prevalence studies have yielded varying results.[2] Limited international data indicates low prevalence of CHD in blacks in nonindustrialized countries. An interesting phenomenon is that a high incidence of angina pectoris has been found in Ghana and in Jamaica when the London School of Hygiene questionnaire is used.[2] New data on CHD prevalence in blacks were not available for the San Diego symposium. Reports from the 1971-1980 HANES surveys from the National Center of Health Statistics will be forthcoming.

CORONARY HEART DISEASE INCIDENCE IN BLACKS

The few longitudinal studies of CHD incidence in blacks indicate high absolute rates.[2] The rates for acute myocardial infarction incidence were generally lower in black than white men and similar for women. Rates for angina pectoris incidence were generally lower in blacks than whites. It should be emphasized that there are very few longitudinal studies in the US, and these are not recent.

Hospital discharge surveys indicated similar discharge rates for blacks and whites for acute myocardial infarction in New Jersey, but lower rates for blacks in Nashville, Baltimore, and South Carolina.[2] Data from Jamaica indicated low incidence of CHD in blacks. Limited data indicate that clinical manifestations of myocardial infarction and coronary insufficiency are similar in blacks and whites, but that physician misinformation and cultural barriers may hinder diagnosis and hence reporting.

Recent findings indicate the need for reassessment of the validity of standard diagnostic criteria for acute myocardial infarction in black populations.[2] At the San Diego Symposium, Dr. Julian Keil and associates[20] reported that white men had the highest 14-year incidence of all types of CHD combined and of acute MI in their study. Black men and black women had the next highest rates. The incidence of angina pectoris in black women was double the rate of white women and five times that of white men.

CONCLUSIONS

Coronary heart disease is the leading cause of death among US blacks, whose CHD mortality rates are among the highest in the world. The marked decline in CHD mortality since 1968 remains unexplained. Among blacks, data are completely lacking on trends in diagnostic accuracy, classification, and comparability ratios for mortality statistics. Among blacks, data are completely lacking on trends in sudden death, hospitalization, incidence, and recurrence rates. Among blacks, data are completely lacking on case fatality and long-term survivorship, utilization and efficacy of medical care. Data relating risk factors to mortality and morbidity from coronary heart disease are inadequate.[4,22-28]

Some recommendations for future study are as follows: the National Center for Health Statistics (NCHS), the National Heart, Lung, and Blood Institute (NHLBI), the American Heart Association (AHA) should join forces to support programs and research to eliminate the many deficiencies in our knowledge about CHD mortality and morbidity among blacks. The NHLBI should encourage and support research to test hypotheses about CHD prevalence, incidence and survivorship, and their determinants in blacks. Documents should be prepared detailing deficiencies in current hypotheses, testable predictions from current hypotheses, observations needing confirmation, new alternative hypotheses, together with concrete research strategies, to aid in gaining support for this research.

Literature Cited

1. Buck C. Popper's philosophy for epidemiologists. Int J Epidemiol 1975; 4:159-167.
2. Gillum R. Coronary heart disease in black populations. I. Mortality and morbidity. Am Heart J 1982; 104:839-851.
3. Gillum R, Liu G. Coronary heart disease mortality in United States blacks, 1940-1978. Trends and unanswered questions. Am Heart J 1984; 108:728-732.
4. Gillum R, Grant CT. Coronary heart disease in black populations. II. Risk Factors. Am Heart J 1982; 104:852-864.
5. Gillum RF, Hannan PJ, Prineas RJ, et al. Coronary heart disease mortality trends in Minnesota 1960-1978: The Minnesota Heart Survey. Am J Public Health 1984; 74:360-362.
6. Cooper R, Steinhauer M, Schratskin A, Miller W. Improved mortality among US blacks, 1968-1978: The role of the antiracist struggle. Int J Health Serv 1982; 11:511-522.
7. Gillum RF. Toward explaining the decline in coronary heart disease mortality. Am Heart J 1983; 106:783-785.
8. Wing S, Manton KG. The contribution of hypertension to mortality in the US: 1968-1977. Am J Public Health 1983; 73:140-144.
9. Cooper R. Cardiovascular mortality among blacks, hypertension control, and the Reagan budget. J Natl Med Assoc 1981; 73:1019-1020.
10. Kim SYS, Ornstein SM, DeLong ER, Grufferman S. Secular trends in ischemic heart disease mortality. Regional variation. Circulation 1983; 68:3-8.
11. Correa P, Strong JP, Johnson WD, et al. Atherosclerosis and polyps of the colon. Quantification of precursors of coronary heart disease and colon cancer. J Chron Dis 1982; 35:313-320.
12. Newman WP III, Strong JP, Johnson WD, et al. Community pathology of atherosclerosis and coronary heart disease in New Orleans. Morphologic findings in young black and white men. Lab Invest 1981; 44:496-501.
13. Strong JP, Guzman MA. Decrease in coronary atherosclerosis in New Orleans. Lab Invest 1980; 43:297-301.
14. Leaverton P, Feinleib M, Thom T. CHD mortality rates in US blacks, 1968-1978. Interstate variation. Am Heart J 1984; 108:732-737.
15. Keil JE, Lackland DT, Hudson MD, et al. Coronary heart disease and stroke mortality in South Carolina: Geographical and temporal trends. J SC Med Assoc 1983; 79: 65-69.
16. Kautz JA, Bradshaw BS, Fonner E Jr. Trends in cardiovascular mortality in Spanish surnamed, other white, and black persons in Texas, 1970-1975. Circulation 1981; 64:730-735.
17. Tyroler HA, Knowles MG, Wing SB, et al. IHD risk factors and twenty-year mortality in middle-age Evans County black males. Am Heart J 1984; 108:738-746.
18. Strong JA, Oalmann MC, Newman WP III, et al. CHD in young black and white men in New Orleans: A community pathology study. Am Heart J 1984; 108:747-759.
19. Neaton JD, Kuller L, Wentworth D. Total and cardiovascular mortality in relation to cigarette smoking, serum cholesterol concentration, and diastolic blood pressure among black and white men followed five years. Am Heart J 1984; 108:759-769.
20. Keil JE, Loadholt CB, Weinrich MC, et al. Incidence of CHD in blacks in Charleston, South Carolina. Am Heart J 1984; 108:779-786.
21. Garfinkel L. Cigarette smoking and coronary heart disease in blacks: Comparison to whites in a prospective study. Am Heart J 1984; 108:802-807.
22. Manton KG. Sex and race specific mortality differentials in multiple cause of death data. Gerontologist 1980; 20:480-493.
23. Krueger DE, Ellenberg SS, Bloom S, et al. Fatal myocardial infarction and the role of oral contraceptives. Am J Epidemiol 1980; 111:655-774.
24. Manton KG, Stallard E, Poss SS. Estimates of US multiple cause life tables. Demography 1980; 17:85-102.
25. Cutter GR, Oberman A, Kouchoukos N, Rogers W. Epidemiologic study of candidates for coronary bypass surgery. Circulation 1982; 66:1116-1115.
26. Akman D, Berenson GS, Blonde CV, et al. Heart disease in a total population of children: The Bogalusa Heart Study. South Med J 1982; 75:1177-1181.
27. Eisenstein I, Edelstein J. Gray hair in black males: A possible risk factor in coronary artery disease. Angiology 1982; 33:652-654.
28. Edelman B, Koch TR, Raab C. Evaluation of the new Beckman electrophoretic method for CK-MB. Comparison with ion exchange chromatography and investigation of a reference outpatient population. Clin Biochem 1981; 14: 39-44.