AGE-PERIOD-COHORT-ANALYSIS OF CARDIOVASCULAR MORTALITY, MICHIGAN 1945-1995

By

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ABSTRACT

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Period and cohort effects on cardiovascular disease mortality in Michigan between 1945 and 1995 were studied. Age, race, and gender-specific deaths in persons >19 years of age, and attributed to Major Cardiovascular Diseases (MCD), Diseases of the Heart (DOH), Ischemic Heart Disease (IHD), Cerebrovascular Disease (CD), and Hypertensive Heart Disease (HHD), were obtained. Population denominators for each year were estimated by linear interpolation of decennial census data. Age, race and sex specific mortality rates were calculated for successive 5 year periods.

Overall, Michigan trends paralleled national data. MCD mortality was highest in white males, followed by black males, black females and white females respectively. It declined consistently in all age, race and gender groups over 50-year period. Deaths from CD and HHD were notably higher in blacks than whites. There was an overall decline in mortality due to DOH. In 1995, IHD was responsible for 70% of DOH deaths in whites and 46% in blacks. A cohort effect was not evident in any of the race/gender groups. These results emphasize the burden of premature MCD mortality, particularly among black males.

To my family

ACKNOWLEDGMENTS

In researching and writing this thesis, I have been the beneficiary of three extraordinary groups of people: 1) my faculty at the Department of Epidemiology at Michigan State University; 2) the staffs of Michigan Public Health Institute(MPHI) and the Michigan Department of Community Health(MDCH); and 3) the members of my family.

Dr. Aryeh Stein of MSU and Dr. Mathew Reeves of MDCH were invaluable as my principal advisors in this project. Together, they not only offered their gentle coaching but also their keen insights. Two other members of the MSU faculty, Drs. Nigel Paneth and Dr. Dorothy Pathak, remained steadfast in their interest and encouragement. Dr. Charlotte Pratt of MPHI sponsored this research, and offered useful feedback on my work. Much of the raw data analyzed in this thesis was drawn from the library of the Michigan Department of Community Health. and The Library of Michigan. I thank the staff of these institutions.

Finally, I would like to thank my husband and my three children for their patience and good humor during these hours in the library or on the computer. My parents and brothers who were visiting during this writing were also full of encouragement.

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Age-period-cohort analysis of cardiovascular mortality, Michigan 1945-1995

Chapter 1 - Background

A. General trends of Cardiovascular Diseases

Over the past three decades, there has been a marked decline in death rates from cardiovascular diseases (MCD) in the United States [4,7,43]. In 1960s, among all industrialized countries the United States had the second highest death rate from ischemic heart disease [IHD], a major component of cardiovascular diseases. However, by 1990 the United States ranked 18th for men and 14th for women in ischemic heart disease deaths and was among the lowest-ranked countries in stroke deaths [43]. If the rise in mortality rates of the 1950s had continued until the present, annual deaths from ischemic heart disease would be nearly 1.5 million; instead they are now half that number [43]. The decline in MCD death rates are related both to improvements in medical care and to decreases in cardiovascular diseases risk factors [43, 16].

Despite these remarkable achievements, cardiovascular diseases remain the leading cause of death in the US (and most other western countries). According tothe American Heart Association in 1996 the yearly cost of cardiovascular diseases in the United States was estimated to ber $259 billion. In 1996 according to statistics provided by American Heart

Association [1], the number of deaths from 5 groups of cardiovascular diseases are listed below:

Major Cardiovascular Diseases	960,592
Cerebrovascular Disease	157,991
Diseases of Heart	737,563
Hypertensive Heart Disease	39,981
Ischemic Heart Disease	481,287

About 16 percent of MCD deaths occurred among those under 65 years of age [43]. The epidemiological pattern of mortality and morbidity from cardiovascular disease is generally characterized by differences due to age, race, and gender. Before age 60, heart disease rates are substantially higher in men than in women. However, heart disease increases markedly in women after menopause, with women accounting for nearly half of the heart disease deaths annually [31].

Mortality rates from some of the cardiovascular diseases tend to be higher in the black population than in other ethnic groups in the United States [20]. Furthermore, there was great disparity in the rates of decline between blacks and whites for most categories of cardiovascular diseases. Among white males, death rates from cardiovascular diseases declined 42 percent between 1950 and 1988. In comparison, the decline among black

males for the same time period was only 31 percent. On a national level, it has been observed that more than 7,000 fewer blacks would have died of cardiovascular diseases in 1988 if their death rates had equaled those of whites [43]. The American Heart Association reported that compared to whites, blacks have more hypertension related morbidity, a higher mortality rate from stroke, more frequent left ventricular hypertrophy by electrocardiographic criteria, and strikingly more end-stage renal disease [3].

In Michigan, Cardiovascular Disease is the largest cause of adult deaths. According to American Heart Association, 36,070 Michigan residents died in 1995 from cardiovascular diseases. That figure represents 43 percent of all deaths, 31 percent more deaths than cancer, and forty five times as many deaths as were due to AIDS.

The objectives of this study were to a) determine the overall trends in mortality rates in cardiovascular diseases among the race/gender groups in Michigan during the period 1945 to 1995 and b) determine the effect of three interrelated factors - age, calendar period of death, and birth cohort - on mortality from cardiovascular diseases. Knowledge of cardiovascular disease mortality rates by race, gender and age as well as temporal changes in mortality rates within Michigan are important for health planners in continuing and implementing programs aimed at awareness, prevention, and treatment of cardiovascular diseases. Age-period-cohort analysis can be used to make future predictions of the impact of disease in various race and gender groups. Cohort analysis has not been widely applied previously to cardiovascular disease mortality with the

exception of stroke. This analytical approach could, however, provide valuable new insights into the epidemiology of cardiovascular diseases.

II. Trends of specific cardiovascular diseases

An overview of ICD-9 codings for Major cardiovascular diseases and Diseases of heart is provided with an in-depth description for 3 specific subgroups (Ischemic heart diseases, Cerebrovascular disease, Hypertensive heart disease). These specific subgroups will be presented in order of the importance of burden of their mortality in the population.

Major cardiovascular diseases (MCD):

Major cardiovascular diseases (MCD) refer to the disorders of the heart and blood vessels that are included in the rubric of ICD-9 Nos. 390-448. Within this category are several major clinical groupings. The first two, Diseases of the Heart and Cerebrovascular Disease are examined separately in this study:

Major cardiovascular diseases (ICD-9 Code No. 390-448) consists of:

ICD-9 Nos.	**390-398, 402, 404, 410-429:**	**Diseases of Heart**

ICD-9 Nos.	**430-438:**	**Cerebrovascular Disease**
ICD-9 No.	401:	Essential Hypertension
ICD-9 No.	403:	Hypertensive Renal Disease
ICD-9 No.	405:	Secondary Hypertension
ICD-9 Nos.	440-448:	Diseases of Arteries, Arterioles, and Capillaries

Diseases of heart:

Diseases of Heart is the largest component of Major cardiovascular diseases. Nationally, diseases of heart started to decline after 1950 and the rate declined at a more rapid rate during each successive decade. From 1950 to 1960, the age adjusted death rate for heart disease fell by an annual average of 0.88 percent. During 1960-1970, it dropped an average of 1.14 percent annually; from 1970-1980 it dropped 2.03 percent; and from 1980-1990, 2.21 percent annually [59]. In 1950 heart disease caused 37 percent of all deaths compared with 32 percent in 1988. The pace of decline accelerated steadily for white and black males, while among females of both races, especially blacks, it accelerated until the early 1980s, and then slowed. In 1986, age adjusted rates were 91% higher in men than in women and 37% higher in blacks than in whites. Differences in mortality rates in blacks and whites were higher in younger than in with older persons [12].

Diseases of heart (ICD-9 Code No. 390-429) consists of:

ICD Code No. 390-398:	Acute rheumatic fever and chronic rheumatic heart disease
ICD Code No. 401	Essential hypertension
ICD Code No. 402:	**Hypertensive heart disease (Section C)**
ICD Code No. 403:	Hypertensive renal disease
ICD Code No. 404:	Hypertensive heart and renal disease
ICD Code No. 405:	Secondary hypertension
ICD Code No. 410-414	**Ischemic heart disease (Section A)**
ICD Code No. 415	Acute pulmonary heart disease
ICD Code No. 416	Chronic pulmonary heart disease
ICD Code No. 417	Other diseases of pulmonary circulation
ICD Code No. 420:	Acute pericarditis
ICD Code No. 421:	Acute and subacute endocarditis
ICD Code No. 422:	Acute myocarditis
ICD Code No. 423:	Other diseases of pericardium
ICD Code No. 424:	Other diseases of endocardium
ICD Code No. 425:	Cardiomyopathy
ICD Code No. 426:	Conduction disorders
ICD Code No. 427:	Cardiac dysrhythmias
ICD Code No. 428	Heart failure

ICD Code No. 429 Ill-defined descriptions and complications of heart

The category of cerebrovascular disease is encompassed in International Classification of Diseases, 9th Revision (ICD-9) codes 430-438.

Cerebrovascular disease ICD -9 Nos. 430-438 (Section B)]

ICD Code No. 430 Subarachnoid hemorrhage

ICD Code No. 431 Intracerebral hemorrhage

ICD Code No. 432 Other unspecified intracranial hemorrhage

ICD Code No. 433 Occlusion and stenosis of precerebral arteries

ICD Code No. 434 Occlusion of cerebral arteries

ICD Code No. 435 Transient cerebral ischemia

ICD Code No. 436 Acute, but ill-defined, cerebrovascular disease

ICD Code No. 437 Other and ill-defined cerebrovascular disease

ICD Code No. 438 Late effects of cerebrovascular disease

However, due to the difficulties (and incompleteness) of exact diagnosis, from a public health perspective, these codes are often combined into one group (430-438).

A. Ischemic heart disease (IHD):

A.1 Overview

Ischemic heart disease (ICD-9 Nos. 410-414) accounts for more than 50 percent of all cardiovascular disease deaths in the US [43]. In 1995 a total of 481,287 persons died as a result of IHD. Ischemic heart disease (IHD) is a generic term for any type of cardiac diseases that produce inadequate myocardial oxygenation. This may result from several different types of diseases of the coronary arteries, including coronary atherosclerosis leading to thrombosis, arterial spasm and embolism. It is commonly manifested as a heart attack which results from ischemia to the myocardial muscle. Angina pectoris (chest pain) is a symptom of inadequate oxygenation which can result from any of the pathologies listed.

The rubric for Ischemic Heart Disease included 5 codes :-

ICD Code No. . 410 Acute myocardial infarction

ICD Code No 411 Other acute and subacute form of ischemic heart disease

ICD Code No 412 Old myocardial infarction

ICD Code No 413 Angina pectoris

ICD Code No 414 Other forms of chronic ischemic heart disease

Mortality rates for Ischemic Heart Disease were at their peak in 1965, when age adjusted IHD mortality for the United States was approximately 240 per 100,000. After 1965, however, *overall* rates declined approximately 2% each year. Initially, this decline occurred approximately equally in men and women, blacks and whites, and across all age groups. However, after 1976, the secular trends diverged considerably. Rates of decline were steeper for whites than for blacks, and steeper for men than for women.

From 1990 through 1994, *age-adjusted* Ischemic Heart Disease death rates for the United States population 35 years and older declined 10.3% i.e. from 416.3 deaths per 100,000 to 373.6 deaths per 100,000 [32]. However, the rate of decline again diverged by race and gender. The largest annual percentage decline occurred among white men (2.9% per year), followed by white women (2.5%), black men (2.3 %), and black women (1.6%) [32].

A.2 Etiology and Pathophysiology of IHD:

The basic pathophysiology of ischemic heart disease is an imbalance between myocardial oxygen supply and demand [6]. Oxygen supply may decrease or demand may increase beyond the limits of coronary perfusion reserve resulting in ischemia. Myocardial oxygen supply can decrease due to decreased cardiac output, decreased diastolic pressure or by increased coronary arteriolar resistance. Myocardial oxygen demand can increase with increased heart rate, increased heart size and increased systolic pressure.

Atherosclerosis is the first sign of IHD. Atherosclerosis is a pathologic condition of the coronary arteries characterized by a series of abnormal changes of the intima of the arteries [56], the earliest lesions of which are the development of fatty streaks. Fatty streaks may progress to fibrous plaques and eventually to lesions complicated by ulceration, hemorrhage, calcification and thrombosis.

Fatty streaks are characterized by an accumulation of lipid filled smooth muscle cells and macrophages and fibrous tissue in focal areas of the intima [56]. The fatty streak is usually sessile and causes little obstruction and no symptoms. The lesion appears in various segments of the arterial tree at different ages. It is generally believed that the fatty streaks are reversible, but the evidence is inconclusive.

Fibrous plaques, also called raised lesions, are palpably elevated areas of intimal thickening and represent the most characteristic lesion of advancing atherosclerosis. These plaques first appear in the abdominal aorta, coronary arteries, and carotid arteries in the third decade and increase progressively with age [56]. They appear in men before women. Typically the fibrous plaque is firm, elevated and dome shaped that bulges into the lumen. It consists of a central core of extracellular lipid and necrotic cell debris covered by a fibrovascular layer containing large numbers of smooth muscle cells, macrophages, and collagen. The plaque is much thicker than normal intima.

The complicated lesion is calcified fibrous plaque containing various degrees of necrosis, thrombosis, and ulceration [56]. These are the lesions frequently associated with symptoms. With increasing necrosis and accumulation of gruel, the arterial wall progressively weakens, and rupture of the intima can occur, causing aneurysm and hemorrhage. Arterial emboli can form when fragments of plaque dislodge into the lumen or thrombi and can result from gradual occlusion as plaques thickens.

Although knowledge of the etiologic events is incomplete, it is clear that no single factor is responsible for the development of atherosclerosis. Epidemiologic studies have established the association between certain factors and coronary atherosclerosis. Risk factors for the development of coronary atherosclerosis include a family history of premature coronary artery disease, cigarette smoking, hypercholesterolemia, hypertension, and diabetes mellitus [6]. Obesity, physical inactivity, and stress may also play a role in the development of atherosclerosis.

A.3 Symptoms and Signs of IHD:

There are three main types of symptoms of ischemic heart disease [6]. However, almost 30% of all myocardial infarctions are silent (without symptoms).

a) Angina Pectoris

Brief pain attributed to myocardial ischemia (angina pectoris) is typically a retrosternal discomfort brought on by exercise or emotion and relieved by rest. It usually lasts at least 3 to 5 minutes. The discomfort is not necessarily described as pain, but rather as a fullness, ache, pressure, tightness or burning. The discomfort may occur in the jaw, neck, throat, interscapular area, or arm; it may be on the left more often than on the right, and may occur with or without simultaneous chest discomfort

b) Severe Angina

Prolonged pain of myocardial ischemia has the same characteristics as brief pain, but the duration is longer (15 minutes to several hours). The pain may be more severe and may be associated with nausea and perspiration. It may occur at rest or during exertion.

c) Other cardiovascular symptoms

Other cardiovascular symptoms may be associated with brief pain or prolonged pain. Patients may have palpitation (rapid heart beat), dizziness or weakness.

A.4 Diagnostic Tests of IHD:

a) Electrocardiogram of IHD :

A normal electrocardiogram (EKG) does not exclude the diagnosis of ischemic heart disease, however, certain characteristic abnormalities tracings obtained at rest can confirm it. ST segment change and T-wave changes accompany episodes of angina pectoris and disappear thereafter [56].

b) Stress Test:

The most widely used test in the diagnosis for ischemic heart disease involves recording the 12-lead EKG before, during and after exercise on a treadmill or using a bicycle ergometer [56]. The test consists of a standardized incremental increase in external workload while the patient's EKG, symptoms, and arm blood pressure are continuously monitored.

c) Coronary arteriography:

This invasive diagnostic method is used to detect evidence of coronary atherosclerosis or to exclude the condition [56]. Coronary arteriography is indicated in 1) patients with chronic stable or unstable angina pectoris who are refractory to medical therapy and who are being considered for revascularization, and 2) patients with troublesome symptoms

that present diagnostic difficulties in whom there is need to confirm or rule out the diagnosis of coronary artery disease.

d) Serum enzyme studies:

Enzymes are released in large quantities into blood from necrotic heart muscle following myocardial infarction. The rate of liberation of specific enzymes differs following infarction, and temporal pattern of enzyme release is of diagnostic importance. SGOT and creatine phosphokinase (CK) rise and fall rapidly, while that of lactic dehydrogenase (LDH) rises later and remains elevated longer [56]. CK is more specific than SGOT since it is not present in significant concentrations in extra-cardiac stores. In myocardial infarction, the level of LDH rises during the first day, peaks at 3 to 4 days, and returns to normal in 14 days. Characteristic rises occur in serum enzyme concentration in more than 95% of patients with clinically proven myocardial infarction. The amount of enzyme releases also correlates with the size of infarct.

B. Cerebrovascular Diseases (CD)

B.1 Overview

Cerebrovascular disease or stroke is an important form of cardiovascular disease both in terms of mortality and morbidity. Of all cardiovascular disease deaths, nearly 16% are

due to cerebrovascular disease or [43]. CD is the third leading cause of death in United States. The death rates for CD are higher for non-whites than for whites up to age 75, reflecting mainly higher incidence and severity of hypertensive disease among blacks. At older ages Cerebrovascular Disease rates are higher in whites because of the increasing prominence of atherosclerotic thrombo-occlusive cerebrovascular disease [35]. It has an overall prevalence of 794 per 100,000 [56]. Five percent of the population over 65 are affected (mortality and morbidity) by it and more than 400,000 patients are discharged each year after an episode of cerebrovascular disease [56]. Blacks are twice as likely as whites to succumb to strokes.

The extended hospitalization and post treatment rehabilitation that the affected persons require during recovery make the economic impact of this disease very devastating.

In US, the age-adjusted mortality rate for cerebrovascular disease declined even more sharply between 1950 and 1988 than did Diseases of the Heart. CD declined at similar rates in all age groups [43]. Though in all race and sex groups the death rate for stroke declined at least 60 percent, the greatest decline was noticed among black women (68%). In the 1950s, 1960s, and 1970s these reductions accelerated for whites and blacks of both sexes. In the 1980s the rate of decline still continued, though slowed for all except white males [43]. The black/white variation, however, changed differently for males and females. In 1950, for example, the death rate for stroke among black females was 95 percent greater than among white females, but by 1988 the difference was 83 percent [59]. The difference of cerebrovascular disease mortality rate between black and white

males, however, increased from 68 percent to 93 percent [43]. Black males have a far higher CD death rate than any other group.

B.2 **Symptoms and Signs:**

The exact signs of cerebrovascular diseases depend on the type of cerebrovascular disease pathology and the area of brain affected. Brain damage from cerebrovascular diseases can cause:

a. Paralysis - Paralysis of one side of the body (hemiplegia) is very common. However, sometimes the paralysis is more localized such as only a leg or an arm.

b. Loss of sight - May affect reading, objects may appear closer or farther away than they really are.

c. Aphasia and dysarthria - Victims may have trouble verbalizing. Aphasia affects the ability to talk, listen, read and write. Aphasia usually occurs when cerebrovascular disease affects the right side of the body. Dysarthria affects speech which can be slowed, slurred or distorted.

C. Hypertensive heart disease: (ICD-9 code no. 402)

C.1 Overview

When cardiac abnormality (for example, on the X-ray or electrocardiogram) is demonstrable in association with elevated blood pressure, the term Hypertensive heart disease [HPD] is employed [32]. Hypertensive heart disease produces the third largest number of deaths from Disease of Heart, but only 4 percent as many as the ischemic form [59]. Moreover, death rates have declined more slowly for hypertensive heart disease than for ischemic heart disease. Hypertensive heart disease death rates are 1.6 to 13.5 times greater in blacks than in whites depending age and sex. The discrepancy is particularly greater in the ages 25-64, though it does diminish in old ages [59].

According to ICD-9 [21]

Hypertensive heart disease (ICD-9 Code No. 402):

It consists of several sub-categories.

ICD Code No. 402.0 Malignant

ICD Code No 402.00 Without congestive heart failure

ICD Code No 402.01 With congestive heart failure

ICD Code No 402.1 Benign

ICD Code No 402.10 Without congestive heart failure

ICD Code No 402.11 With congestive heart failure

ICD Code No 402.9 Unspecified

ICD Code No 402.90 Without congestive heart failure

ICD Code No 402.91 With congestive heart failure

The trend of mortality rates for hypertensive disease was steadily downward from 1940-1960 for white males and females in all age groups [35]. The rate of decline accelerated in 1950s and the age adjusted rate of decline was 60 percent. 35 to 44 year old men and women were benefited the most. The declines were considerably greater for women than for men. In 1940, in 25 to 34 age group, the mortality rate for hypertensive heart disease was seven times higher in blacks than in whites. Mortality rates for hypertensive heart disease in blacks had not declined until 1950. For the decade 1950 to 1960, rates for nonwhites fell substantially; but at all ages up to 85, the rates of decline were not as great as those for whites. As a result of these trends, the relative position of non whites in comparison with whites worsened from 1940 to 1960.

C.2 Etiology and pathophysiology of HPD

The relationship between hypertension and heart disease is not clear, and the delineation of hypertensive heart disease as a pure etiologic entity, independent of other forms of heart disease, is ill defined. The causal relationship of hypertension to heart disease is

based on the frequency with which the two conditions are associated i.e. the high incidence of hypertension in cases of heart disease and predominant frequency of ultimate cardiac disease in hypertensive patients. Furthermore, physiologic evidence that hypertension increases the work and impairs cardiac function strengthens the concept of a form of heart disease due to hypertension [35].

However, the exact causal relationship between hypertension and heart disease is obscured by two types of data [35]:

1. There is a lack of correlation in most cases between the severity and duration of hypertension and the development of cardiac complications.

2. Hypertension is associated with a high incidence of coronary atherosclerosis. In 70 percent of coronary atherosclerotic heart disease hypertension is present. Conversely coronary sclerosis has been found in 90 percent of hearts of persons dying with hypertension [35].

Hypertensive heart disease is due to the excessive work load imposed by increased systemic pressure. It is first evident as ventricular hypertrophy. Ventricular hypertrophy is characterized by an increase in thickness of ventricular walls. Ultimately the functions of this chamber deteriorates, the cavity dilates, and the symptoms and signs of heart failure appear[56].

C.3 Symptoms and signs:

Palpitation and rapid heart action are the earliest symptoms of Hypertensive heart disease. Headache, fatigue, diminished exercise tolerance and shortness of breath are however, some of the other common symptoms [6]. On physical examination, a fourth heart sound is sometimes evident.

C.4 Diagnostic tests of HPD

The EKG and chest roentgenogram are exceedingly important diagnostic tools for determining Hypertensive heart disease [6].

a) Left atrial abnormality: The earliest sign of cardiac involvement following hypertension is the electrocardiographic finding of left atrial abnormality. The left atrial changes may be present without EKG based evidence of left ventricular enlargement. They do not reflect atrial disease, but rather the response of a dynamic atrium to the less compliant ventricles as hypertrophy is developing. Nevertheless, these patients demonstrate evidence of left ventricular hypertrophy by echocardiography. The ventricular septum thickens and ventricular mass is increased. The fiber shortening rate of the left ventricle is also impaired [6].

b) Left ventricular hypertrophy: As clinical ventricular hypertrophy becomes obvious, it can be identified by EKG or roentgenographic criteria. At this stage of Hypertensive heart disease resting cardiac output is reduced.

c) Left ventricular failure: Eventually if hypertension remains untreated, left ventricular failure takes place.

D. Summary of trend for the three Cardiovascular Diseases

The studies on trends of cardiovascular disease in US as described in literature is summarized in TABLE 1.

Cooper et al analyzed mortality rates in the four major race-gender group from 1940-1975. He showed that the age adjusted mortality rate rose in all race and sex group from 1948-1967. The rate of increase was greater in blacks than in whites. However, during the period 1968-1975 age adjusted mortality rates from IHD in the US declined significantly among all four race-gender groups (blacks and whites, males and females). Overall, the trend was more favorable for blacks than for whites.

The data for this analysis was drawn from two sources. Moriyama et al provided the data for 1940-1966. The National Center for Health Statistics was the source of data for the

years 1967-1975. To minimize the effect of the changes in ICD revisions, the data were analyzed in four time sets, corresponding to the periods of the four ICD revisions.

Sempos et al demonstrated the divergence in IHD mortality trends among the four major race/sex groups. He computed age adjusted mortality rates of US population from 1968-1985 [49]. Age adjusted mortality rate declined almost equally in all four groups from 1968-1975. However, during 1976-1985, secular trends diverged considerably. The rates of decline for black males, black females and white females slowed down, but white males actually experienced an increase in their rate of decline.

Cardiovascular mortality trends from 1980-1986 was studied in Harris County, Texas by Yoon et al. Mortality trends in four ethnic groups (blacks, whites, Hispanics and others) were examined [58] The black population, in general, showed significantly higher cardiovascular mortality rates than the other ethnic groups. Higher cardiovascular disease mortality rates were also found in the white and black populations with respect to the Hispanic and "other". Furthermore males had higher cardiovascular mortality rates than females.

Age-Period-Cohort Analysis:

Time trends of incidence and mortality rates for a particular disease often provide an epidemiologist with important clues for disease etiology. Three time factors which are often considered in such an investigation are i) age at death ii) date of death (period effect) iii) date of birth (cohort effect) [24].

An age effect is an intrinsic effect independent of period and experience, and dependent on differentiation and maturation of the organism [53]. It is present when the disease rate varies by age regardless of birth cohort and independent of the period (calendar time). Cohort effects are environmental effects attributed to the singular experience of each cohort antecedent to the time when the outcome of interest is observed. A cohort effect is present when the disease rate varies by year of birth, regardless of age. That is persons born in certain years carry with them throughout their lives a relatively higher (or lower) rate of disease. For example, children born during the years when diethylstilbestrol was prescribed to pregnant women in US might face a lifetime risk for certain type of cancer that differs from that faced by children born at another time [24]. Not only are the factors at the year of birth considered as cohort effect but any factor that affects disease incidence that is related to year of birth. For example, cigarette smoking is usually started in late teens, the effect of any large change in smoking habits depend on a person being of a

particular age when the change the in smoking habit occurs. Diseases like cardiovascular diseases that are strongly related to cigarette smoking might be expected to produce a birth cohort pattern even though there was nothing associated with birth itself that influenced disease risk [24].

Period effects are environmental effects attributed to and defined by a given time period [53]. The population at risk is thus all those living at the point in time when the observations are made. For example changes in levels of a pollutant in the air or water might be expected to produce the same change in disease risk for everyone in the population. Changes in medical technology also might produce such a period effect by ascertaining more cases due to improved diagnostic ability, thereby producing an artifact that may not represent a true important change in public health [53].

A secular trend is characterized by systemic change in age specific rates over calendar time. For any single age group, a secular trend may be due to period effect, a cohort effect, or some combination of the two [24].

The procedures used for analyzing longitudinal data is called cohort analysis [24]. Cohort analysis involves the retrospective collection of data from three or more observation periods for a single dynamic population. The approach may involve incidence, prevalence, or mortality data and the entire study period is usually spaced over a span of 20 or more years. For example, using vital statistics and census information between

1945-1995, we could estimate the age specific mortality rates for cardiovascular disease among white males, white females, black males and black females of Michigan. In cohort analysis, the rate of disease is displayed graphically as a function of age, by birth cohort (i.e. year of birth) or by period (i.e. calendar time).

Frost in 1939 considered the implications of these three factors on mortality rates from tuberculosis in Massachusetts [9]. The procedure he developed was primarily descriptive, and graphs were used to examine patterns in disease rates over time. Using a graphical approach, he found that the age and cohort analysis provided a consistent pattern in the trends, which was not apparent for the age and period analysis. He demonstrated that tuberculosis mortality rate peaked at different age groups over time.

He showed that in 1910, the highest mortality from tuberculosis was evident at the age of 30-40 . However, in the later period (1930), the highest rate of mortality came at the age of 50-60. The same group of people who were at higher risk in 1910 when they were 30-40 years old carried with them this higher risk for tuberculosis in 1930 when they were 50-60 years old [Appendix A].

For past few years, age period cohort analysis (APC) has become a popular epidemiological tool. Regression models were designed by different investigators to quantify the separate effects of these three factors: age, period, and cohort [26]. These investigators studied several different diseases, including as breast cancer [33], cancer of

the cervix [2], prostrate cancer [22], bladder cancer [34,51] and lung cancer [51,52]. Each study has adopted a regression analysis approach in the treatment of incidence or mortality data; typically a three factor model (age at occurrence of disease or death, time of occurrence of disease or death (i.e. period and birth cohort) or a two factor model (usually age at occurrence and birth cohort), or some modification of these two models has been employed.

Methodically the major objective of cohort analysis is the empirical separation of three time related effects that could provide alternative explanation for the observations; these are age, period and birth cohort effects. There is an inherent limitation of cohort analysis since each set of data has at least two etiologic explanations [24]. For example, if we know that a person is 50 years old in 1980, then we also know that the person was also born in 1930. This limitation is often called an identification problem in APC analysis [24] and is due to the fact that the factors age, period and cohort are mathematically related. When these factors are treated as continuous variables, this mathematical relationship (when mortality is the end point) is simply (year of birth) + (age of death) = (year of death) [24]. The correspondence among these factors is called a linear dependence. In regression analysis, when regressor variables are linearly dependent, it is not possible to attribute separate effects to each of these factors. Again, the net result of this identification problem is that any attempt to separate the three effects empirically depends on a priori knowledge [24]. For example, if cardiovascular disease mortality in a population is due to period effect, the variation in mortality rate may have been due to a

gradual increase in the prevalence of certain risk factors - affecting all age groups and birth cohorts equally. However, this assumption is not valid, specially since we know that there is an age effect. Thus, in general, when observing one age group, one period, or one birth cohort, there is no way to separate out the effects of the other two factors.

Mortality data are usually organized as a set of age-race-sex specific rates for several periods of time. The interval widths for age and period are usually equal, typically i.e. both age and period are divided into five-year intervals. The birth cohort is defined by the age of a subject and the date of occurrence of the event of interest. Because age and period are expressed as intervals, birth cohorts are intervals also. Indeed birth cohort intervals are longer and may overlap to some extent. For instance, if we have five-year age and period intervals, then individuals aged 50-54 who died during the period 1960-64 were born sometime during the years 1905-1914. Similarly, individuals aged 55-59, who died during the period 1960-1964 belong to the 1910-1919 cohort, which overlaps the previous cohort. Since population based data are often tabulated in 5 or 10 year age group and it is not possible to obtain individual records, including date of birth.

The interpretation of secular trends in terms of period, age and cohorts by Susser is illustrated by data on peptic ulcer mortality for England and Wales from 1900 to 1977 [53]. He examined the relationships between age effects, period effects and cohort effects. Susser adopted the cohort method that relies upon the recognition of patterns in sets of age specific rate curves. The interpretation may depend upon recognition of

patterns in sets of curves or on their quantified relation. Prior to Susser's analysis, the prevailing view was that incidence of peptic ulcer was rising. Cohort analysis by Susser changed the interpretation of the overall pattern, and showed that the disease was probably in decline. Susser presented the data in semi-log graphs for duodenal ulcer in males.

Period date contours for peptic ulcer (Appendix B. Fig. a)

The sharply divergent age distribution of mortality for the different time period makes mortality pattern confusing and irregular.

Cohort date-of- birth contours for peptic ulcer(Fig. b)

The pattern in the 'date of birth' curves shows a steady rise for each successive birth year or generation between 1835 to 1885. For each successive birth year or generation after 1905, by contrast, a steady decline can be observed. For the birth years 1885-1905, the pattern is muddled by the overlap of curves. To avoid the problem of waxing and waning of mortality, the data was recast in the form of age contours.

Period age contours for peptic ulcer (Fig. c)

These age contours show a fan shaped divergence, increasing over time between the

mortality curves of young and old age-groups. The pattern, with relative small age differences in early time period and larger age differences at later times, is typical of waxing and waning rates among successive generations.

Cohort age contours for peptic ulcer (Fig. d)

In figure d the period age curves of figure c are reassembled with the abscissa indicating date of birth, instead of date of death. In this arrangement, beginning with the birth year on the abscissa, each generation can be followed vertically upwards across the curves for successive age groups. It becomes evident that for successive birth year cohorts, up to 1885, mortality rises steadily, and after 1895 declines steadily. Also an age effect is present for all cohorts throughout, excepting the beginning of the curve for the 75 years and over age group.

Chapter II - Issues

A. Accuracy of mortality statistics:

The accuracy of mortality statistics depends on the method of data collection and reporting process. The factors affecting mortality rates are: 1) registration of deaths and 2) enumeration of population [35].

1. Registration of Deaths:

The annual collection of mortality statistics for the United States Death Registration States began with the calendar year 1900. However, complete nationwide coverage was not obtained by the death registration system until 1933 [35]. It has been generally assumed that registration of deaths is relatively complete, with possible underregistration of certain of segments of the population and the less accessible areas of the country. Underregistration of deaths is probably higher in the black than in the white population. It is also likely to be a problem in certain areas of the country where registration offices are not readily accessible for geographic reasons. Overall, it is unlikely that cardiovascular disease mortality data are affected to any great extent by incomplete death registrations.

2. Enumeration of Population:

It is likely that underenumeration of the population is a more important source of inaccuracy in death rates than underregistration of deaths. The effect of underenumeration would be to over inflate death rates - opposite to that of underregistration of deaths.

The undercount of the population in the censuses has been shown to be unequal among different sex and race groups. The undercount rate has been higher for men than for women and higher for blacks than for whites. It was demonstrated in 1955 that almost 10 percent of the blacks were not counted in the 1950 census [35]. The percentage of understatement was smaller in the succeeding decades, and in 1990, 7.5 percent of all black males and 2 percent of all white males were estimated to not have been counted [25]. These levels of understatement of population and resulting overstatement of death rates should be taken into account in interpreting mortality rate.

B. Comparability of Data:

Comparability of data is affected by 1) diagnostic accuracy and 2) change in coding.

B.1 Diagnostic accuracy

The chief problem in interpreting mortality statistics on cardiovascular disease deaths are uncertainty and inaccuracy of diagnosis, lack of uniformity in diagnostic terminology used, and selection and classification of the diagnostic term to be tabulated when multiple contributory causes of death are reported. The accuracy of mortality statistics depends on the method of data collection and reporting process. At one extreme, the disease is asymptomatic and undetectable for many years; at the other, it is just one aspect of multiple other problems that are present at the time of death. Thus, change in coding and change in diagnostic practice makes comparability of data difficult.

Cause of death statistics are essential in evaluating public health problems and in measuring the progress of medical science in resolving these problems. Statistics on causes of death are derived from information entered on the death certificates. This portion of the death certificate is completed by the physician who attended the descedent or by the medical examiner in cases of death by violence and of death without medical attendance [38]. The cause of death information so reported is classified according to the International Lists of Causes of Death. This classification scheme provides a uniform basis for the assignment of the causes of death.

When one cause of death is reported on the death certificate, the assignment is relatively simple. However, more than half of the death certificates in US report two or more

diseases as causes of death [38]. It is required to select only one underlying cause of death for statistical analysis. Hence the method of selection used has an important effect upon the resulting statistics. Before 1949, selection of a cause of death for tabulation was made by reference to a set of priority tables, published in the Manual of Joint Causes of Death [38]. By using these priority tables when more than one cause was jointly reported, the primary cause for tabulation was selected. The new international rules adopted for use in 1949 made the medical practitioner responsible for indicating the underlying cause of death for tabulation. Underlying cause of death, is defined as the disease or injury which initiated the train of events leading directly to death. For example,

> Right lower limb of a man was paralyzed after stroke and he could not walk without help. While trying to walk he fell down from stairs and died of a head injury. *He would be categorized as stroke death (underlying cause) after 1949 but as head injury death (primary cause) before 1949.*

B.2. Change in coding:

The causes of death are standardized by the World Health Organization (WHO) in its Manual of the International Statistical Classification of Diseases, Injuries, and Causes of

Death (ICD). ICD has been in use since 1900. The ICD describes the specific causes and groups them into major categories and specific subcategories at several levels. The ICD also includes rules for systematically identifying the underlying cause of death, which is relatively easy to report and understand. ICD has been revised approximately every ten years to reflect progress in medical knowledge [Table 2]. ICD 9, however, has been in place since 1976. Though the revisions introduce refinements and categories that correspond better to changing realities they create certain comparability problems over time.

From 1945 to 1995 five different versions of the International Classification of Diseases (ICD) were used namely the Fifth, Sixth, Seventh, Eighth and Ninth. A systematic method for evaluation of classification changes in transition from one ICD revision to the next is essential in order to determine the net effect of any change in ICD version. The International Conference for the Decennial Revision of the International Lists of Diseases and Causes of Death recommended that a sample of deaths for a country as a whole should be coded according to the two consecutive Revisions [38]. This dual coding of causes of death (first introduced after 6th Revision in 1950) shows the net changes resulting from the two revisions. The comparability ratio has been in use after 1950 for all ICD revisions. The number of deaths assigned to a particular cause of death in accordance to the most recent revision divided by the number of deaths assigned to a comparable cause in accordance with the previous revision gives the comparability ratio (C.R.) [Table 3]. The comparability ratio for the Eighth and Seventh Revision would be

calculated as (Number of deaths by Eighth Revision)/(Number of deaths by Seventh Revision). For example, 202,894 cerebrovascular disease deaths were recorded according to 8th Revision in 1966. Death by comparable cause (Vascular lesions affecting central nervous system) according to 7th Revision in 1966 was 204,841. Thus, comparability ratio for the Eighth and Seventh Revision for cerebrovascular disease was therefore 202,894/204,841 i.e. 0.9905. A list of comparability ratios for all five cardiovascular disease groups evaluated between 1945-1995 in this study are shown in Table 3. Comparability ratios give a valuable quantitative indication of the net change between revisions. Comparability ratios may also vary with age at death, race and sex. Age, race and sex specific comparability ratio was calculated for Fifth, Sixth and Seventh revisions. A comparability ratio of 1.00 indicates that same number of deaths was assigned to a particular cause or combination of causes in both the revisions. However, a ratio showing perfect correspondence (1.00) between the two revisions does not necessarily indicate that the cause was unaffected by the changes in classification and coding procedures because the changes may compensate for each other [37].

C. Issues with comparability of data (diagnostic accuracy and change in coding) for specific cardiovascular diseases:

Many factors affect the interpretation of mortality statistics on cardiovascular diseases. These may result from method of data collection and from procedures employed in the

classification. The effects of diagnostic procedures and coding changes for the three important cardiovascular diseases are discussed.

C.1 Ischemic heart disease:

a) Diagnostic Accuracy:

Many IHD deaths occur suddenly, without medical attention, and with no history of the existence of cardiovascular or other disease Because there are few diseases other than IHD which are frequent causes of sudden, unexpected death, it is reasonable to attribute such deaths to IHD. Available information indicates that one-third of all IHD deaths are certified by medical examiners [35]. Although medical examiners consult physicians or hospital records in a substantial proportion of cases and make postmortem examinations in some, the diagnosis of IHD is frequently a presumptive one [35].

b) Change in Coding:

For approximate comparability of data on diseases of the coronary arteries, "arteriosclerotic heart disease, including coronary disease" (ICD-6 420) should be compared with "diseases of the coronary arteries and angina pectoris" (ICD -5 No. 94) and "Chronic myocarditis and myocardial degeneration, not specified as rheumatic" (ICD-5 No. 93d) in the fifth revision. The comparability ratio for the Fifth and Sixth

Revisions for IHD for all ages, races, and sexes combined was 0.77 [Table 3]. It ranged among adult subgroups from a low of 0.46 for nonwhite females aged 35-44 to a high of 0.93 in white males aged 45-54 [40].

The IHD categories in the seventh revision were the same as those in the sixth, but changes in coding rules resulted in somewhat different code assignments [39]. The Seventh Revision had no special provision for classifying arteriosclerotic heart disease (ICD-7 No. 420.0) jointly reported with Hypertensive disease. Consequently, some deaths attributed to this combination of diseases were classified by the Seventh Revision to hypertensive heart disease (ICD-7 No. 440-443). Age, race and sex specific comparability ratio ranged from 0.45 (35-44 year old black female) to 0.89 (35-44 year old white female). Dual coding of a ten percent sample of deaths that occurred in 1958 supplied the basis for comparability ratios that were than applied to deaths classified according to the Seventh Revision. The overall comparability ratio for the Seventh and Sixth was 0.98 [Table 3].

Adoption of the Eighth Revision of the ICD in 1968 created a break in comparability of the IHD trend data. The comparability ratio for all age-sex-race groups estimated by the National Center for Health Statistics provided a measure of the impact of the new coding procedure. An estimated 14.57 percent more deaths (totaling 83,500) were assigned by the Eighth Revision to this title than were assigned to Arteriosclerotic heart disease including coronary disease (ICD-7 No. 420) by the Seventh Revision [37]. In particular

the Eighth Revision deleted the category Other Myocardial degeneration, and gave preference to IHD in classifying heart disease related to hypertension. The largest single group of these deaths (41,228) was assigned by the Seventh Revision to Other myocardial degeneration with arteriosclerosis (ICD-7 No. 422.1). Of these 41,228 deaths an estimated 40,993 (99%) were classified by the Eighth Revision to Chronic ischemic heart disease (ICD-8 No. 412). Comparability ratio by age race and sex was not computed for Eighth and Seventh Revision. Comparability ratio combined for all age race and sex is 1.063 [37].

In the Ninth Revision, a new classification, cardiovascular disease, unspecified (ICD-9 No. 429.2) was used, which accounts for the reduction in chronic ischemic heart disease grouping. Chronic ischemic heart disease grouping in the Ninth Revision is termed as old myocardial infarction (ICD-9 No. 412) and other forms of chronic ischemic heart disease (ICD-9 No. 414). Comparability ratio (Ninth and Eighth) for ischemic heart disease for all age, race and sex was 0.8784 [36].

C. 2 Cerebrovascular disease:

a) Diagnostic Accuracy:

There are several problems with respect to interpretation of cerebrovascular disease mortality data, including the frequent appearance of cerebrovascular diseases as a cause

of death along with other causes in the death certificates. For example, cerebrovascular disease and hypertensive heart disease may appear on a certificate together. Whether or not the death is classified to the cerebrovascular category depends on the sequence reported by the medical certifier.

A detailed analysis was made of multiple causes of death based on the US data for 1955. Altogether cerebrovascular diseases appeared 304,004 times on death certificates, and were coded as the underlying cause of death in 173,541 cases, (57.1%) [35]. This percentage varied with type of stroke. Clinically it is difficult to distinguish between the different types of stroke, and this produces difficulties in the interpretation of mortality data [35].

Change in Coding:

Vascular lesions affecting central nervous system (cerebrovascular disease) was coded as Code No. 83 according to 5th Revision and as Code Nos. 330-334 according to 6th Revision. The comparability ratio between the two Revisions adjusted for age race and sex was 1.16. The Sixth Revision also created a discontinuity in the data for vascular lesions of the central nervous system. The 16% gain was caused by change in coding rule. Most of these 'extra' deaths were classified into the various categories of heart disease, arteriosclerotic kidney, and diabetes when the Fifth Revision was in effect [35].

In the Seventh Revision vascular lesions of the central nervous system (cerebrovascular disease) was also coded as ICD-7 Code No. 330-334. The comparability ratio the Sixth and Seventh Revision was 1.00. Actually, 940 deaths (4.9%), were assigned differently by the two revisions Cerebrovascular disease gained 466 cases and lost 474 cases by the Seventh Revision, with the resulting comparability ratio of 1.00.

The Eighth Revision title for vascular lesions affecting central nervous system(ICD-7 No. 330-334) was cerebrovascular diseases (ICD-8 Nos. 430-438) [37]. The comparability ratio between these two titles of cerebrovascular disease for the Seventh and Eighth Revisions was 0.981 [37]. Although the ratio is close to 1.00, there were some important changes in coding procedures, which in part compensated for each other. About 4,516 deaths in 1966 assigned to ICD-7 Nos. 330-334 in the Seventh Revision were transferred by the changes in coding procedures in the Eighth Revision to categories other than cerebrovascular diseases [37]. On the other hand 2,569 deaths not assigned to cerebrovascular diseases by Seventh Revision were assigned to cerebrovascular disease by Eighth Revision.

Introduction of Ninth Revision did not bring much change in cerebrovascular disease category. Same ICD coding 430-438 was used. The comparability ratio of Eighth and Ninth Revision was 1.0049 [36].

C.3 Hypertensive heart disease:

Diagnostic Accuracy:

Physicians frequently certify hypertensive heart disease on the death certificate as a contributory cause rather than as a underlying cause of death [35]. This inevitably results in underestimation of the impact of hypertensive disease on mortality. Moreover, the coding rules tend to give certain major causes of death precedence over hypertensive heart disease. When a physician reports both cerebrovascular disease and hypertension (without mention of heart) on the certificate, for instance, the death is coded to vascular lesions affecting the central nervous system. Thus, coding a single underlying cause of death in death certificates results in loss of critical data concerning the role of hypertension in mortality. The definite diagnosis of hypertensive disease must be made before death. Several studies show that in the general population a sizable percentage of hypertension is undiagnosed. When catastrophic illness like heart attack or stroke occur in such persons, leading rapidly to death, the diagnosis of hypertensive disease may not be made and therefore may not appear in the death certificate [35].

b) Change in Coding:

Prior to the introduction of the Sixth Revision of the ICD in 1949, hypertensive heart disease did not appear as such in the classification. All deaths from this condition was

coded at that time to other cardiovascular disease category. In the Sixth Revision hypertensive heart disease was coded as ICD-6 Code Nos. 440-443. Hypertensive heart disease (ICD-6 Code No. 440-443) was compared with Fifth Revision ICD-5 Code Nos. 131a and 93d [40], the combined comparability ratio was 0.29. This low comparability ratio is due to changes in procedures for selecting the cause for primary tabulations; and also because the sum of the causes described by the Sixth Revision categories is not precisely the same as that described by the Fifth Revision title with which it is compared. While the examination of the inclusion terms under the titles of both revisions and of the transfers of cases from one cause under one revision may suggest some of the reasons for differences, it is not possible to determine quantitatively how much of the change in a ratio results from the incomparability of the title and /or from each of the factors which may be involved [40].

The Seventh Revision of ICD coding did not change HHD coding very much. The adjusted comparability ratio for all age, race and sex groups combined was 1.11 [39].

In the Eighth Revision cause hypertensive heart disease with or without renal disease (402,404) was compared with the Seventh Revision cause hypertensive heart disease (440-443), with a resulting ratio of 0.398 [37]. An estimated 60 percent of all deaths assigned in the Seventh Revision to hypertensive heart disease (ICD-7 440-443) were transferred in the Eight Revision to chronic ischemic heart disease with hypertensive disease (ICD-8 412.0).

The Seventh Revision had no special provision for classifying arteriosclerotic heart disease (ICD-7 No. 420.0) jointly reported with hypertensive disease. Consequently, some deaths attributed to this combination of diseases were classified by the Seventh Revision to Hypertensive heart disease (ICD-7 No. 440-443). In the Eighth Revision arteriosclerotic heart disease was classified as an ischemic heart disease, and four digit subcategories were provided under the ischemic heart disease categories for jointly reported hypertensive disease [37].

When the Ninth Revision List of 72 Selected Causes of Death was compared with the Eighth Revision List of 70 Selected Causes of Death for the Annual Summary, the comparability ratio for hypertensive heart disease (ICD-9 No. 402) was 3.3022 [36].

D. Age-adjusted and Age-specific mortality rates:

We used age-race-sex specific mortality rate rather than crude death rate or age adjusted death rates. Crude death rate is a ratio between the number of deaths in one year and the enumerated or estimated total population in that year. It gives only an overall idea of mortality levels regardless of age, sex, race or other characteristics. Use of crude death rates for black and white comparison may give the impression of lower cardiovascular disease death rates in blacks because the black population is much younger than the white population. Age is the most crucial variable in mortality analysis and no index that fails to account for it is very useful, especially in comparing population with markedly

different age profiles. The common practice is to compute age adjusted death rates. The age-adjusted death rates distill age-specific death rates into a single figure and account for changes in the age structure of the population [59]. They indicate what the death rate would be in an actual population if it had the age distribution of a standard population. Any census year could be used for standard population, but the NCHS uses 1940 to compute age adjusted rates for the US. However, this common practice of age adjustment is no substitute for the age specific rates, because the selection of the age range for inclusion and the standard population can drastically influence the results obtained. The age adjusted death rate conceals any variation of trend by age or cohort.

Moreover, changes in age adjusted rates by age and sex provide less insight into detailed causes than do changes in age specific rates because cardiovascular diseases declined more as a cause of death for some groups than others. Use of age adjusted rate obscure the fact that racial differences are often reversed at different extremes of age, with upper ages having much more impact on the adjusted rate than the lower age

E. Race:

Mortality analysis of cardiovascular diseases by race is complicated by the following problems [13]

E.1 Mortality for blacks and other nonwhite groups not being documented separately:

The past failure (prior to 1975) of the National Center for Health Statistics to report mortality for blacks and other nonwhite groups separately [11].

E.2 The different population age structures for blacks and whites:

The different population age structures for blacks and whites making the published generalizations of black white trends using age-adjusted rates misleading. For example, age adjusted IHD rates for black male aged 35-74 years were higher than those for white males in 1968, whereas age adjusted rates for black males of all ages were lower than white male rates [59].

E.3 The greater inaccuracy of death certificate diagnoses in blacks than whites [13].

A greater percentage of IHD deaths in blacks than in whites below age 65 occur out of hospital and emergency rooms [25]. The cause of death for out hospital deaths is often based on minimal or non existent information. The death certificates are often signed as due to IHD because of lack of better diagnosis. More blacks, especially in younger age groups die outside the hospital and therefore are at greater risk of being classified as IHD deaths for the lack of better information [25]. The majority of out of hospital deaths

among black men, if carefully studied, are not due to IHD. In Pittsburgh, Pennsylvania, for example, only 33 percent of sudden, natural, out-of-hospital deaths among black men, ages 35-44, were due to IHD. 25% of other causes of death were misclassified as IHD deaths. Misclassification of 25 percent of the other causes of sudden death as due to IHD would increase the IHD deaths in black men by close to 50 percent at least in the younger age groups [25].

According to a 1970-1972 Baltimore study a much higher percentage of deaths certified as arteriosclerotic heart disease among black men were misclassified, 33 percent compared with 18 percent for white men [25]. The percentage of IHD deaths classified as sudden was higher in black men - 69 percent compared with 54 percent among white men. Misclassification of sudden death may also contribute to the higher IHD mortality rates among black men compared with white men [25].

E.4 The greater inaccuracy of census data for blacks than whites:

Another problem with death rates among nonwhites is inaccuracy of population data. Greater undercounting of nonwhites in censuses compared with whites has been reported. In 1990, 7.5 percent of black males were undercounted compared to 1.5 percent of white males [25] and poor intercensal estimates would tend to inflate nonwhite rates [13]. Trends toward reduced undercounting could produce apparent decline in mortality. Consistency of reporting of age is more of a problem among nonwhites than whites [35].

According to a study there was 90 percent agreement between the age recorded on death certificates and census record of whites 65 to 74 years who died of cardiovascular disease [35]. The corresponding figure for non-whites was 70 percent. For ages over 74 years, ages reported on death certificates as compared with census record were understated in about 16 percent of the deaths in nonwhite males and 18 percent in nonwhite females. For whites the net difference was only 2 percent [35].

E.5 Change in ICD code:

Change in ICD code from ICD-7 to ICD-8 created a large discontinuity in IHD rates in blacks between 1967 and 1968. In the Eighth Revision ischemic heart disease when jointly reported with hypertensive heart was coded under ischemic heart disease. Since Seventh Revision did not have provision for classifying ischemic heart disease in association with hypertensive heart diseases, a large number of these deaths were classified under hypertensive heart disease. Furthermore, in Eighth Revision the old terminology "myocardial degeneration" was eliminated and most of the deaths due to myocardial degeneration was coded in ICD-8 under ischemic heart disease [39]. Change from ICD-7 code to ICD-8 code, in which IHD diagnosis takes precedence over hypertensive heart disease and the old terminology "myocardial degeneration" has been eliminated would affect nonwhite rates much more than whites, because (1) hypertensive heart disease is more prevalent in blacks and (2) myocardial degeneration is more frequently used in blacks to designate IHD [13].

In ICD-9 however, when hypertensive heart disease and ischemic heart disease was jointly reported, it was coded under hypertensive heart disease. This was also found to have more affect on blacks than whites. Thus, the changes from ICD-7 to ICD-8 and ICD-8 to ICD-9 were associated with substantial artifactual upward and downward shifts in the IHD rates in the black population [13].

E.6 The greater impact of influenza epidemics on CHD in blacks compared to whites.

Influenza epidemics cause more mortality in blacks than whites. Since, respiratory infection is often a complicating cause in cardiovascular deaths, influenza epidemics run in parallel trends with heart diseases [13]. Cardiovascular disease mortality rose sharply in blacks during December 1968 to January 1969 epidemic. Racial differences in percentage decrease in cardiovascular mortality were less after the epidemic.

Chapter III

Methods:

A. Data sets:

1. Data sources:

The number of cardiovascular disease deaths in Michigan for adults 20 years or older was collected for the years 1944 to 1995, categorized by race (black or white), age (by 5 year category) and sex. The number of deaths due to the five major categories of cardiovascular disease (Major cardiovascular disease, Diseases of heart, Ischemic heart disease, Cerebrovascular disease and Hypertensive heart disease) was tabulated from the vital statistics of the United States, Natality and Mortality Data for the United States, Tabulated by place of residence. All data were tabulated by place of residence rather than place of occurrence because in most cases, both will be the same and because risk of death from chronic diseases is usually related to long term risk factors prevailing in resident populations. We grouped age at death in five year intervals and restricted our analysis to 11 age-groups, from 20-24 years through 70-74 years prior to 1970. We further analyzed our data for 13 age groups from 20-24 years through 80-84 years after 1970. The lower age restrictions avoided highly variable estimates due to small number of events that occur at very young ages. We could not include higher age groups because

population figures in 5 year age groups were not available for older ages prior to 1970. We decided not to include 75+ and 85+ groups in our analysis because analyzing data with age 75 and over or 85 and over as one age group will result in too much lumping of data, and will not allow us to separate mortality rate in different age groups.

2. Count Data:

The number of deaths for each disease category was calculated for each five year period (i.e. 1945, 1950, 1955.....1995). We used an average of the number of deaths of three consecutive years around each 5 year period. For example, number of cerebrovascular disease deaths for 1960 was calculated as an average of the number of deaths of 1959, 1960 and 1961 [Table 4]. Three year averages reduced the effect of annual fluctuation in mortality and the possibility of significant misreporting in any one year. Since 1996 mortality data were not, yet available, for 1995 we calculated only the average of 1994 and 1995.

3. Population Data:

Population data from 1971 to 1995 were obtained from Michigan Department of Community Health (MDCH). These data were tabulated by age (5 year age group), race (black or white) and sex for every year. Intercensal population estimates were provided to MDCH by the state department of Management and Budget. Prior to 1970 population

data by age, race and gender was not available for every year. Population data classified by age, race and gender for 1940, 1950, 1960, and 1970 were obtained from decennial census. Intercensal estimates were then made using linear interpolation. Decennial census data were obtained from MDCH. An example, of linear interpolation between 1950 -1960 for white males is shown in Table 5.

Prior to 1975, reporting of deaths for all races other than whites were grouped as non-whites. For Michigan, non-white rates were probably a fair approximation of rates for blacks, in as much as blacks comprised greater than 85% of the non-white population in those years [11]. Furthermore, results of linear interpolation are based on the assumption that there has not been any large migration of population in and out of Michigan. Large migration in and out of Michigan from 1940 to 1970 may have affected both the number of events and actual population size but may not be immediately reflected in the population estimates.

We inserted the count data (i.e. number of deaths for each disease category and the population data) in Excel. Underlying cause of death was categorized by the Ninth Revision of the International Classification of Diseases. We calculated age-race-sex specific death rate for each of the 5 disease categories by constructing simple fractions, where the numerator is the number of deaths during one calendar year (estimated as an average of three consecutive years), due to the cause of interest in a given age-sex-race group and the denominator is the estimated size of the relevant population. The fraction

is reported as the observed mortality rate per 100,000 persons at risk. Thus the formula for determining IHD death rates in black women aged 20-24 in 1970 is given by:

(Number of deaths due to IHD among black women aged 20-24 in 1970)/(Total number of black women aged 20-24)* 100,000

The period (1945-1995) under review encompasses five revisions of the International Classification of Diseases (ICD): the Fifth (1939-1948), Sixth (1949-1957), Seventh (1958-1967), Eighth (1968-1978) and Ninth (1976-1996) (Table 3). Each of these revisions of ICD codes altered the coding rules and resulted in lack of comparability with the previous code. To make the rates of 1945 comparable to 1995 rates we have to take into account of these changes. For example, to make the mortality rate due to IHD in 1945 to be comparable with the 1995 rate, the 1945 rate must be multiplied by the relevant comparability ratios, i.e.

1945 rate * C.R. of 5th and 6th Revision for MCD deaths * C.R. of 6th and 7th Revision for MCD * C.R. of 7th and 8th Revision for MCD * C.R. of 8th and 9th Revision for MCD. For example to make 1945 MCD rate for black male 50-54 year old comparable to 1995 rate we applied the following procedure:

917(1945 rate) * 1.17(C.R. 6th, 5th) * 1.00(C.R. 7th, 6th) * 0.991(C.R. 8th, 7th) * 1.0069(C.R 9th, 8th) =1079. The rate, for 50-54 year old black males for 1945 (917) when adjusted to be comparable to 1995 rate was 1079.

The 1945 data from the Michigan population did not code 'chronic myocarditis (93d)' as a separate group. Instead, it was included in one category with several other conditions in diseases of the heart (other forms) [other pericarditis (90b), acute endocarditis (91), diseases of aortic valve (92a), other chronic endocarditis (92d), endocarditis unspecified (92e), acute myocarditis (93a), myocarditis unspecified (93b), other chronic myocarditis (93d), other myocarditis unspecified (93e), functional diseases of heart (95a), other diseases of heart, not rheumatic (95c)] in the category diseases of heart (other forms). Using the national data we were able to estimate chronic myocarditis (93d) mortality by examining the proportion of deaths due to chronic myocarditis relative to total mortality due to diseases of heart (other forms) in the national data. By applying this proportion to the disease of heart in Michigan population we estimated the chronic myocarditis (93d) mortality in Michigan for 1945 for each age, race and sex group. [Table 6]. The formula used was to estimate 93d was

{93d in US/diseases of heart(other forms) in US}* diseases of heart other form in Michigan. For 1950, onwards mortality data for IHD did not pose any further problems.

B. Analysis

Data analysis was done in two parts:

1. Period analysis

2. Cohort analysis

1. Period analysis:

Age-specific mortality rates for major cardiovascular disease were presented by gender and race in five year age groups [See Data 0001 to 0020]. In these Data Sets, the rows represents categories of age at occurrence and the columns defines categories of year of occurrence.

The rates were based on 5-year age intervals and 5-year period intervals. Data were plotted with the rate per 100,000 as the ordinate and the age at death category as the abscissa. Each graph was standardized for each disease cause. The linear trend graphs were superimposed in lower age groups and some were not even evident . So, mortality rate was plotted on a log scale to accommodate the wide range of rates. The same process was repeated for other disease entities. A separate graph was plotted for each race and gender group [See Figure 0001 to Figure 0004].

The average annual percentage change in age-race specific mortality rate for each 5 year period (for each of the cardiovascular diseases category) was calculated. For example, average annual percentage change for IHD deaths in white males for the period 1950-1955 was calculated as the 1955 rate (WM age 50-55 age) minus 1950 rate (WM 50-55 age) divided by 5, divided by 1950 rate and multiplied by 100 [Table 7(i)].

2. Cohort Analysis:

To examine mortality trends in a different way, we computed mortality rates in 5-year birth cohorts from 1873 to 1973 for each of the 5 disease groups. Age, race and sex specific mortality in these cohorts aged 20 to 84 is shown in Data Table 0021 to 0040. However, in birth cohorts prior to 1888 we could not include 75-79 and 80-84 age groups, since denominator data were not available prior to 1980.

We took the central year of age group i.e. for 70-74 year age group we took 72. We deducted 72 from 1945 to identify the birth cohort and to give us the mortality rate of persons born in 1873 (1945-72 = 1873) and died when they were 70-74 years old. For example, IHD mortality rate in 1945 for white male 70-74 year age group was 946 per 100,000. To construct a cohort chart this mortality rate will be for 1873 (1871-1875) birth cohort of white males aged 70-74. Similarly, DOH mortality rate for 50-55 year old white males in 1970 was 350 per 100,0000. This group of white males will constitute the (1970-53 = 1917) 1917 birth cohort of white males aged 50-54.

We plotted mortality rate per 100,000 as the ordinate, year of birth instead of year of death as the abscissa and stratified it by age. To accentuate the difference in mortality rate in lower age groups we plotted mortality rate per 100,000 in log scale. This was particularly helpful to show the differences in lower age groups where the number of events was very small. For cohort graphs there were fewer data points in the two extreme ends of ages. For example for persons born in 1873 we can only include 70-74 years old and for people born in 1973 we can only include 20-24 years old. For each disease group a separate graph was plotted for each race and sex group [Figure 0021 to Figure 0040].

Chapter IV - Results

A. Major Cardiovascular Diseases:

White Males:

Figure 0001, Data Set 0001, and Table 7a each presents age specific mortality rates in white males over 5-year successive period over a fifty year span beginning in 1940 and ending in 1995. An overall trend of consistent secular decline in mortality rates emerges from a review of this data set. In a handful of instances, in particular years certain age groups reported mortality rates that are inconsistent with the overall trends i.e. instead of a decline, they in fact report a slight increase. These inconsistencies may be derived from extraordinary events impacting on a relatively small sample size. From 1945 to 1965 the rate of decline of mortality rate was relatively small. In 1945, 673 per 100,000 white males died and in 1965, 599 per 100,000 white males died of MCD. The average rate of annual decline was only 0.57 percent. The linear graphs (1945-1965) also show a series of almost parallel straight lines, indicating very little change in the rate. The rate of decline accelerated after 1965 and continued to do so until 1990. Mortality rate in 1990 was almost half that of 1965. However, the rate of decline in MCD-related mortality substantially slowed in the period between 1990-95 as compared to the earlier periods studied in this review.

Although the data reveals a constant pattern of overall declines in mortality rates, age-specific mortality rate for every period increased with age, particularly for over 50 year age groups, suggesting what has now become obvious -- that aging population groups carry a higher risk of cardiovascular diseases.

Data Set 0021 shows that in 65-69 year age group 1888 birth cohort had the highest mortality rate (2577). In 60-64 year age group however, 1893 birth cohort had the highest rate. Men born in 1888 were 65-69 years old in 1955 (1953-1957) and men born in 1893 were 60-64 years old in 1955. So, a period effect and not cohort effect is evident. If a cohort effect would be present a particular birth cohort would have the highest rate in all ages.

White Females:

Table in Data 0002 and Figure 0002 show age specific mortality rates in white females aged 20-84 from 1945 to 1995. Mortality rate in white female declined steadily from 1945 to 1965. During 1945 to 1965 average annual rate of decline in 50-54 year olds white female was 2 percent. From 1965 to 1995 the average annual rate of decline was also 2 percent. The rate of decline was consistent among all age groups. However, the decline of mortality rate was highest during 1980-1985, and it was more pronounced in the older age groups (55-84). For example, 80-84 year old women experienced an

average annual decline of 4 percent during this period compared to 0.5% among women of 50-54 year age group.

Figure 0002 shows a consistent decline in mortality rate through out our study period. The cohort graphs do not show any cohort effect. If strong cohort effect would be present, it would not be evident in the period graph.

Black males:

Age specific mortality rate in black males showed a pattern similar to white males, except in the period 1990-95 when black males registered an increase in mortality rate while the overall declining trends continued for all other groups. As Data Set 0003, Figure 0003 and Table 7c demonstrate age specific mortality rate declined steadily in all age groups from 1945 to 1965. The rate of decline accelerated after 1965 and continued until 1995. However, death rates in age groups 55 to 69 increased during 1990-1995. It increased at an annual rate of 2 percent among 55-59 year old men, at 0.8% among 60-64 year old men, and at 0.7% among 64-69 year old men.

The cohort Data 0023 and Figure 0023 also do not indicate any cohort effect. Black males aged 60-64 had the highest rate in 1883 birth cohort. and 65-69 year old men had the highest rate in 1888 birth cohort. No particular birth cohort showed very high rates.

Black females:

Overall mortality rate in black females declined during the study period (1945-1995). The rate of decline of mortality among Black females of all age groups reached accelerated in the period between 1970-75. During this period, 60-64 year old black females experienced an annual reduction of 8.2%. In the same period, Black males of the same age group, registered a decline of just 2.6%. The rates continued to decline throughout the 1980s and the 1990s. In 1990s the rate declined in all age groups except 40-44 age group (6.3% increase) and 50-54 age group (5.6% increase) [Table 7d]. This increase in mortality among these two particular age groups of Black females mirrors a similar trend of increase of mortality rate among Black men during this same period.

The Cohort Table Data 0004 and Figure 0004 do not show any cohort effect. Black females aged 65-69 show highest mortality rate in 1888 cohort. 70-74 year old black females showed highest mortality rate in 1873 birth cohort. No particular birth cohort was at higher risk for cardiovascular disease death.

Cardiovascular disease mortality rate was higher among black males at ages 20-69. In age 70 and higher age groups white men had higher rates. White females had the lowest cardiovascular diseases death rates. Larger percentages of white males than white females die in every age group from cardiovascular diseases, although the gap is narrower in some ages than others. The mortality differential by sex varies considerably with age.

In 1975 death rate of white males 70-74 years was 1.9 times that of white females [Table 7b]. Cardiovascular disease mortality rates are 2 to 3 times higher in black females than in white females. This mortality gap due to racial difference widens in middle ages and converges in older age. However, the death rate for black females were well below those of black males. Death rates also declined faster in black females than black males.

B. Diseases of Heart:

White Males:

Data Set 0005, Figure 0005 and Table 7e present age-specific mortality rate in white males in Michigan from 1945 through 1995. DOH death rate decreased in virtually every age group for every time period after 1955. However, the greatest declines have been since 1985. Again, during this period (1985-1995) 55-59 age group has most benefited. They experienced an annual decline of mortality rate of 4.7 percent [Table 7e].

During 1950-1955 DOH declined in all age groups except 60 to 69 year old men. In 1950, 1305 per 100,000 white males 60-64 years old died. In 1955, 1362 males per 100,000 white males of the same age group died. The rate of decline accelerated after 1970 and was evident in all age groups. The death rates decreased most during the years of 1985 to 1995. However, not all age groups benefited equally from this declining trend. For example, during 1985-1990, 40-44 year old age group experienced the most

reduction in rate (6% decline) and in 1990-1995, 70-74 age group experienced maximum decline (5% decline).

Cohort Table (Data 0025) and cohort graph (Figure 0025) do not show any evidence of cohort effect. 50-54 year old white male had the highest mortality rate in 1903 birth cohort. Similarly, 65-69 year old men had highest death rate in 1888 birth cohort.

White Females:

Data 0006 shows age specific DOH mortality rate in white females in Michigan from 1945 to 1995. DOH mortality rate decreased in all age group during this period (1945-1995). The rate of decline, accelerated after 1970 and was more pronounced after 1985. Average annual rate of decline was three times more during 1970-1995 (3.5 %) than in during 1945-1970 (1.1 %).

DOH mortality rates do not show any cohort effect. In Data 0026), 70-74 year old white females of 1893 birth cohort had higher mortality rate than 1888 birth cohort (1647 versus 1621). However, in 65-69 year old group 1893 birth cohort has lower mortality rate than 1888 (921 versus 1027).

Black males:

Table in Data 0007 and Figure 0007 presents age specific death rates in black males in Michigan from 1945 to 1995. The rate of decline showed a very complex, almost bewildering pattern with declines for one period followed by increase in the next. Different age groups in the same period also showed very different rates. Consistent decline were seen only for 1970-1975 and 1980-1985. During 1990-1995 death rates increased in black males except in ages over 70.

In Cohort Table Data 0027 and figure 0027 shows no cohort effect in black males aged 20-84 during 1945-1995. Highest mortality rate in 65-69 age group was in 1898 birth cohort, in 60-64 age group it was however in 1888 birth cohort. No consistent pattern was evident in cohort graphs.

Black female:

Data 0008 denotes mortality rate in black females in Michigan from 1945 to 1995. The DOH mortality had an overall declining trend, but this declining trend was not evident in every period. The rates consistently declined only after 1980. From 1975-1980, however the rate increased in all age groups.

Cohort Table Data 0028 and Figure 0028 shows no consistent pattern in the mortality rates of the birth cohorts. No particular birth cohort experiences higher death rate in all age groups than the other birth cohorts. In age 60-64 black women born in 1918 had higher mortality rate than black women born in 1913 (649 versus 605). In age group 55-59, 1918 birth cohort shows lower mortality rate than 1913 birth cohort (397 versus 493).

C. Ischemic Hear Disease:

White Males

Table in Data 0009 and Figure 0009 present age specific mortality rate in white males from 1945 to 1995. Ischemic heart disease in white males increased steadily from 1945 and reached a peak in 1965. After 1965 it started to decline and continued to do so until 1995. During 1945 to 1965 the rate of increase was not same in all age groups. It was higher in older age groups (age 65 and over). For example, mortality rate for IHD in 70-74 year old men was 1350 per 100,000 in 1945. In 1965 it was it was 2257 per 100,000, representing a 70 percent increase. During the same time period mortality rate increased only 30 percent in 50-54 year old men. After 1965 mortality rate started to decline in all age groups. This decline was most pronounced since 1980.

Data Table 0029 and figure 0029 shows age specific mortality rate by birth year. Cohort effect is not evident in white males. 70-74 year old white males show highest mortality

rate in 1893 birth cohort. Similarly, in age 65-69, 1898 birth cohort shows highest mortality rate. Examining cohort data it is evident that highest mortality rate in age groups follow a diagonal pattern. If a cohort effect would be present a particular birth cohort would show largest mortality rates throughout all age groups. The diagonal pattern of the cohort table indicates a strong period effect rather than a cohort effect.

White Females:

Data 0010 and Figure 0010 depicts age specific mortality rate in white females from 1945 to 1995. The mortality rate for White females was unchanged in all ages from 1945 to 1965, except those 65 and over. Women 70-74 year old experienced almost 40 percent decline in that period. After 1965 the rate began to decline for all groups and has continued to show substantial consistent declines ever since.

Like white males white females also do not show any cohort effect [Data Set 0030 and Figure 0030]. In 70-74 year old women highest mortality rate was in 1893 birth cohort. Highest mortality rate in 65-69 year old women was not in 1893 birth cohort but in 1898 birth cohort. Like white males cohort analysis shows a diagonal pattern rather than vertical pattern indicating absence of cohort effect but a strong period effect.

Black Males:

Table in Data 0011 and Figure 0011 indicated age specific mortality rate in black males during 1945 to 1995. Mortality rate of black males increased rapidly and almost equaled that of white male by 1965. For example the average annual increase in 70-74 year old men during the period 1945-1965 was 3.9 percent. During 1965 to 1970 IHD rates began to show decline among men 50 years and older. Between 1970-1990 it declined in all age groups. However, since 1990 IHD rates have increased in men less than 50 years.

Black males also showed no cohort effect [Data 0031 and Figure 0031]. Mortality rate in 75-79 year old men was highest in 1893 birth cohort. In 70-74 year old men it was highest in 1898 birth cohort. If a cohort effect would be present highest mortality in 70-74 year old men would also be in 1893 birth cohort.

Black Females:

Table in Data 0012 and Figure 0012 shows age specific mortality rate in black females during the study period (1945-1995). Age specific mortality rate peaked in 1965. After 1970 it decreased in all age groups, particularly among the younger age groups. Declines have been consistent until 1990, though they appear to be larger in younger age groups. During 1990-1995 evidence shows that the rates have increased in younger ages(<55 years).

Cohort analysis in black females do not show any cohort effect [Data 0032 and Figure 0032]. Highest mortality rate in 60-64 year old black females was in 1903 birth cohort. However, highest mortality rate in 55-59 year old women was in 1908. No particular birth cohort was at risk higher risk of IHD deaths.

D. Cerebrovascular Diseases:

White Males:

Table in Data 0013 shows age specific mortality rate in white males from 1945 to 1995. With few exceptions age specific mortality rate declined steadily from 1945 to 1995. The rate of decline accelerated after 1970. The average annual rate of decline from 1970 to 1975 was 3.5 percent. Thus, the rate of decline almost tripled during the second half of the study period. During 1990 to 1995 the rate of decline diminished in older age groups (55-84). And it even increased in some age groups (35-49) [Table 7m].

Cerebrovascular disease death rates in the birth cohorts 1873 to 1973 did not show any cohort effect [Data Set 0033 and Figure 0033]. In 70-74 age group mortality rate was highest in 1878 birth cohort. However, in 65-69 age group it is highest in 1888 birth cohort . If a cohort effect was present mortality rate would be highest consistently in all age groups in a particular birth cohort.

White Females:

Cerebrovascular disease started to decline in white female from 1945. The rate declined steadily in all age groups. The rate of decline was accelerated in 1970 and continued to do decline until 1995. Death rates declined more than 50 percent between 1945 and 1965. For example, in 50-54 year old men it was 99 per 100,000 in 1945 but only 44 per 100,000 in 1965. Death rate declined more than 60 percent during 1970-1995 [Table 7m].

Cerebrovascular disease in white females did not show any cohort effect. 70-74 year old white females had the highest mortality rate in 1923 birth cohort but 65-69 year old women had highest mortality rate in 1918 birth cohort. No particular birth cohort had highest mortality rate in all age groups.

Black Males:

Mortality rate in black males started to decline in all age groups after 1960 and continued to do so until 1990. The rate of decline accelerated after 1965. During 1970-1995 the rate increased in most age groups. For example in 55-59 year old men experienced 4 percent annual average increase in mortality rate.

Black males did not show any birth cohort effect [Data Set 0035, Figure 0035]. 55-59 year old black males had highest mortality rate in 1893 birth cohort. However, in 1898 cohort, 50-54 year old black males had the highest mortality rate. If a cohort effect would be present a particular birth cohort would have highest mortality rate in all age strata.

Black Females:

Cerebrovascular disease in black male started to decline in 1950, particularly for the younger age group. The rate of decline was higher during 1970-1975 and 1980-1985. The rate of decline diminished and even increased in some groups during 1990-1995 (40-59, and 70-74 age groups).

A cohort effect is not evident in 20-84 year old black females born during 1873-1973[Data Set 0036, Figure 0036]. Largest death rate in 65-69 year age group is seen in 1893 birth cohort. In 60-64 age group, however, highest mortality rate is in 1888 birth cohort.

E. Hypertensive Heart Disease:

White Males:

Mortality rates in 30-84 year old white males for hypertensive heart disease from 1950-1995 is showed in Data 0017 and Figure 0017. Mortality trend was studied from 1950 and 30 year old was the youngest group included since, we did not have data under 30 years of age. It was also very difficult to compare 1945 data to 1995 data because of drastic changes in ICD codes. The rate declined in most age groups from 1950-1990. The rate of decline accelerated in 1970 and continued to decline until 1990. During 1975-1980 the rate of decline was more for the older age groups(age 60-84). For example, the rate of decline was 12.1 percent in 75-79 age groups during 1975-1980 but only 2.4 percent for 50-54 year old men [Table 7q].

White males did not show any cohort effect for HPD mortality rates in birth cohorts 1878-1963. For 75-79 age group mortality rate was higher in 1918 birth cohort than in 1913 birth cohort[Data set 0037]. In 70-74 age group, however mortality rate was higher in 1913 birth cohort than in 1918 birth cohort. If a particular birth cohort would have higher risk of CD death mortality rate in that birth cohort would be higher in all age strata.

White Females:

The Data Set 0018, Figure 0018 and Table 7r, presents age specific mortality rates for white females from 1950-1995. Mortality rate for white female declined from 1950-1985 in all age groups (with few exceptions). In 1950 mortality rate in 60-64 year old white

female was 153 per 100,000 and in 1965 it was only 40 per 100,000 i.e. that is almost 1/4 the rate of 1950. Mortality rate continued to decline until 1985. The rate continued to rise in most age groups during 1990-1995.

White Females did not show any birth cohort effect. In 55-59 age group, 1913 birth cohort had higher mortality rate than 1918 birth cohort. However, in 50-54 age group 1918 birth cohort had higher mortality rate than 1913 birth cohort. Mortality rate was not consistently higher in a particular birth year.

Black Males:

There was an overall decline in mortality from 1950-1995 [Data Set 0019, Figure 0019 and Table 7s]. However, black males showed complex pattern, marked increase and decrease depending on age group and time period. Mortality rate decreased from 726 to 88 per 100,000 in 65-69 age group during this period, representing an overall decrease of 87 percent.

Black males aged 30-84 in birth cohorts 1878-1963 did not show any evidence of cohort effect in cerebrovascular disease mortality [Data set 0039 and Figure 0039]. 50-54 year old black men showed higher mortality rate in 1913 birth cohort than in 1908 birth cohort. In 55-59 year old black males, however, higher mortality was in 1908 birth cohort than in 1913 birth cohort.

Black Female:

Mortality rate from hypertensive heart disease is presented in Data Set 0020, Figure 0020 and Table 7t. Mortality rate of black females had more of a consistent pattern than black males. .Mortality rate from hypertensive heart disease in black females declined rapidly from 1950-1995. Age specific mortality rate in 60-64 year old women dropped from 963 to 41 per 100,000. Black females experienced the largest decline during 1970-1975. In 60-64 age group it declined more than 60% during this period. During 1990-1995 rate increased in 50-54 age group (13.5%) and in 55-59 age group (9.2%) [Table 7t].

No cohort effect is evident in 30-84 year old black females born during 1878-1963 [Data set 0040 and Figure 0040]. In 50-54 age groups higher mortality is observed in 1917 birth cohort than in 1913 birth cohort. The trend reverses in 45-49 year old age group, mortality rate is more in 1913 birth cohort than in 1918 birth cohort. A consistent cohort trend is not evident.

Chapter IV

1. Discussion

In this study we demonstrated variation of cardiovascular mortality in Michigan by time, race and gender. An overall declining trend for all cardiovascular diseases was evident throughout our study period (1945-1995). However, if we analyze each period separately, we find that the rates of decline have not been the same during successive periods of analysis. From 1945 to 1970, the rates declined slowly but steadily for all race and sex groups. During this period decline in mortality can be attributed almost entirely to decreases in fatalities from cerebrovascular diseases and hypertensive heart diseases. During 1970 to 1975 the rates dropped substantially in all race and sex groups. The fall in mortality rate was almost equal among the five- year age groups. However, the decline in mortality rate was disproportionately high for blacks, particularly for black females. After, 1975, the downward trend continued but now in a slower pace in blacks than in whites. During 1990-1995 cardiovascular mortality increased in black males (age 40-44 and age 45-49).

Ischemic heart disease (IHD) deaths increased in Michigan in all four major race and sex groups from 1945 to 1965. The rise in mortality was most pronounced among black males. Beginning at a much higher initial level than the black males, the rates of white

males also rose moderately. The first downward trend in IHD mortality in Michigan became evident in 1965, and we saw a sharp decline during 1970-75. This decline among black females was double that of white males. After 1975, trends for blacks and whites began to diverge, with a deceleration in the annual fall in rates for blacks. This diverging trend continued, and in 1990 for the first time in Michigan more black men than white men aged 45 to 55 were dying from IHD. However, the death rates for black females were more than that of white females since 1960. During 1990-1995 the rate of decline in mortality decreased in all race and sex groups. The mortality rate even increased in 30 to 54 year old blacks.

Death rates from cerebrovascular disease have been steadily declining in Michigan throughout our study period. Black males had the highest mortality rate. In 1945 data we observed the decline of mortality in white males, white females and black males. For black females the rate started to fall after 1950. The rate of decline accelerated in whites during 1975 to 1980 and in blacks during 1970 to 1975. The rates continued to decline thereafter.. During 1990-1995 the rate of decline decelerated in all race and sex group, and even increased in some groups. Mortality rate for cerebrovascular disease increased in 40 to 50 year old black men and 40 to 54 year old black women.

Hypertensive heart disease started to decline in 1950 and the greatest reduction in mortality rate was observed during 1975-1980. However, during 1990 to 1995, death

rates from hypertensive heart disease increased in all races and genders except black females.

The interpretation of divergent trends of mortality is difficult since our ability to identify clear cut cause and effect relationship is limited. However, a number of factors could potentially have contributed to the slower rate of decline in cardiovascular disease deaths among blacks. Decrease in cardiovascular mortality is accompanied by 1) a decrease in the prevalence of risk factors, 2) a decline in the incidence of disease and 3) increased access to medical care.

1. Trends in the prevalence of risk factors:

Hypertension , high serum cholesterol levels and smoking have been shown to be independent risk factors for cardiovascular diseases. The best sources of data on risk factor levels in the US population is the National Health and Nutrition Examination Survey.

A. Hypertension

Three National Health and Nutrition Examination Surveys were carried out in the United States.

National Health and Nutrition Examination Survey NHANES -1 (1971-1975) [47]

National Health and Nutrition Examination Survey NHANES II (1976 to 1980) [48]

National Health and Nutrition Examination Survey NHANES III (1988-1991) [50]

From NHANES I to NHANES II the estimated prevalence of definite hypertension (BP greater or equal 160/95 mm Hg and /or currently taking antihypertensive medication) was unchanged among whites, while a modest decrease was noted in black males and females(3-4%) . However, prevalence of hypertension increased from NHANES II to NHANES III for black men ages 65 to 74 years. This national data is in consistent with our findings that hypertensive heart disease, and cerebrovascular disease both declined more in blacks from 1975 to 1985. The increase in rate in hypertensive heart disease and cerebrovascular disease in black males during 1990s is also in agreement with the national data.

B. Serum cholesterol level:

Between NHANES I and NHANES II serum cholesterol levels declined by approximately 3-4 mg/100 ml for blacks and white males and 1 mg/100 ml for white females. Total cholesterol levels fell from NHANES II to NHANES-III in all four race and sex groups. The decrease in the percentage of persons with high cholesterol levels was similar for blacks and whites.

C. Obesity

Both black men and women had much greater increases in prevalence of overweight. than did whites. Distribution of body fat also varies among blacks and whites. Central obesity and diabetes is a stronger predictor of cardiovascular disease. A 28 year follow-up study of US women showed more central obesity and diabetes in blacks [43].

D. Smoking :

According to 1991 data 29% black males smoke compared to 26% white males. Among black women, prevalence of during smoking was slightly higher in 1991 than 1990 [43].

Based on the 13 year ischemic heart disease data from the First National Health and Nutrition Examination Survey Epidemiologic Follow-up study, cumulative incidence rates were 24 percent for white men, 22 percent for black men, 14 percent white women and 15 percent for black women. Overall, it would appear that earlier data from 1960s and 1970s showed lower incidence rates for blacks, while in mid 1980s the rates are similar in blacks and whites.

E. Socioeconomic status:

Socioeconomic forces within a community can raise or lower the risk associated with cardiovascular mortality. The adverse trends in cardiovascular disease mortality among blacks have occurred due to the overall worsening of the social and economic condition of blacks. The disproportionate fall in rates among the educated and rich strengthens this notion.

F. Access to medical care:

A striking consistency has emerged in the studies of racial differences in access to care for cardiovascular diseases. In data sets obtained from private hospitals, Medicare and Veterans Administration indicate that blacks are half as likely to have bypass surgery with similar angiographic findings [25].

2. Conclusions:

The factors that have led to the decline in cardiovascular mortality in Michigan did not affect all four major race and sex groups equally. As the result of the divergent trends among blacks and whites, Michigan vital statistics data show IHD mortality of blacks now exceeds that of whites for both men and women. Although the rates continue to decline in all groups in Michigan, the total benefit of the major public health advances achieved against the coronary epidemic has not been realized among blacks as it has among whites. Furthermore, the rate of decline of cardiovascular diseases in all race sex

group declined in Michigan during 1990 to 1995. In Michigan, after 1990 ischemic heart disease increased in black males age 35 to 44. Cerebrovascular disease and hypertensive heart disease also increased in 1990s in almost all ages in black males. Black females also showed a marked increase in cerebrovascular disease in some age groups. The results emphasize the need for increased efforts aimed at primary and secondary prevention and access to appropriate treatment in Blacks. However, since 1990s have been the decade of less improvement in all groups. Efforts must be directed also towards improving the gains already made on whites.

TABLE 1
STUDIES ON TRENDS OF CARDIOVASCULAR DISEASE MORTALITY

Author, Yr. of Publication	Region	Period	Disease Entity	Population	Source of Data	Findings
Sempos C, Cooper R, Kovar MG, et al; 1988 REF [49]]	United States	1968-1985	Ischemic Heart Disease (IHD)	White Male & Female Black Male & Female	Mortality Data from National Center for Health statistics	IHD mortality rates declined in US in all groups from 1965-75 from 1975-85 rate of decline increased in all groups except white males
Cooper R, Stamler J, Dyer A, et al; 1978 REF [7]	United States	1940-1975	Ischemic Heart Disease (IHD)	White Male & Female Black Male & Female	1940-66 mortality data from the monograph of Moriyama and 1967-1975 mortality data from National Center for Health Statistics	IHD mortality rates increases for all race sex gp. from 1940-66 and declined from 1967-75
Richard F. Gillium,1989 REF [14]	United States	1980-1985	Sudden Coronary Death	White Male & Female Black Male & Female 25 years and older	Data from National Center for Health Statistics	SCD(Deaths occurring out of hospital and emergency room) was higher in blacks than whites
Yoon GY, Kapadia AS, Canfield MA, et al;1989 REF [58]	Harris County, Texas	1980-1986	Cardiovascular Diseases	White, Black, Hispanic and 'Other'	Vital statistics data tapes from Texas Department of Health	All gps. had decline in cardiovascular mortality except males of Other gp.
Keil JE, Saunders DE, Lackland DE, et al; 1985 REF [23]	Pee Dee & Columbia, S. Carolina	1978	Acute Myocardial Infarction	White Male & Female Black Male & Female	Hospital Records of AMI (prevalence)	AMI rates were higher in Columbia and Pee Dee than other parts of US WM had higher AMI rates in Pee Dee, BM & BF had higher rates in Columbia

TABLE 1

Sytkowski PA, D'Agostino, Belanger A, et al; 1996 REF[54]	Framingham, Massachusetts	1950-1989	Cardiovascular Diseases	White Male & Female aged 50-59 years in 1950, 1960 & 1970 cohort free of cardiovascular disease	Framingham Heart Stud	Largest mortality declines occurred between 1950 & 1960 female cohorts during 2nd 10 yrs follow-up & between 1960 & 1970 male cohorts during both period of follow-up
Ross C. Brownson, 1992 REF [5]	Missouri	1987-1991	Ischemic heart disease &	White Male & Female Black Male & Female	Missouti Center for Health Statistics	Black-white difference was 40% for IHD mortality, Blacks having higher rates
Ross C. Brownson, 1992 REF [5]	Missouri	1987-1991	Cerebrovascular disease	White Male & Female Black Male & Female	Missouti Center for Health Statistics	Black-white mortality difference was 77% for cerebrovascular disease. Blacks having higher rates
Richard F. Gillium, 1991 REF [12]	United States	1950-1986	Hypertensive heart disease	White Male & Female Black Male & Female	Data from National Center for Health Statistics	Age specific death rates declined in all groups but more for blacks between 1968 to 1978
Howard G, Anderson R, Sorlie P, et al, 1994 REF [20]	United States	1979-1985	Cerebrovascular disease	White Male & Female Black Male & Female Hispanic Male and Female age>45 yrs	Data from National Longitudinal Study	Excess stroke mortality in blacks in younger age (45-55). Hispanic stroke rate is similar to that for whites at younger ages but is marginally lower in older ages

TABLE 2

International Classification of Diseases:(ICD)

Causes of death were classified from 1900 to present time by International Clasification of Diseases (ICD). ICD has been revised periodically (approximately every 10 years) to reflect progress in medical knowledge.

Revision of ICD	Year adopted	Years in use in US
First	1900	1900-1909
Second	1909	1910-1920
Third	1920	1921-1929
Fourth	1929	1030-1938
Fifth	1938	1939-1948
Sixth	1948	1949-1957
Seventh	1955	1958-1967
Eighth	1965	1968 -1978
Ninth	1976	1979-1996
Tenth		1997 to date

TABLE 3

ICD CODES AND COMPARABILITY RATIOS FOR CARDIOVASCULAR DISEASES FOR VARIOUS ICD REVISIONS BETWEEN 1945-1995

No. of Revision	Name of Disease	ICD Code	C.R.
5th Revision	Major Cardiovascular Disease	58, 83, 90-95	
Revision	Major Cardiovascular Disease	330-334,400-468	1.18
Seventh Revision	Major Cardiovascular Disease	330-334,400-468	1.01
Eighth Revision	Major Cardiovascular Disease	390-448	0.999
Ninth Revision	Major Cardiovascular Disease	390-448,	1.0069
Fifth Revision	Cerebrovascular Disease	83	
Sixth Revision	Cerebrovascular Disease	330-334	1.16
Seventh Revision	Cerebrovascular Disease	330-334	1.00
Eighth Revision	Cerebrovascular Disease	430-438	0.981
Ninth Revision	Cerebrovascular Disease	30-438	1.0049
Fifth Revision	Diseases of Heart	58, 90-95	
Sixth Revision	Diseases of Heart	400-402,410-443	0.98
Seventh Revision	Diseases of Heart	400-402,410-443	1.00
Eighth Revision	Diseases of Heart	390-398,402,404, 410-429	1.00
„ „ „ „ „	„ „ ,		
Ninth Revision	Diseases of Heart	90-398,402,404,	1.0126
„ „ „ „	Diseases of Heart	410-429	
Fifth Revision	Ischemic Heart Disease	93d, 94a /b	
Sixth Revision	Ischemic Heart Disease	420	0.77
Seventh Revision	Ischemic Heart Disease	420	0.98
Eighth Reverse	Ischemic Heart Disease	410-413	1.063
Ninth Revision	Ischemic Heart Disease	410-414	0.8784
Fifth Revision	Hypertensive Heart Disease	93d, 131a	
Sixth Revision	Hypertensive Heart Disease	440-443	0.29
Seventh Revision	Hypertensive Heart Disease	440-443	1.11
Eighth Revision	Hypertensive Heart Disease	402,404	0.3941
Ninth Revision	Hypertensive Heart Disease	402,	3.3022

TABLE 4

MORTALITY RATE FOR CEREBROVASCULAR DISEASE
DERIVED FROM COUNT AND POPULATION DATA

CEREBROVASCULAR DISEASE EVENTS IN MICHIGAN 1960 (1959-61)
ICD-7 CODE NOS. 330-334

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	4	3	1	1
25-29	5	4	1	1
30-34	12	9	4	8
35-39	18	15	6	9
40-44	37	40	14	17
45-49	65	56	18	24
50-54	95	93	27	27
55-59	162	123	34	35
60-64	255	196	39	40
65-69	432	358	56	48
70-74	623	523	41	38

MICHIGAN POPULATION DATA FOR 1960

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	190904	214909	17866	23454
25-29	207455	216112	22922	27299
30-34	238620	242725	27363	30154
35-39	243685	253878	28618	29417
40-44	225267	233752	24541	25215
45-49	208896	209366	21869	21066
50-54	183702	181624	17026	15947
55-59	165182	159119	14979	13307
60-64	136426	136311	10426	9684
65-69	116386	119790	7427	7313
70-74	83763	91280	4453	4589

CEREBROVASCULAR DISEASE DEATH RATES 1960

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	1.9	1.2	3.7	2.8
25-29	2.2	1.7	4.4	4.9
30-34	4.9	3.8	13.4	26.5
35-39	7.2	6.0	22.1	31.7
40-44	16.4	17.1	55.7	68.7
45-49	31.3	26.6	82.3	112.3
50-54	51.7	51.0	156.6	167.2
55-59	98.3	77.5	224.8	263.0
60-64	186.9	144.0	370.9	409.6
65-69	371.2	299.1	754.0	660.9
70-74	743.4	573.0	928.2	828.1

TABLE 5

INTERCENSAL ESTIMATES OF WHITE MALES IN MICHIGAN (1940-1970)
INTERCENSAL ESTIMATES WERE MADE USING LINEAR INTERPOLATION OF DECENNIAL CENSUS (1940,1950, 1060 AND 1970

WHITE MALE 1940-1950

Age	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
20-24	218346	218554	218762	218971	219179	219387	219595	219803	220012	220220	220428
25-29	208867	211906	214945	217985	221024	224063	227102	230141	233181	236220	239259
30-34	196949	199816	202683	205550	208417	211285	214152	217019	219886	222753	225620
35-39	192696	194956	197216	199475	201735	203995	206255	208515	210774	213034	215294
40-44	182292	183884	185477	187069	188662	190254	191846	193439	195031	196624	198216
45-49	181243	181581	181919	183610	182595	182934	183272	183610	183948	184286	184624
50-54	157247	157247	159747	160997	162247	163497	164747	165997	167247	168497	169747
55-59	119032	122824	126615	130407	134198	137990	141781	130407	149364	153156	156947
60-64	90703	94469	98235	102000	105766	109532	113298	117064	120829	124595	128361
65-69	67035	69671	72307	74943	77579	80215	82851	85487	88123	90759	93395
70-74	46374	47825	49277	50728	52179	53631	55082	56533	57984	59436	60887

WHITE MALE 1950-1960

Age	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
20-24	220428	217476	214523	211571	208618	205666	202714	199761	196809	193856	190904
25-29	239259	236079	232898	229718	226537	223357	220177	216996	213816	210635	207455
30-34	225620	226920	228220	229520	230820	232120	233420	234720	236020	237320	238620
35-39	215294	218133	220972	223811	226650	229490	232329	235168	238007	240846	243685
40-44	198216	200921	203626	206331	209036	211742	214447	217152	219857	222562	225267
45-49	184624	187051	189478	201614	194333	196760	199187	201614	204042	206469	208896
50-54	169747	169747	172538	173934	175329	176725	178120	179516	180911	182307	183702
55-59	156947	157771	158594	159418	160241	161065	161888	159418	163535	164359	165182
60-64	128361	129168	129974	130781	131587	132394	133200	134007	134813	135620	136426
65-69	93395	95694	97993	100292	102591	104891	107190	109489	111788	114087	116386
70-74	60887	63175	65462	67750	70037	72325	74613	76900	79188	81475	83763

WHITE MALE 1960-1970

Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
20-24	190904	200564	210223	219883	229543	239203	248862	258522	268182	277841	287501
25-29	207455	212661	217868	223074	228280	233487	238693	243899	249105	254312	259518
30-34	238620	244987	251355	257722	264090	270457	276824	283192	289559	295927	302294
35-39	243685	239762	235840	231917	227994	224072	220149	216226	212303	208381	204458
40-44	225267	225814	226361	226908	227455	228002	228549	229096	229643	230190	230737
45-49	208896	210987	213078	223532	217260	219351	221441	223532	225623	227714	229805
50-54	183702	183702	188572	191006	193441	195876	198311	200746	203180	205615	208050
55-59	165182	167320	169459	171597	173736	175874	178012	171597	182289	184428	186566
60-64	136426	137488	138549	139611	140672	141734	142796	143857	144919	145980	147042
65-69	116386	115881	115376	114871	114366	113861	113355	112850	112345	111840	111335
70-74	83763	83547	83332	83116	82900	82685	82469	82253	82037	81822	81606

TABLE 6

Ischemic Heart Disease Deaths in Michigan Average of 1969-71
Eighth Revision 410-413

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	2	2	2	0
25-29	6	2	3	1
30-34	27	8	8	3
35-39	92	18	20	11
40-44	260	49	48	25
45-49	539	115	83	38
50-54	871	145	109	67
55-59	1310	253	136	85
60-64	1690	403	173	128
65-69	1986	637	201	130
70-74	2150	947	181	146
75-79	2297	1287	135	120

Michigan population 1970

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	288292	325735	40917	48581
25-29	260348	263378	33538	37079
30-34	214151	218871	25638	30708
35-39	205011	213104	25762	30759
40-44	231327	237314	28369	31911
45-49	230373	242535	27793	29223
50-54	208499	221951	23361	24564
55-59	181932	190343	19650	19835
60-64	147381	158628	14925	15779
65-69	111600	127881	11787	12621
70-74	81789	105324	7614	8569

Ischemic Heart Disease death rate in Michigan (1970)

Age	WHITE_MALE	WHITE_FEMALE	BLACK_MALE	BLACK_FEMALE
20-24	1	1	4	1
25-29	2	1	10	2
30-34	13	4	33	11
35-39	45	9	78	35
40-44	112	21	170	77
45-49	234	48	299	129
50-54	418	65	465	273
55-59	720	133	694	429
60-64	1147	254	1159	813
65-69	1779	498	1705	1033
70-74	2629	899	2373	1708

TABLE 7(a)

ABSOLUTE AND ANNUAL MORTALITY CHANGE IN CARDIOVASCULAR DISEASES IN MICHIGAN

CHANGE OF MORTALITY RATE FOR MCD IN WHITE MALES

MAJOR CARDIOVASCULAR DISEASE IIN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	43	42	34	30	23	23	19	18	17	16	15
35-39	86	86	82	75	69	63	48	49	41	31	36
40-44	188	181	186	172	172	143	127	111	99	72	70
45-49	368	359	345	338	327	295	262	220	179	145	133
50-54	673	631	619	603	599	515	462	385	335	256	233
55-59	1100	1024	978	952	945	896	780	657	572	439	386
60-64	1611	1602	1643	1534	1541	1466	1281	1113	946	747	661
65-69	2534	2469	2577	2432	2385	2338	2086	1767	1505	1228	1065
70-74	3831	3937	3847	3858	4056	3613	3164	2835	2529	2002	1775
75-79						5679	5093	4468	4019	3266	2794
80-84						8944	7994	7151	6425	5332	4935

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-5	1955-6(	1960-6:	1965-7(	1970-7:	1975-80	1980-8	1985-90	1990-95
30-34	-1.0	-8.2	-3.6	-7.5	0.4	-4.5	-0.6	-1.5	-0.9	-0.5
35-39	0.3	-4.9	-6.4	-6.4	-5.8	-14.8	1.0	-7.8	-10.4	5.5
40-44	-7.2	5.1	-13.5	-0.6	-28.4	-16.2	-16.1	-11.5	-27.7	-1.8
45-49	-9.1	-13.9	-7.0	-11.0	-31.0	-33.6	-42.0	-40.3	-34.7	-12.0
50-54	-41.4	-11.8	-16.2	-4.6	-83.5	-53.2	-77.1	-49.7	-79.4	-22.5
55-59	-75.9	-46.4	-25.8	-7.4	-49.2	-115.7	-122.5	-85.8	-132.2	-53.2
60-64	-9.1	40.6	-108.8	7.1	-75.1	-185.6	-167.5	-167.5	-198.2	-86.5
65-69	-65.0	107.8	-144.7	-47.7	-46.7	-252.5	-318.8	-262.0	-277.0	-163.2
70-74	106.7	-90.3	11.4	197.5	-442.7	-449.2	-328.9	-305.9	-527.5	-226.4
75-79	0.0	0.0	0.0	0.0	5679.1	-586.5	-624.5	-449.1	-752.8	-472.1
80-84	0.0	0.0	0.0	0.0	8944.3	-950.8	-842.8	-725.9	-1092.7	-397.5

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-5	1955-6(	1960-6:	1965-7(	1970-7:	1975-80	1980-8	1985-90	1990-95
30-34	-0.5	-3.9	-2.1	-5.0	0.3	-3.9	-0.6	-1.7	-1.1	-0.6
35-39	0.1	-1.1	-1.6	-1.7	-1.7	-4.7	0.4	-3.2	-5.0	3.6
40-44	-0.8	0.6	-1.5	-0.1	-3.3	-2.3	-2.5	-2.1	-5.6	-0.5
45-49	-0.5	-0.8	-0.4	-0.7	-1.9	-2.3	-3.2	-3.7	-3.9	-1.7
50-54	-1.2	-0.4	-0.5	-0.2	-2.8	-2.1	-3.3	-2.6	-4.7	-1.8
55-59	-1.4	-0.9	-0.5	-0.2	-1.0	-2.6	-3.1	-2.6	-4.6	-2.4
60-64	-0.1	0.5	-1.3	0.1	-1.0	-2.5	-2.6	-3.0	-4.2	-2.3
65-69	-0.5	0.9	-1.1	-0.4	-0.4	-2.2	-3.1	-3.0	-3.7	-2.7
70-74	0.6	-0.5	0.1	1.0	-2.2	-2.5	-2.1	-2.2	-4.2	-2.3
75-79						-2.1	-2.5	-2.0	-3.7	-2.9
80-84						-2.1	-2.1	-2.0	-3.4	-1.5

TABLE 7(b)

CHANGE OF MORTALITY RATE FOR MCD IN WHITE FE MALES
MAJOR CARDIOVASCULAR DISEASE IIN WHITE FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	31	20	17	17	15	13	8	10	8	8	7
35-39	63	42	34	26	30	28	22	16	13	12	15
40-44	100	85	66	56	59	48	42	35	34	23	26
45-49	191	156	122	106	106	93	87	65	62	48	44
50-54	363	282	221	201	199	178	155	124	121	103	89
55-59	591	470	425	366	335	306	268	242	214	192	154
60-64	979	841	803	700	614	581	501	446	417	323	305
65-69	1809	1485	1440	1293	1177	1069	890	799	732	599	523
70-74	3084	2779	2524	2332	2317	1971	1679	1436	1306	1069	1020
75-79						3702	3174	2598	2435	1941	1818
80-84						6573	5561	4941	4488	3601	3501

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-11.3	-2.5	-0.2	-2.3	-1.8	-4.6	1.1	-1.4	-0.5	-0.7
35-39	-21.0	-7.2	-8.5	3.7	-1.6	-6.5	-5.1	-3.1	-1.5	2.9
40-44	-15.5	-18.7	-10.5	2.9	-10.2	-6.2	-7.0	-1.3	-11.1	3.1
45-49	-35.2	-33.8	-16.4	0.5	-13.2	-5.5	-22.2	-2.9	-13.9	-4.2
50-54	-81.2	-61.5	-20.0	-1.2	-21.6	-22.8	-30.8	-3.1	-18.6	-13.4
55-59	-120.9	-44.9	-59.6	-30.4	-29.1	-38.4	-26.0	-28.0	-22.1	-37.4
60-64	-137.6	-37.8	-103.2	-86.5	-32.6	-80.6	-54.8	-28.4	-94.5	-17.4
65-69	-323.7	-44.8	-147.4	-115.6	-107.7	-179.2	-90.6	-67.1	-133.1	-75.9
70-74	-304.6	-255.5	-191.4	-14.9	-346.3	-291.7	-243.5	-130.2	-237.0	-48.4
75-79						-527.8	-576.8	-163.0	-493.3	-123.1
80-84						-1012.3	-619.7	-453.0	-887.0	-100.1

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-7.3	-2.5	-0.3	-2.7	-2.4	-7.0	2.7	-2.9	-1.2	-1.7
35-39	-6.7	-3.5	-4.9	2.9	-1.1	-4.6	-4.7	-3.8	-2.2	4.9
40-44	-3.1	-4.4	-3.2	1.1	-3.5	-2.6	-3.3	-0.7	-6.6	2.8
45-49	-3.7	-4.3	-2.7	0.1	-2.5	-1.2	-5.1	-0.9	-4.5	-1.8
50-54	-4.5	-4.4	-1.8	-0.1	-2.2	-2.6	-4.0	-0.5	-3.1	-2.6
55-59	-4.1	-1.9	-2.8	-1.7	-1.7	-2.5	-1.9	-2.3	-2.1	-3.9
60-64	-2.8	-0.9	-2.6	-2.5	-1.1	-2.8	-2.2	-1.3	-4.5	-1.1
65-69	-3.6	-0.6	-2.0	-1.8	-1.8	-3.4	-2.0	-1.7	-3.6	-2.5
70-74	-2.0	-1.8	-1.5	-0.1	-3.0	-3.0	-2.9	-1.8	-3.6	-0.9
75-79						-2.9	-3.6	-1.3	-4.1	-1.3
80-84						-3.1	-2.2	-1.8	-4.0	-0.6

TABLE 7(c)

CHANGE OF MORTALITY RATE FOR MCD IN BLACK MALES
MAJOR CARDIOVASCULAR DISEASE IN BLACK MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	71	95	63	71	63	77	43	55	78	32	54
35-39	178	157	120	135	127	149	106	108	122	114	104
40-44	368	318	298	266	266	310	226	252	227	184	221
45-49	604	540	514	434	420	476	372	448	356	370	392
50-54	1079	901	836	782	786	672	636	639	621	595	583
55-59	1620	1364	1235	1083	1083	1035	896	928	874	815	898
60-64	2462	2064	1843	1798	1975	1651	1435	1398	1402	1256	1305
65-69	4474	2659	2817	2718	2699	2483	1910	1871	1918	1686	1744
70-74	5116	4064	3341	3426	3614	3465	3039	2751	2964	2686	2427
75-79						4886	3769	4282	4092	3654	3344
80-84						6290	5741	6385	6237	5257	4923

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	24.0	-32.2	8.2	-8.4	14.5	-34.5	11.8	23.5	-45.9	22.0
35-39	-21.4	-36.8	14.7	-7.4	21.2	-42.1	1.5	13.9	-7.5	-10.6
40-44	-49.3	-20.8	-31.2	-0.7	44.2	-84.2	26.3	-25.0	-43.3	37.0
45-49	-63.8	-26.0	-80.1	-13.5	55.4	-104.3	76.7	-92.4	14.1	21.8
50-54	-177.9	-65.4	-53.9	4.5	-113.9	-36.4	2.7	-17.8	-25.4	-13.0
55-59	-256.2	-128.6	-151.8	-0.3	-48.0	-138.7	31.2	-53.4	-59.6	83.4
60-64	-397.4	-221.7	-44.9	177.3	-324.4	-215.7	-37.1	4.1	-145.9	48.7
65-69	-1814.8	158.2	-99.2	-19.2	-215.6	-572.9	-38.7	46.6	-232.1	58.4
70-74	-1052.1	-723.2	85.4	187.7	-148.9	-426.1	-287.7	212.7	-278.1	-258.5
75-79						-1117.8	513.2	-190.3	-437.4	-310.1
80-84						-548.9	644.0	-147.6	-980.1	-334.0

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	6.8	-6.8	2.6	-2.4	4.6	-8.9	5.5	8.6	-11.8	13.7
35-39	-2.4	-4.7	2.5	-1.1	3.3	-5.7	0.3	2.6	-1.2	-1.9
40-44	-2.7	-1.3	-2.1	0.0	3.3	-5.4	2.3	-2.0	-3.8	4.0
45-49	-2.1	-1.0	-3.1	-0.6	2.6	-4.4	4.1	-4.1	0.8	1.2
50-54	-3.3	-1.5	-1.3	0.1	-2.9	-1.1	0.1	-0.6	-0.8	-0.4
55-59	-3.2	-1.9	-2.5	0.0	-0.9	-2.7	0.7	-1.2	-1.4	2.0
60-64	-3.2	-2.1	-0.5	2.0	-3.3	-2.6	-0.5	0.1	-2.1	0.8
65-69	-8.1	1.2	-0.7	-0.1	-1.6	-4.6	-0.4	0.5	-2.4	0.7
70-74	-4.1	-3.6	0.5	1.1	-0.8	-2.5	-1.9	1.5	-1.9	-1.9
75-79						-4.6	2.7	-0.9	-2.1	-1.7
80-84						-1.7	2.2	-0.5	-3.1	-1.3

TABLE 7(d)

CHANGE OF MORTALITY RATE FOR MCD IN BLACK FEMALES
MAJOR CARDIOVASCULAR DISEASE IN BLACK FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	113	76	85	83	63	49	29	37	33	31	32
35-39	227	176	160	133	154	110	59	67	59	59	58
40-44	526	395	313	222	245	180	113	130	88	86	113
45-49	729	641	456	422	314	279	203	216	179	186	172
50-54	1145	1041	862	633	535	491	381	326	328	253	324
55-59	1329	1343	1196	990	853	679	527	512	516	482	466
60-64	2252	2224	1598	1607	1479	1291	764	816	776	723	728
65-69	2033	2040	2158	2040	1885	1697	1254	1271	1167	1104	1068
70-74	3652	3056	3085	3332	2694	2730	2126	2033	1911	1710	1619
75-79						3812	3118	3160	3047	2661	2350
80-84						5566	4399	5103	5113	4325	3892

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-7	1970-75	1975-8	1980-8	1985-9	1990-95
30-34	-36.8	9.5	-1.9	-19.9	-14.3	-20.0	8.1	-4.8	-1.6	1.0
35-39	-50.4	-16.5	-26.5	20.9	-44.0	-51.3	7.8	-8.0	0.7	-1.7
40-44	-131.4	-81.5	-91.2	23.1	-65.3	-67.0	17.6	-42.4	-1.8	27.1
45-49	-88.2	-184.7	-34.6	-107.4	-35.3	-75.8	12.9	-37.6	7.0	-13.6
50-54	-104.1	-178.7	-229.4	-98.2	-44.1	-109.1	-55.6	2.7	-75.5	71.0
55-59	14.6	-147.3	-205.9	-137.3	-174.4	-151.1	-15.7	4.4	-34.3	-16.2
60-64	-28.9	-625.5	8.5	-127.1	-188.3	-526.8	52.0	-40.3	-52.8	4.2
65-69	7.4	117.8	-117.6	-155.1	-188.6	-442.6	17.2	-104.4	-62.5	-36.1
70-74	-596.3	29.3	246.8	-637.9	36.1	-603.8	-92.8	-122.8	-200.7	-91.1
75-79						-693.8	42.3	-112.9	-386.1	-311.4
80-84						-1167.1	703.7	10.4	-788.6	-432.3

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-7	1970-75	1975-8	1980-8	1985-9	1990-95
30-34	-6.5	2.5	-0.4	-4.8	-4.5	-8.1	5.6	-2.5	-1.0	0.6
35-39	-4.4	-1.9	-3.3	3.1	-5.7	-9.3	2.6	-2.4	0.2	-0.6
40-44	-5.0	-4.1	-5.8	2.1	-5.3	-7.5	3.1	-6.5	-0.4	6.3
45-49	-2.4	-5.8	-1.5	-5.1	-2.2	-5.4	1.3	-3.5	0.8	-1.5
50-54	-1.8	-3.4	-5.3	-3.1	-1.6	-4.4	-2.9	0.2	-4.6	5.6
55-59	0.2	-2.2	-3.4	-2.8	-4.1	-4.5	-0.6	0.2	-1.3	-0.7
60-64	-0.3	-5.6	0.1	-1.6	-2.5	-8.2	1.4	-1.0	-1.4	0.1
65-69	0.1	1.2	-1.1	-1.5	-2.0	-5.2	0.3	-1.6	-1.1	-0.7
70-74	-3.3	0.2	1.6	-3.8	0.3	-4.4	-0.9	-1.2	-2.1	-1.1
75-79						-3.6	0.3	-0.7	-2.5	-2.3
80-84						-4.2	3.2	0.0	-3.1	-2.0

TABLE 7(e)

CHANGE OF MORTALITY RATE FOR DOH IN WHITE MALES

DISEASE OF HEART IN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	30	33	25	22	17	17	15	14	13	13	11
35-39	62	73	69	65	57	52	39	43	36	26	27
40-44	139	158	164	151	147	127	114	98	90	63	52
45-49	285	316	300	297	290	262	236	199	166	130	103
50-54	518	539	540	530	528	453	415	350	301	228	184
55-59	845	876	835	815	817	781	678	590	513	391	302
60-64	1206	1305	1362	1273	1300	1242	1089	981	836	659	502
65-69	1807	1958	2036	1932	1920	1916	1735	1520	1287	1046	802
70-74	2622	2889	2862	2878	3046	2824	2487	2319	2079	1651	1303
75-79						4261	3815	3520	3240	2632	1978
80-84						6344	5749	5326	5026	4180	3429

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-8	1980-85	1985-9	1990-95
30-34	2.6	-8.0	-2.6	-5.0	0.1	-2.1	-1.1	-0.7	-0.7	-1.9
35-39	10.7	-4.2	-4.0	-8.0	-4.6	-13.5	4.7	-7.6	-9.5	0.4
40-44	18.7	5.5	-12.8	-3.7	-20.4	-12.3	-16.8	-7.3	-27.2	-11.4
45-49	31.0	-15.7	-3.4	-6.8	-28.5	-25.5	-36.7	-33.8	-35.3	-26.8
50-54	21.2	1.1	-10.2	-2.3	-74.8	-38.0	-65.3	-48.2	-73.2	-44.7
55-59	31.1	-40.6	-20.8	2.9	-35.9	-103.0	-88.0	-77.3	-122.1	-89.3
60-64	98.9	56.6	-89.0	26.6	-57.1	-153.7	-107.6	-145.5	-177.1	-157.0
65-69	151.3	77.6	-103.8	-12.0	-3.4	-181.5	-214.9	-233.3	-241.2	-243.1
70-74	267.1	-27.5	16.8	167.3	-222.1	-336.4	-168.2	-240.2	-427.3	-348.9
75-79						-446.3	-294.7	-280.7	-607.2	-654.2
80-84						-594.7	-422.8	-300.1	-846.2	-751.2

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-8	1980-85	1985-9	1990-95
30-34	1.7	-4.9	-2.1	-4.5	0.1	-2.5	-1.5	-1.0	-1.0	-3.1
35-39	3.4	-1.2	-1.2	-2.5	-1.6	-5.2	2.4	-3.5	-5.3	0.3
40-44	2.7	0.7	-1.6	-0.5	-2.8	-1.9	-2.9	-1.5	-6.0	-3.6
45-49	2.2	-1.0	-0.2	-0.5	-2.0	-1.9	-3.1	-3.4	-4.3	-4.1
50-54	0.8	0.0	-0.4	-0.1	-2.8	-1.7	-3.1	-2.8	-4.9	-3.9
55-59	0.7	-0.9	-0.5	0.1	-0.9	-2.6	-2.6	-2.6	-4.8	-4.6
60-64	1.6	0.9	-1.3	0.4	-0.9	-2.5	-2.0	-3.0	-4.2	-4.8
65-69	1.7	0.8	-1.0	-0.1	0.0	-1.9	-2.5	-3.1	-3.7	-4.7
70-74	2.0	-0.2	0.1	1.2	-1.5	-2.4	-1.4	-2.1	-4.1	-4.2
75-79						-2.1	-1.5	-1.6	-3.7	-5.0
80-84						-1.9	-1.5	-1.1	-3.4	-3.6

TABLE 7(f)

CHANGE OF MORTALITY RATE FOR DOH IN WHITE FEMALES
DISEASE OF HEART IN WHITE FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	21	13	11	10	7	8	4	7	5	5	4
35-39	42	29	24	16	18	16	13	11	10	8	9
40-44	65	56	43	34	35	31	27	24	25	14	15
45-49	110	104	84	72	73	63	62	48	44	36	27
50-54	207	189	152	140	142	125	116	96	97	81	58
55-59	350	323	305	269	251	242	210	197	177	152	106
60-64	587	590	583	520	467	451	393	365	340	268	216
65-69	1072	1034	1027	921	879	817	675	641	599	487	365
70-74	1855	1854	1733	1621	1647	1465	1243	1115	1053	836	689
75-79						2611	2252	1984	1917	1497	1233
80-84						4534	3838	3586	3399	2726	2309

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-7.8	-2.1	-0.4	-3.5	0.7	-3.6	2.8	-1.7	0.1	-1.5
35-39	-12.7	-5.4	-7.7	1.3	-1.5	-2.7	-2.7	-1.0	-1.7	0.7
40-44	-9.2	-13.1	-9.3	1.5	-4.3	-4.4	-2.3	1.2	-11.2	1.2
45-49	-5.3	-20.8	-11.4	0.5	-9.4	-1.0	-14.0	-4.3	-8.0	-9.1
50-54	-18.8	-36.7	-12.4	2.4	-16.7	-9.1	-20.1	0.4	-16.1	-22.5
55-59	-27.1	-18.3	-35.9	-18.0	-9.2	-31.7	-13.0	-20.1	-24.8	-46.6
60-64	3.1	-7.4	-63.0	-52.1	-16.7	-57.8	-27.5	-25.7	-71.4	-52.1
65-69	-38.3	-6.7	-105.4	-42.1	-62.6	-141.8	-33.5	-42.6	-112.1	-121.8
70-74	-0.5	-121.5	-111.6	26.3	-182.5	-221.7	-128.2	-61.9	-216.9	-146.8
75-79						-358.7	-268.2	-66.4	-420.1	-264.1
80-84						-695.5	-252.0	-187.0	-672.7	-417.4

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-7.5	-3.2	-0.7	-6.8	2.0	-9.4	13.8	-4.9	0.5	-5.9
35-39	-6.0	-3.7	-6.4	1.6	-1.7	-3.4	-4.1	-1.9	-3.5	1.8
40-44	-2.8	-4.7	-4.3	0.9	-2.4	-2.9	-1.7	1.0	-8.8	1.7
45-49	-1.0	-4.0	-2.7	0.1	-2.6	-0.3	-4.5	-1.8	-3.7	-5.0
50-54	-1.8	-3.9	-1.6	0.3	-2.4	-1.4	-3.5	0.1	-3.3	-5.6
55-59	-1.5	-1.1	-2.4	-1.3	-0.7	-2.6	-1.2	-2.0	-2.8	-6.1
60-64	0.1	-0.3	-2.2	-2.0	-0.7	-2.6	-1.4	-1.4	-4.2	-3.9
65-69	-0.7	-0.1	-2.1	-0.9	-1.4	-3.5	-1.0	-1.3	-3.7	-5.0
70-74	0.0	-1.3	-1.3	0.3	-2.2	-3.0	-2.1	-1.1	-4.1	-3.5
75-79						-2.7	-2.4	-0.7	-4.4	-3.5
80-84						-3.1	-1.3	-1.0	-4.0	-3.1

TABLE 7(g)

CHANGE OF MORTALITY RATE FOR DOH IN BLACK MALES

DISEASE OF HEART IN BLACK MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	49	62	44	44	36	57	25	40	61	26	48
35-39	132	95	85	85	88	127	71	86	96	88	86
40-44	253	252	208	168	189	217	165	196	178	139	173
45-49	427	401	379	330	315	369	281	380	292	307	313
50-54	777	639	634	579	587	543	510	514	527	470	477
55-59	1152	1003	878	782	824	811	726	779	753	705	752
60-64	1178	1492	1400	1321	1419	1316	1156	1120	1170	1057	1107
65-69	1505	1880	1957	1809	1919	1876	1471	1479	1602	1429	1443
70-74	3195	2720	2318	2266	2567	2642	2311	2152	2406	2220	1981
75-79						3582	2899	3323	3260	3046	2673
80-84						4571	4120	4868	5119	4386	3726

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-5	1955-6	1960-6	1965-7	1970-7	1975-80	1980-85	1985-9	1990-95
30-34	12.7	-18.6	0.8	-8.9	21.1	-31.4	15.1	20.2	-34.4	21.5
35-39	-37.5	-10.1	0.4	3.5	38.7	-56.6	15.0	10.4	-7.8	-1.9
40-44	-0.4	-44.6	-39.9	21.6	27.1	-51.8	31.3	-17.7	-39.4	34.1
45-49	-26.2	-21.7	-49.0	-15.3	54.2	-87.7	98.8	-88.5	14.8	6.1
50-54	-138.0	-5.1	-54.9	8.4	-44.0	-32.9	3.8	12.8	-56.5	6.7
55-59	-148.3	-125	-96.3	42.3	-13.5	-84.8	52.8	-26.3	-47.0	46.7
60-64	313.9	-91.9	-78.9	98.1	-102.8	-160.0	-35.9	50.1	-113.9	50.0
65-69	374.3	77.1	-148.1	110.5	-43.6	-405.1	8.1	123.8	-173.6	14.4
70-74	-475.3	-401.9	-51.3	300.8	74.9	-331.0	-158.9	253.7	-186.3	-238.3
75-79						-683.2	423.7	-62.8	-213.3	-373.5
80-84						-450.8	747.5	251.2	-732.7	-660.3

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-5	1955-6	1960-6	1965-7	1970-7	1975-80	1980-85	1985-9	1990-95
30-34	5.1	-6.0	0.4	-4.0	11.9	-11.1	12.0	10.0	-11.4	16.4
35-39	-5.7	-2.1	0.1	0.8	8.8	-8.9	4.2	2.4	-1.6	-0.4
40-44	0.0	-3.5	-3.8	2.6	2.9	-4.8	3.8	-1.8	-4.4	4.9
45-49	-1.2	-1.1	-2.6	-0.9	3.4	-4.8	7.0	-4.7	1.0	0.4
50-54	-3.6	-0.2	-1.7	0.3	-1.5	-1.2	0.1	0.5	-2.1	0.3
55-59	-2.6	-2.5	-2.2	1.1	-0.3	-2.1	1.5	-0.7	-1.2	1.3
60-64	5.3	-1.2	-1.1	1.5	-1.4	-2.4	-0.6	0.9	-1.9	0.9
65-69	5.0	0.8	-1.5	1.2	-0.5	-4.3	0.1	1.7	-2.2	0.2
70-74	-3.0	-3.0	-0.4	2.7	0.6	-2.5	-1.4	2.4	-1.5	-2.1
75-79						-3.8	2.9	-0.4	-1.3	-2.5
80-84						-2.0	3.6	1.0	-2.9	-3.0

TABLE 7(h)

CHANGE OF MORTALITY RATE FOR DOH IN BLACK FEMALES
DISEASE OF HEART IN BLACK FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	71	39	56	41	34	23	18	21	24	20	22
35-39	138	120	94	76	87	59	37	49	36	35	38
40-44	301	259	208	129	148	109	70	83	67	53	78
45-49	470	422	278	266	189	170	132	154	135	146	124
50-54	700	698	582	406	323	353	266	250	246	206	227
55-59	809	878	874	647	560	493	397	386	404	378	361
60-64	1470	1644	1095	1112	1035	937	605	649	621	601	582
65-69	1313	1344	1392	1292	1190	1198	920	947	932	908	839
70-74	2175	1899	2087	2265	1785	1867	1552	1499	1460	1359	1221
75-79						2595	2304	2360	2376	2079	1884
80-84						3668	2914	3768	4105	3405	2936

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-31.9	17.0	-14.8	-7.2	-11.1	-5.1	2.7	2.9	-3.4	2.4
35-39	-18.3	-25.6	-18.6	11.7	-28.2	-21.9	11.7	-13.3	-0.5	2.6
40-44	-41.9	-50.7	-79.7	19.1	-38.6	-38.9	13.0	-16.2	-13.9	24.6
45-49	-48.6	-143.3	-12.4	-76.9	-19.3	-37.6	21.8	-18.6	11.0	-22.2
50-54	-1.9	-116.8	-175.2	-83.8	30.6	-87.0	-16.0	-4.4	-39.5	20.8
55-59	68.4	-3.3	-227.4	-86.8	-66.5	-96.7	-10.5	17.3	-25.9	-17.0
60-64	174.2	-549.2	17.0	-76.7	-98.3	-332.3	44.8	-28.6	-20.1	-18.3
65-69	30.4	47.9	-99.2	-101.9	7.7	-278.0	26.9	-15.1	-23.8	-69.2
70-74	-275.7	187.4	178.8	-480.3	82.0	-315.4	-52.5	-39.1	-101.6	-138.0
75-79						-291.0	55.1	16.4	-296.4	-195.5
80-84						-753.3	853.8	336.4	-699.5	-469.2

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-9.0	8.7	-5.3	-3.5	-6.5	-4.5	3.0	2.8	-2.9	2.3
35-39	-2.6	-4.3	-3.9	3.1	-6.4	-7.4	6.2	-5.4	-0.3	1.5
40-44	-2.8	-3.9	-7.7	3.0	-5.2	-7.1	3.7	-3.9	-4.2	9.3
45-49	-2.1	-6.8	-0.9	-5.8	-2.0	-4.4	3.3	-2.4	1.6	-3.0
50-54	-0.1	-3.3	-6.0	-4.1	1.9	-4.9	-1.2	-0.4	-3.2	2.0
55-59	1.7	-0.1	-5.2	-2.7	-2.4	-3.9	-0.5	0.9	-1.3	-0.9
60-64	2.4	-6.7	0.3	-1.4	-1.9	-7.1	1.5	-0.9	-0.6	-0.6
65-69	0.5	0.7	-1.4	-1.6	0.1	-4.6	0.6	-0.3	-0.5	-1.5
70-74	-2.5	2.0	1.7	-4.2	0.9	-3.4	-0.7	-0.5	-1.4	-2.0
75-79						-2.2	0.5	0.1	-2.5	-1.9
80-84						-4.1	5.9	1.8	-3.4	-2.8

TABLE 7(i)

CHANGE OF MORTALITY RATE FOR IHD IN WHITE MALES

ISCHEMIC HEART DISEASE IN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	12	14	12	11	12	10	10	7	6	6	5
35-39	31	37	41	40	41	35	25	30	23	15	18
40-44	91	89	105	99	109	88	80	75	61	41	42
45-49	170	188	195	198	218	184	171	151	120	92	99
50-54	301	325	357	362	398	328	301	274	226	166	164
55-59	502	535	550	555	614	565	490	462	388	293	240
60-64	707	770	878	864	977	901	781	784	638	504	353
65-69	935	1101	1246	1297	1432	1397	1260	1225	989	796	648
70-74	1350	1528	1682	1888	2257	2064	1793	1855	1622	1284	1170
75-79						3117	2762	2814	2495	2028	1790
80-84						4591	4137	4193	3788	3184	3285

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	2.2	-2.2	-1.0	0.9	-2.0	-0.1	-2.4	-1.5	-0.2	-1.1
35-39	5.7	4.3	-1.4	1.0	-5.5	-10.3	4.9	-6.7	-8.3	3.3
40-44	-1.6	15.4	-5.6	9.7	-20.3	-8.6	-4.6	-14.1	-19.7	0.6
45-49	18.1	6.8	3.6	19.3	-33.8	-13.3	-19.1	-31.7	-27.7	6.6
50-54	23.6	32.4	4.8	35.9	-69.9	-26.7	-27.5	-47.3	-60.0	-2.8
55-59	32.9	15.2	4.7	58.5	-48.3	-74.8	-28.5	-74.1	-95.3	-52.1
60-64	63.0	108.4	-14.4	112.8	-76.1	-119.5	2.4	-146.1	-133.6	-150.8
65-69	166.0	144.6	51.3	134.3	-34.3	-136.9	-35.0	-236.1	-193.0	-147.9
70-74	177.7	154.4	206.6	368.4	-192.6	-271.3	62.4	-233.1	-338.6	-114.0
75-79						-355.2	51.7	-319.0	-466.9	-237.6
80-84						-453.1	55.7	-405.6	-604.0	101.9

PERCENT CHANGE OF MORTALITY CHANGE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	3.6	-3.1	-1.7	1.7	-3.4	-0.3	-4.9	-4.1	-0.6	-4.0
35-39	3.7	2.3	-0.7	0.5	-2.7	-5.9	4.0	-4.5	-7.2	4.4
40-44	-0.4	3.5	-1.1	2.0	-3.7	-2.0	-1.1	-3.8	-6.5	0.3
45-49	2.1	0.7	0.4	1.9	-3.1	-1.5	-2.2	-4.2	-4.6	1.4
50-54	1.6	2.0	0.3	2.0	-3.5	-1.6	-1.8	-3.5	-5.3	-0.3
55-59	1.3	0.6	0.2	2.1	-1.6	-2.6	-1.2	-3.2	-4.9	-3.6
60-64	1.8	2.8	-0.3	2.6	-1.6	-2.7	0.1	-3.7	-4.2	-6.0
65-69	3.5	2.6	0.8	2.1	-0.5	-2.0	-0.6	-3.9	-3.9	-3.7
70-74	2.6	2.0	2.5	3.9	-1.7	-2.6	0.7	-2.5	-4.2	-1.8
75-79						-2.3	0.4	-2.3	-3.7	-2.3
80-84						-2.0	0.3	-1.9	-3.2	0.6

TABLE 7(j)

CHANGE OF MORTALITY RATE FOR IHD IN WHITE FEMALES

ISCHEMIC HEART DISEASE IN WHITE FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	5	2	2	2	4	3	2	2	1	1	1
35-39	12	7	6	5	10	7	7	4	4	3	5
40-44	23	16	17	13	23	16	15	14	15	8	12
45-49	42	36	33	34	49	37	37	32	28	22	22
50-54	99	76	72	70	100	78	73	66	64	51	47
55-59	194	143	148	143	179	156	138	137	125	101	80
60-64	312	271	317	302	335	296	267	274	238	185	142
65-69	505	467	546	554	641	569	467	488	436	348	261
70-74	857	823	896	938	1187	1046	873	854	779	611	559
75-79						1857	1605	1534	1411	1089	1048
80-84						3247	2721	2749	2472	2003	1930

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-7(	1970-7	1975-8	1980-85	1985-90	1990-95
30-34	-2.4	0.0	-0.4	2.1	-1.1	-1.3	0.7	-1.1	0.0	0.1
35-39	-4.6	-1.1	-1.4	5.6	-3.5	0.0	-2.6	0.2	-1.4	1.6
40-44	-6.8	0.6	-4.0	9.6	-6.3	-1.0	-1.1	1.0	-7.2	4.2
45-49	-5.7	-3.1	1.2	14.7	-11.7	-0.2	-5.4	-4.1	-5.4	-0.3
50-54	-23.1	-4.1	-2.2	29.8	-21.8	-4.9	-7.3	-1.5	-13.0	-4.3
55-59	-51.3	5.0	-4.1	35.7	-22.7	-18.5	-1.4	-12.0	-23.7	-21.4
60-64	-40.1	45.8	-15.5	33.6	-39.4	-29.2	7.4	-36.2	-53.5	-42.2
65-69	-38.5	78.8	8.3	86.9	-72.2	-102.0	21.0	-51.8	-88.3	-86.5
70-74	-34.7	73.1	42.1	249.2	-141.1	-173.1	-18.2	-75.7	-167.9	-51.7
75-79						-251.4	-71.5	-122.4	-322.0	-41.3
80-84						-525.4	27.2	-276.7	-469.3	-72.1

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-7(	1970-7	1975-8	1980-85	1985-90	1990-95
30-34	-10.4	-0.3	-3.3	23.4	-5.6	-8.9	8.6	-10.0	0.3	2.5
35-39	-7.8	-3.2	-4.6	24.0	-6.8	0.1	-7.7	0.8	-6.5	11.1
40-44	-5.9	0.7	-4.7	14.8	-5.5	-1.2	-1.4	1.4	-9.4	10.4
45-49	-2.7	-1.7	0.8	8.5	-4.8	-0.1	-2.9	-2.6	-3.9	-0.3
50-54	-4.7	-1.1	-0.6	8.6	-4.4	-1.3	-2.0	-0.5	-4.1	-1.7
55-59	-5.3	0.7	-0.6	5.0	-2.5	-2.4	-0.2	-1.8	-3.8	-4.2
60-64	-2.6	3.4	-1.0	2.2	-2.4	-2.0	0.6	-2.6	-4.5	-4.6
65-69	-1.5	3.4	0.3	3.1	-2.3	-3.6	0.9	-2.1	-4.1	-5.0
70-74	-0.8	1.8	0.9	5.3	-2.4	-3.3	-0.4	-1.8	-4.3	-1.7
75-79						-2.7	-0.9	-1.6	-4.6	-0.8
80-84						-3.2	0.2	-2.0	-3.8	-0.7

TABLE 7(k)

CHANGE OF MORTALITY RATE FOR IHD IN BLACK MALES

ISCHEMIC HEART DISEASE DEATH RATES IN BLACK MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	11	21	10	8	20	26	7	6	7	5	7
35-39	37	26	28	41	55	61	34	20	25	23	27
40-44	59	76	87	83	134	134	105	78	52	40	50
45-49	137	147	179	174	214	235	194	168	110	94	111
50-54	263	269	290	338	418	365	351	216	193	177	220
55-59	391	404	419	426	584	545	507	376	327	292	253
60-64	336	543	666	776	995	910	808	564	542	442	341
65-69	428	676	891	1047	1374	1339	1042	801	814	680	590
70-74	946	1077	1110	1334	1879	1863	1634	1222	1302	1161	1067
75-79						2598	2064	2063	1976	1641	1463
80-84						3336	2918	2827	2864	2519	2319

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-5	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	9.6	-11.0	-2.0	12.7	5.1	-18.3	-0.9	0.2	-1.9	2.3
35-39	-11.1	2.4	13.1	13.7	6.1	-26.8	-13.9	4.8	-2.5	4.7
40-44	17.2	10.8	-4.1	50.8	-0.2	-29.1	-26.2	-26.4	-12.3	9.7
45-49	10.7	31.4	-5.2	40.6	20.4	-40.7	-26.1	-58.1	-15.6	17.0
50-54	6.7	20.1	48.6	80.2	-53.2	-14.1	-135.6	-22.9	-16.0	43.8
55-59	13.0	14.2	7.8	157.4	-38.9	-38.1	-130.6	-48.6	-35.0	-39.7
60-64	206.8	123.1	110.1	219.0	-84.6	-102.5	-244.0	-22.1	-99.7	-100.5
65-69	248.1	215.5	155.4	327.0	-34.6	-297.1	-240.6	13.1	-134.5	-90.4
70-74	130.7	32.9	224.6	544.9	-16.0	-229.6	-412.2	80.9	-141.6	-93.7
75-79	0.0	0.0	0.0	0.0	2598.4	-534.5	-0.6	-87.2	-335.0	-177.7
80-84	0.0	0.0	0.0	0.0	3335.8	-417.8	-91.2	37.3	-345.3	-200.1

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-5	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	17.4	-10.7	-4.1	33.3	5.0	-14.3	-2.5	0.8	-5.7	10.0
35-39	-6.0	1.9	9.3	6.6	2.2	-8.8	-8.1	4.7	-2.0	4.2
40-44	5.8	2.8	-0.9	12.2	0.0	-4.4	-5.0	-6.7	-4.7	4.9
45-49	1.6	4.3	-0.6	4.7	1.9	-3.5	-2.7	-6.9	-2.9	3.6
50-54	0.5	1.5	3.4	4.7	-2.5	-0.8	-7.7	-2.1	-1.7	5.0
55-59	0.7	0.7	0.4	7.4	-1.3	-1.4	-5.2	-2.6	-2.1	-2.7
60-64	12.3	4.5	3.3	5.6	-1.7	-2.3	-6.0	-0.8	-3.7	-4.5
65-69	11.6	6.4	3.5	6.2	-0.5	-4.4	-4.6	0.3	-3.3	-2.7
70-74	2.8	0.6	4.0	8.2	-0.2	-2.5	-5.0	1.3	-2.2	-1.6
75-79						-4.1	0.0	-0.8	-3.4	-2.2
80-84						-2.5	-0.6	0.3	-2.4	-1.6

TABLE 7(I)

CHANGE OF MORTALITY RATE FOR IHD IN BLACK FEMALES

ISCHEMIC HEART DISEASE IN BLACK FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	10	9	12	9	18	9	9	3	5	2	4
35-39	25	24	22	25	49	27	18	9	10	5	6
40-44	75	70	63	42	98	61	38	25	11	15	19
45-49	118	103	87	106	131	101	83	54	56	47	47
50-54	148	228	199	199	216	214	174	126	109	77	104
55-59	198	218	280	332	392	337	254	193	216	196	118
60-64	349	529	406	581	690	639	397	325	320	309	194
65-69	295	428	498	651	848	811	609	535	520	498	393
70-74	414	694	773	1198	1258	1341	1071	918	777	783	648
75-79						1858	1596	1501	1408	1228	1019
80-84						2649	2073	2309	2491	2173	1988

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-55	1955-60	1960-6	1965-70	1970-75	1975-8	1980-85	1985-9	1990-95
30-34	-0.9	2.7	-3.2	9.0	-9.2	0.3	-5.5	1.5	-2.7	1.9
35-39	-1.9	-1.0	2.4	24.1	-21.8	-9.5	-8.5	0.7	-4.7	0.9
40-44	-5.6	-6.3	-21.9	56.0	-36.9	-22.7	-12.6	-14.4	3.8	4.2
45-49	-15.0	-15.9	18.4	25.1	-29.5	-18.5	-29.0	2.6	-9.2	-0.5
50-54	79.2	-28.9	-0.1	17.3	-1.7	-40.2	-48.3	-16.2	-32.3	27.2
55-59	19.9	62.0	52.2	60.0	-55.9	-82.8	-61.2	23.4	-19.8	-77.7
60-64	179.6	-122.8	175.1	108.5	-50.9	-241.3	-72.7	-4.6	-11.1	-115.2
65-69	132.7	70.0	153.8	196.8	-37.3	-201.9	-74.2	-15.0	-21.9	-104.7
70-74	280.9	78.2	425.2	59.9	83.3	-270.3	-153.2	-140.9	6.6	-135.5
75-79	0.0	0.0	0.0	0.0	1857.9	-262.4	-94.4	-93.6	-180.0	-208.5
80-84	0.0	0.0	0.0	0.0	2649.2	-575.8	235.9	181.8	-317.7	-185.2

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-55	1955-60	1960-6	1965-70	1970-75	1975-8	1980-85	1985-9	1990-95
30-34	-1.8	5.8	-5.4	20.8	-10.4	0.8	-12.5	9.0	-11.0	17.5
35-39	-1.5	-0.9	2.2	19.4	-8.9	-7.0	-9.6	1.6	-9.4	3.3
40-44	-1.5	-1.8	-6.9	27.0	-7.6	-7.5	-6.6	-11.3	7.0	5.7
45-49	-2.5	-3.1	4.2	4.7	-4.5	-3.7	-7.0	1.0	-3.3	-0.2
50-54	10.7	-2.5	0.0	1.7	-0.2	-3.8	-5.6	-2.6	-5.9	7.0
55-59	2.0	5.7	3.7	3.6	-2.9	-4.9	-4.8	2.4	-1.8	-7.9
60-64	10.3	-4.6	8.6	3.7	-1.5	-7.6	-3.7	-0.3	-0.7	-7.5
65-69	9.0	3.3	6.2	6.0	-0.9	-5.0	-2.4	-0.6	-0.8	-4.2
70-74	13.6	2.3	11.0	1.0	1.3	-4.0	-2.9	-3.1	0.2	-3.5
75-79						-2.8	-1.2	-1.2	-2.6	-3.4
80-84						-4.3	2.3	1.6	-2.6	-1.7

TABLE 7(m)

CHANGE OF MORTALITY RATE FOR CD IN WHITE MALES

CEREBROVASCULAR DISEASE IN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	5	5	5	5	4	5	2	3	2	2	2
35-39	9	9	10	7	8	8	7	4	5	3	4
40-44	17	17	17	16	18	13	11	11	7	7	8
45-49	40	32	33	31	28	28	22	15	11	11	11
50-54	77	72	58	51	51	49	37	25	24	20	15
55-59	140	129	113	97	90	83	75	46	41	31	30
60-64	235	241	225	184	168	166	136	92	69	54	59
65-69	414	418	437	366	322	309	259	165	134	113	102
70-74	729	829	765	733	710	595	486	354	309	224	193
75-79						1122	960	652	538	427	407
80-84						1906	1704	1254	952	804	810

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-	1955-6	1960-	1965-70	1970-75	1975-8	1980-85	1985-90	1990-95
30-34	0.2	0.4	-0.7	-0.4	0.8	-2.7	0.7	-0.8	-0.3	-0.5
35-39	0.5	0.6	-2.6	0.6	0.4	-0.7	-3.4	0.5	-1.6	0.6
40-44	0.3	-0.2	-0.6	2.3	-5.0	-2.6	0.0	-3.8	-0.4	1.1
45-49	-8.0	1.3	-2.4	-3.1	0.6	-6.8	-6.5	-4.1	-0.4	0.7
50-54	-5.5	-13.1	-7.5	-0.1	-1.5	-12.6	-11.8	-0.9	-3.7	-5.8
55-59	-11.2	-15.9	-15.7	-6.6	-7.2	-8.2	-28.5	-5.8	-9.2	-1.0
60-64	5.7	-16.0	-40.6	-15.9	-2.6	-29.4	-44.8	-22.5	-15.0	4.5
65-69	3.8	19.0	-71.1	-43.5	-13.8	-49.9	-93.7	-31.4	-20.0	-11.4
70-74	99.8	-63.9	-32.3	-23.0	-114.3	-109.6	-132.1	-45.2	-84.7	-31.1
75-79	0.0	0.0	0.0	0.0	1122.3	-162.5	-308.1	-113.6	-110.8	-20.2
80-84	0.0	0.0	0.0	0.0	1906.1	-202.4	-449.4	-302.8	-147.6	6.2

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-	1955-6	1960-	1965-70	1970-75	1975-8	1980-85	1985-90	1990-95
30-34	0.9	1.5	-2.4	-1.9	3.6	-10.5	6.1	-4.9	-2.1	-4.2
35-39	1.3	1.4	-5.3	1.8	1.0	-1.7	-9.0	2.6	-6.9	3.6
40-44	0.3	-0.3	-0.7	2.8	-5.4	-3.9	-0.1	-7.0	-1.2	3.3
45-49	-4.0	0.8	-1.4	-2.0	0.5	-4.8	-6.1	-5.5	-0.7	1.4
50-54	-1.4	-3.7	-2.6	-0.1	-0.6	-5.1	-6.4	-0.7	-3.1	-5.7
55-59	-1.6	-2.5	-2.8	-1.4	-1.6	-2.0	-7.6	-2.5	-4.5	-0.6
60-64	0.5	-1.3	-3.6	-1.7	-0.3	-3.5	-6.6	-4.9	-4.4	1.7
65-69	0.2	0.9	-3.3	-2.4	-0.9	-3.2	-7.2	-3.8	-3.0	-2.0
70-74	2.7	-1.5	-0.8	-0.6	-3.2	-3.7	-5.4	-2.6	-5.5	-2.8
75-79						-2.9	-6.4	-3.5	-4.1	-0.9
80-84						-2.1	-5.3	-4.8	-3.1	0.2

TABLE (n)

CHANGE OF MORTALITY RATE FOR CD IN WHITE FEMALES

CEREBROVASCULAR DISEASE IN WHITE FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	4	4	4	4	5	5	4	2	2	2	2
35-39	10	8	7	6	9	10	7	5	3	4	4
40-44	18	22	16	17	15	15	14	10	7	7	7
45-49	51	45	32	26	26	25	22	14	16	10	10
50-54	100	81	59	50	44	45	34	25	19	19	18
55-59	144	125	102	76	61	61	47	37	29	30	25
60-64	232	221	188	142	111	107	92	65	60	44	41
65-69	434	385	355	295	231	209	176	128	103	80	73
70-74	712	756	664	565	516	419	362	249	194	173	179
75-79						882	747	479	388	340	330
80-84						1596	1066	1017	830	675	709

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-0.1	0.2	-0.3	1.1	0.2	-1.3	-1.3	0.1	-0.5	-0.3
35-39	-2.1	-0.9	-1.3	2.8	0.9	-2.6	-2.0	-1.7	0.4	0.5
40-44	3.7	-5.6	0.8	-1.9	-0.1	-1.1	-3.7	-3.0	0.1	-0.5
45-49	-6.5	-13.0	-5.6	-0.1	-0.9	-3.1	-7.8	1.5	-5.9	0.6
50-54	-19.1	-21.6	-9.0	-6.1	0.5	-10.6	-9.5	-5.3	-0.6	-0.5
55-59	-19.0	-23.2	-25.7	-15.1	-0.4	-13.8	-10.0	-7.8	1.1	-5.2
60-64	-11.8	-32.7	-45.9	-30.7	-4.5	-15.3	-26.1	-5.9	-15.7	-3.1
65-69	-48.8	-30.2	-59.7	-64.1	-22.0	-32.5	-48.6	-25.1	-22.0	-7.0
70-74	44.6	-92.2	-99.3	-48.5	-96.8	-57.5	-112.5	-55.8	-20.4	5.5
75-79	0.0	0.0	0.0	0.0	881.6	-134.2	-268.3	-90.7	-48.0	-10.3
80-84	0.0	0.0	0.0	0.0	1596.3	-530.5	-48.7	-187.3	-154.8	34.4

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-0.4	1.1	-1.6	5.6	0.8	-5.3	-7.1	0.8	-3.7	-3.4
35-39	-4.1	-2.2	-3.5	9.3	2.0	-5.5	-5.7	-6.8	2.2	2.9
40-44	4.2	-5.2	1.0	-2.3	-0.2	-1.5	-5.3	-5.9	0.2	-1.5
45-49	-2.5	-5.8	-3.5	-0.1	-0.7	-2.5	-7.1	2.1	-7.5	1.1
50-54	-3.8	-5.3	-3.0	-2.4	0.2	-4.7	-5.6	-4.3	-0.6	-0.5
55-59	-2.6	-3.7	-5.0	-4.0	-0.1	-4.5	-4.3	-4.2	0.8	-3.4
60-64	-1.0	-3.0	-4.9	-4.3	-0.8	-2.9	-5.7	-1.8	-5.3	-1.4
65-69	-2.3	-1.6	-3.4	-4.3	-1.9	-3.1	-5.5	-3.9	-4.3	-1.7
70-74	1.3	-2.4	-3.0	-1.7	-3.8	-2.7	-6.2	-4.5	-2.1	0.6
75-79						-3.0	-7.2	-3.8	-2.5	-0.6
80-84						-6.6	-0.9	-3.7	-3.7	1.0

TABLE (o)

CHANGE OF MORTALITY RATE FOR CD IN BLACK MALES
CEREBROVASCULAR DISEASE IN BLACK MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	8	19	11	13	14	13	13	9	13	5	4
35-39	13	35	22	22	18	16	28	17	22	21	13
40-44	46	32	61	55	54	64	46	42	43	36	41
45-49	71	99	78	81	72	74	73	52	54	49	61
50-54	136	216	155	154	147	92	104	98	78	88	77
55-59	224	293	237	222	209	176	141	122	101	81	110
60-64	419	485	376	366	403	281	231	231	166	158	150
65-69	211	552	675	743	632	506	380	309	224	183	224
70-74	920	1048	770	915	801	664	623	462	407	353	333
75-79						1108	790	734	601	422	511
80-84						1373	1383	1179	837	628	881

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-70	1970-75	1975-8	1980-8	1985-9	1990-95
30-34	10.3	-7.8	2.5	0.9	-1.0	-0.1	-3.5	3.6	-7.8	-1.0
35-39	22.1	-13.0	0.2	-3.5	-2.7	11.9	-10.4	4.5	-0.5	-7.8
40-44	-13.5	28.8	-6.1	-0.7	9.6	-17.4	-4.3	1.2	-7.6	5.4
45-49	28.2	-21.2	3.4	-9.5	1.9	-0.9	-20.6	2.0	-4.8	11.8
50-54	80.3	-60.5	-1.0	-6.9	-55.7	12.3	-6.3	-19.7	9.5	-10.9
55-59	68.6	-55.8	-15.5	-12.7	-33.2	-34.5	-19.0	-21.5	-19.7	29.0
60-64	66.0	-108.5	-10.6	37.4	-122.5	-49.2	-0.8	-64.5	-8.2	-7.8
65-69	341.8	122.9	68.1	-111.1	-126.4	-125.6	-71.0	-85.3	-41.4	41.1
70-74	127.8	-277.3	144.7	-113.7	-137.0	-41.1	-161.3	-54.9	-54.1	-20.4
75-79	0.0	0.0	0.0	0.0	1108.3	-318.4	-55.8	-133.2	-179.4	89.9
80-84	0.0	0.0	0.0	0.0	1372.7	10.8	-204.7	-342.3	-208.8	253.5

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-50	1950-55	1955-60	1960-6	1965-70	1970-75	1975-8	1980-8	1985-9	1990-95
30-34	25.1	-8.4	4.6	1.3	-1.4	-0.1	-5.4	7.7	-11.8	-3.8
35-39	35.2	-7.5	0.2	-3.2	-2.9	15.3	-7.6	5.3	-0.4	-7.4
40-44	-5.9	17.9	-2.0	-0.3	3.5	-5.5	-1.9	0.6	-3.5	3.0
45-49	8.0	-4.3	0.9	-2.4	0.5	-0.2	-5.7	0.8	-1.8	4.8
50-54	11.8	-5.6	-0.1	-0.9	-7.6	2.7	-1.2	-4.0	2.4	-2.5
55-59	6.1	-3.8	-1.3	-1.2	-3.2	-3.9	-2.7	-3.5	-3.9	7.2
60-64	3.2	-4.5	-0.6	2.0	-6.1	-3.5	-0.1	-5.6	-1.0	-1.0
65-69	32.5	4.4	2.0	-3.0	-4.0	-5.0	-3.7	-5.5	-3.7	4.5
70-74	2.8	-5.3	3.8	-2.5	-3.4	-1.2	-5.2	-2.4	-2.7	-1.2
75-79						-5.7	-1.4	-3.6	-6.0	4.3
80-84						0.2	-3.0	-5.8	-5.0	8.1

TABLE (p)

CHANGE OF MORTALITY RATE FOR CD IN BLACK FEMALES

CEREBROVASCULAR DISEASE IN BLACK FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	15	20	9	26	14	21	9	11	7	9	8
35-39	34	38	34	31	37	39	20	12	19	21	17
40-44	99	105	67	68	77	59	36	36	17	28	29
45-49	125	180	125	111	93	79	55	50	35	32	37
50-54	232	272	228	165	152	116	105	69	67	35	67
55-59	307	393	281	259	214	145	104	103	84	86	89
60-64	424	480	407	404	350	306	136	141	125	91	86
65-69	375	573	639	652	551	443	295	260	183	155	164
70-74	851	931	806	816	687	739	491	420	351	277	304
75-79						1010	713	681	514	458	360
80-84						1606	1211	1120	790	736	755

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-55	1955-60	1960-6	1965-7(	1970-75	1975-8(	1980-85	1985-9(	1990-95
30-34	5.9	-11.3	16.9	-11.7	6.3	-11.8	2.4	-4.1	1.4	-0.9
35-39	4.0	-4.6	-2.4	5.7	2.2	-19.6	-7.5	6.5	2.5	-3.9
40-44	6.3	-38.1	0.9	8.8	-17.8	-22.4	-0.6	-19.3	11.8	1.2
45-49	54.4	-54.4	-14.4	-17.4	-14.3	-24.0	-5.0	-15.4	-2.7	4.5
50-54	40.0	-43.8	-63.3	-12.8	-36.2	-10.9	-36.3	-1.9	-31.4	31.9
55-59	85.8	-111.0	-22.2	-45.3	-68.8	-41.6	-1.0	-18.3	1.2	3.1
60-64	56.2	-73.5	-2.9	-53.8	-44.3	-169.4	4.4	-16.0	-34.1	-4.9
65-69	198.2	65.4	12.9	-100.6	-107.7	-148.6	-34.5	-76.6	-28.2	8.6
70-74	79.4	-124.6	10.0	-129.4	51.9	-247.7	-70.6	-69.8	-73.8	27.7
75-79	0.0	0.0	0.0	0.0	1010.4	-297.2	-32.0	-167.8	-55.4	-98.2
80-84	0.0	0.0	0.0	0.0	1605.8	-394.7	-91.0	-329.7	-54.0	18.3

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1945-5	1950-55	1955-60	1960-6	1965-7(	1970-75	1975-8(	1980-85	1985-9(	1990-95
30-34	8.1	-11.0	36.6	-9.0	8.7	-11.4	5.4	-7.2	4.0	-2.1
35-39	2.3	-2.4	-1.4	3.6	1.2	-10.0	-7.7	10.9	2.7	-3.7
40-44	1.3	-7.3	0.3	2.6	-4.6	-7.6	-0.4	-10.8	14.2	0.8
45-49	8.7	-6.1	-2.3	-3.1	-3.1	-6.1	-1.8	-6.1	-1.5	2.8
50-54	3.4	-3.2	-5.5	-1.6	-4.8	-1.9	-6.9	-0.5	-9.4	18.0
55-59	5.6	-5.7	-1.6	-3.5	-6.4	-5.7	-0.2	-3.6	0.3	0.7
60-64	2.7	-3.1	-0.1	-2.7	-2.5	-11.1	0.6	-2.3	-5.5	-1.1
65-69	10.6	2.3	0.4	-3.1	-3.9	-6.7	-2.3	-5.9	-3.1	1.1
70-74	1.9	-2.7	0.2	-3.2	1.5	-6.7	-2.9	-3.3	-4.2	2.0
75-79						-5.9	-0.9	-4.9	-2.2	-4.3
80-84						-4.9	-1.5	-5.9	-1.4	0.5

TABLE 7(q)

CHANGE OF MORTALITY RATE FOR HPD IN WHITE MALES

HYPERTENSIVE HEART DISEASE IN WHITE MALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	2	1	0	0	2	0	0	1	0	0
35-39	5	4	2	2	4	2	1	1	0	1
40-44	14	8	5	6	4	1	2	2	1	3
45-49	23	14	9	9	11	4	4	3	3	4
50-54	53	37	17	17	13	7	6	4	4	8
55-59	93	58	37	28	23	16	12	7	7	9
60-64	151	118	71	53	43	27	15	11	9	11
65-69	249	217	119	99	66	44	22	15	17	19
70-74	384	352	202	175	110	80	34	27	20	28
75-79					181	124	49	38	35	40
80-84					338	201	75	57	54	62

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-1.4	-0.4	0.0	1.7	-2.1	0.2	0.4	-0.4	0.1
35-39	-1.5	-1.9	0.3	1.8	-1.7	-1.3	-0.2	-0.3	1.0
40-44	-6.0	-2.3	0.9	-1.9	-3.2	0.7	-0.2	-0.7	2.3
45-49	-8.8	-5.2	-0.4	1.7	-6.9	-0.1	-0.3	-0.7	1.8
50-54	-16.1	-19.8	-0.1	-3.4	-6.1	-0.8	-2.3	-0.1	3.8
55-59	-35.3	-20.6	-8.7	-5.4	-6.9	-4.2	-4.5	-0.5	2.5
60-64	-33.7	-46.3	-18.1	-9.8	-16.1	-12.5	-3.3	-2.1	1.9
65-69	-31.6	-97.7	-20.1	-33.2	-22.1	-21.9	-7.2	2.1	2.4
70-74	-31.9	-150.1	-26.5	-65.0	-30.5	-46.0	-7.1	-6.2	7.1
75-79	0.0	0.0	0.0	180.7	-57.1	-74.7	-10.8	-2.6	4.9
80-84	0.0	0.0	0.0	338.3	-137.3	-126.1	-17.4	-3.7	7.9

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-12.9	-10.3	-2.4	106.9	-20.0		37.1	-13.8	11.6
35-39	-6.1	-10.8	4.2	18.4	-8.9	-12.1	-5.5	-9.4	62.2
40-44	-8.8	-6.2	3.4	-6.1	-14.8	12.8	-2.4	-8.3	49.8
45-49	-7.6	-7.2	-1.0	3.9	-13.1	-0.5	-1.8	-4.3	14.6
50-54	-6.1	-10.9	-0.2	-4.1	-9.3	-2.4	-7.3	-0.6	20.0
55-59	-7.6	-7.1	-4.7	-3.8	-6.0	-5.3	-7.5	-1.4	7.2
60-64	-4.5	-7.9	-5.1	-3.7	-7.4	-9.2	-4.5	-3.8	4.1
65-69	-2.5	-9.0	-3.4	-6.7	-6.7	-9.9	-6.5	2.8	2.9
70-74	-1.7	-8.5	-2.6	-7.4	-5.5	-11.5	-4.2	-4.7	6.9
75-79					-6.3	-12.1	-4.4	-1.4	2.8
80-84					-8.1	-12.6	-4.7	-1.3	2.9

TABLE 7((r)

CHANGE OF MORTALITY RATE FOR HPD IN WHITE FEMALES
HYPERTENSIVE HEART DISEASE IN WHITE FEMALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	1	1	1	0	1	0	0	0	0	0
35-39	4	4	1	1	3	1	0	0	0	0
40-44	12	5	2	2	5	1	1	1	0	1
45-49	26	12	7	8	7	5	1	1	1	1
50-54	51	34	19	12	14	6	3	2	3	4
55-59	84	69	34	21	19	12	7	3	5	5
60-64	153	113	75	40	26	21	8	6	9	6
65-69	257	226	122	98	59	43	21	15	11	14
70-74	476	391	244	186	101	56	28	22	21	21
75-79					214	101	50	37	35	42
80-84					411	178	94	73	78	91

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	0.0	0.2	-0.3	0.6	-1.0	0.2	-0.2	0.0	0.2
35-39	-0.8	-3.2	0.0	2.5	-2.6	-0.2	-0.2	0.0	0.0
40-44	-6.7	-3.3	0.2	3.2	-4.6	0.1	0.2	-0.4	0.2
45-49	-14.1	-5.4	1.2	-0.9	-1.8	-4.3	-0.7	0.6	-0.1
50-54	-17.1	-14.4	-7.6	2.6	-8.7	-3.1	-0.6	1.0	1.5
55-59	-14.9	-35.2	-13.1	-2.0	-6.9	-5.6	-3.4	1.4	0.1
60-64	-39.7	-38.7	-35.0	-13.9	-4.3	-13.7	-1.4	3.1	-3.5
65-69	-31.2	-104.0	-23.7	-39.6	-15.7	-22.1	-6.2	-3.5	2.6
70-74	-85.4	-147.0	-57.8	-84.6	-45.0	-28.8	-5.2	-1.3	-0.6
75-79	0.0	0.0	0.0	214.1	-113.5	-50.7	-12.7	-2.4	6.6
80-84	0.0	0.0	0.0	410.9	-233.0	-84.2	-20.6	4.8	13.2

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-0.3	6.2	-9.5	32.9	-20.0		-20.0		
35-39	-3.4	-17.2	1.8	90.0	-16.7	-9.4	-11.3	-2.2	7.6
40-44	-11.5	-13.2	2.1	34.8	-17.9	3.9	6.7	-9.2	6.9
45-49	-10.7	-8.8	3.6	-2.2	-4.9	-15.7	-11.2	24.8	-1.4
50-54	-6.7	-8.5	-7.8	4.5	-12.0	-10.9	-4.7	10.0	10.0
55-59	-3.5	-10.2	-7.7	-1.9	-7.2	-9.2	-10.4	8.7	0.6
60-64	-5.2	-6.8	-9.4	-7.0	-3.4	-12.8	-3.7	10.1	-7.5
65-69	-2.4	-9.2	-3.9	-8.1	-5.4	-10.3	-6.0	-4.8	4.7
70-74	-3.6	-7.5	-4.7	-9.1	-8.9	-10.2	-3.7	-1.1	-0.5
75-79					-10.6	-10.1	-5.1	-1.3	3.8
80-84					-11.3	-9.5	-4.4	1.3	3.4

TABLE 7(s)

CHANGE OF MORTALITY RATE FOR HPD IN BLACK MALES

HYPERTENSIVE HEART DISEASE IN BLACK MALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	16.2	12.5	12.8	6.8	25.8	6.1	7.1	0.7	2.7	3.2
35-39	39.3	33.4	16.8	30.1	34.2	8.2	18.2	2.2	4.4	7.2
40-44	116.9	79.0	62.5	66.1	46.6	8.5	25.2	10.4	13.6	22.8
45-49	169.1	108.2	102.2	79.2	83.2	12.3	36.1	13.3	35.2	52.8
50-54	231.1	238.9	120.9	137.0	108.4	45.9	41.5	21.3	50.0	51.7
55-59	376.4	312.1	137.5	198.5	89.6	74.0	57.5	47.8	57.8	87.0
60-64	486.5	462.3	273.1	304.0	73.8	78.4	54.0	60.1	63.1	87.7
65-69	725.9	793.4	389.3	355.9	121.4	137.9	76.8	78.8	70.8	83.5
70-74	991.1	695.1	354.2	313.8	231.3	154.8	89.0	67.2	132.4	88.5
75-79					242.8	174.4	112.5	114.6	99.2	99.0
80-84					385.1	362.1	163.7	125.0	125.5	86.2

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-3.7	0.3	-6.0	18.9	-19.7	1.0	-6.5	2.0	0.6
35-39	-5.9	-16.6	13.3	4.1	-26.0	10.0	-16.0	2.2	2.8
40-44	-37.9	-16.5	3.6	-19.5	-38.1	16.8	-14.8	3.2	9.2
45-49	-60.9	-6.0	-22.9	3.9	-70.8	23.8	-22.8	21.9	17.6
50-54	7.8	-118.0	16.0	-28.6	-62.5	-4.4	-20.2	28.7	1.7
55-59	-64.3	-174.6	61.0	-108.9	-15.6	-16.5	-9.8	10.1	29.2
60-64	-24.2	-189.2	30.9	-230.3	4.7	-24.4	6.0	3.0	24.6
65-69	67.5	-404.1	-33.4	-234.5	16.5	-61.2	2.1	-8.0	12.7
70-74	-296.0	-341.0	-40.4	-82.5	-76.5	-65.8	-21.8	65.2	-43.9
75-79					-68.5	-61.8	2.0	-15.4	-0.2
80-84					-23.0	-198.4	-38.7	0.5	-39.3

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	-4.6	0.4	-9.3	55.5	-15.3	3.3	-18.2	61.6	4.2
35-39	-3.0	-9.9	15.8	2.7	-15.2	24.2	-17.6	20.0	12.9
40-44	-6.5	-4.2	1.1	-5.9	-16.4	39.6	-11.8	6.1	13.6
45-49	-7.2	-1.1	-4.5	1.0	-17.0	38.5	-12.6	33.0	10.0
50-54	0.7	-9.9	2.7	-4.2	-11.5	-1.9	-9.7	26.9	0.7
55-59	-3.4	-11.2	8.9	-11.0	-3.5	-4.4	-3.4	4.2	10.1
60-64	-1.0	-8.2	2.3	-15.1	1.3	-6.2	2.2	1.0	7.8
65-69	1.9	-10.2	-1.7	-13.2	2.7	-8.9	0.5	-2.0	3.6
70-74	-6.0	-9.8	-2.3	-5.3	-6.6	-8.5	-4.9	19.4	-6.6
75-79					-5.6	-7.1	0.4	-2.7	0.0
80-84					-1.2	-11.0	-4.7	0.1	-6.3

TABLE 7(t))

CHANGE OF MORTALITY RATE FOR HPD IN BLACK FEMALES
HYPERTENSIVE HEART DISEASE IN BLACK FEMALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	15.4	23.2	11.6	8.9	0.0	0.0	4.7	2.4	0.0	0.9
35-39	78.4	51.7	28.3	37.3	35.8	3.4	7.4	3.6	4.7	9.0
40-44	176.0	124.3	60.8	64.4	48.3	10.9	13.8	10.1	4.2	16.9
45-49	259.5	157.9	120.6	60.5	60.3	25.4	21.5	20.4	25.1	20.0
50-54	363.7	324.5	159.3	79.3	116.5	37.9	32.6	40.1	21.5	36.0
55-59	499.3	534.0	233.7	142.7	105.4	63.6	30.4	31.9	27.6	40.3
60-64	962.9	545.2	321.2	270.1	202.3	71.0	55.7	34.6	48.0	41.8
65-69	737.1	703.2	335.5	250.8	200.6	123.6	76.9	37.0	42.5	41.5
70-74	819.1	1008.6	620.5	355.4	231.2	149.4	97.8	84.3	68.7	38.1
75-79					325.5	190.4	115.5	105.2	92.6	81.1
80-84					273.6	288.0	179.8	179.9	120.5	82.7

ABSOLUTE CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-7	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	7.8	-11.6	-2.7	-8.9	0.0	4.7	-2.3	-2.4	0.9
35-39	-26.7	-23.4	9.0	-1.5	-32.4	4.0	-3.8	1.1	4.3
40-44	-51.7	-63.5	3.6	-16.1	-37.4	3.0	-3.8	-5.8	12.7
45-49	-101.6	-37.3	-60.2	-0.2	-34.9	-3.9	-1.1	4.7	-5.1
50-54	-39.2	-165.2	-80.0	37.2	-78.6	-5.3	7.5	-18.6	14.5
55-59	34.8	-300.3	-91.1	-37.2	-41.9	-33.2	1.5	-4.3	12.7
60-64	-417.7	-224.0	-51.1	-67.8	-131.3	-15.3	-21.0	13.3	-6.2
65-69	-33.9	-367.7	-84.7	-50.2	-77.0	-46.7	-39.9	5.5	-1.0
70-74	189.5	-388.1	-265.1	-124.2	-81.8	-51.6	-13.5	-15.6	-30.7
75-79					-135.1	-75.0	-10.3	-12.5	-11.5
80-84					14.4	-108.2	0.1	-59.4	-37.8

ANNUAL PERCENT CHANGE OF MORTALITY RATE DURING SUCCESSIVE PERIOD

Age	1950-55	1955-60	1960-65	1965-7	1970-75	1975-80	1980-85	1985-90	1990-95
30-34	10.1	-10.0	-4.7	-20.0			-9.7	-20.0	
35-39	-6.8	-9.1	6.4	-0.8	-18.1	23.7	-10.3	6.3	18.5
40-44	-5.9	-10.2	1.2	-5.0	-15.5	5.5	-5.4	-11.6	60.0
45-49	-7.8	-4.7	-10.0	-0.1	-11.6	-3.0	-1.0	4.6	-4.1
50-54	-2.2	-10.2	-10.0	9.4	-13.5	-2.8	4.6	-9.3	13.5
55-59	1.4	-11.2	-7.8	-5.2	-7.9	-10.4	1.0	-2.7	9.2
60-64	-8.7	-8.2	-3.2	-5.0	-13.0	-4.3	-7.6	7.7	-2.6
65-69	-0.9	-10.5	-5.0	-4.0	-7.7	-7.6	-10.4	2.9	-0.5
70-74	4.6	-7.7	-8.5	-7.0	-7.1	-6.9	-2.8	-3.7	-8.9
75-79					-8.3	-7.9	-1.8	-2.4	-2.5
80-84					1.1	-7.5	0.0	-6.6	-6.3

MAJOR CARDIOVASCULAR DISEASE IIN WHITE MALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	14	9	9	7	7	7	6	5	4	4	3
25-29	19	16	17	11	12	9	7	9	7	7	7
30-34	43	42	34	30	23	23	19	18	17	16	15
35-39	86	86	82	75	69	63	48	49	41	31	36
40-44	188	181	186	172	172	143	127	111	99	72	70
45-49	368	359	345	338	327	295	262	220	179	145	133
50-54	673	631	619	603	599	515	462	385	335	256	233
55-59	1100	1024	978	952	945	896	780	657	572	439	386
60-64	1611	1602	1643	1534	1541	1466	1281	1113	946	747	661
65-69	2534	2469	2577	2432	2385	2338	2086	1767	1505	1228	1065
70-74	3831	3937	3847	3858	4056	3613	3164	2835	2529	2002	1775
75-79						5679	5093	4468	4019	3266	2794
80-84						8944	7994	7151	6425	5332	4935

DATA 0001

MAJOR CARDIOVASCULAR DISEASE IIN WHITE FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	17	11	8	7	6	5	3	3	3	2	2
25-29	21	13	12	12	8	7	5	4	4	5	3
30-34	31	20	17	17	15	13	8	10	8	8	7
35-39	63	42	34	26	30	28	22	16	13	12	15
40-44	100	85	66	56	59	48	42	35	34	23	26
45-49	191	156	122	106	106	93	87	65	62	48	44
50-54	363	282	221	201	199	178	155	124	121	103	89
55-59	591	470	425	366	335	306	268	242	214	192	154
60-64	979	841	803	700	614	581	501	446	417	323	305
65-69	1809	1485	1440	1293	1177	1069	890	799	732	599	523
70-74	3084	2779	2524	2332	2317	1971	1679	1436	1306	1069	1020
75-79						3702	3174	2598	2435	1941	1818
80-84						6573	5561	4941	4488	3601	3501

DATA 0002

MAJOR CARDIOVASCULAR DISEASE IN BLACK MALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	26	25	17	8	8	15	13	17	13	15	21
25-29	35	25	48	26	30	41	27	26	24	24	20
30-34	71	95	63	71	63	77	43	55	78	32	54
35-39	178	157	120	135	127	149	106	108	122	114	104
40-44	368	318	298	266	266	310	226	252	227	184	221
45-49	604	540	514	434	420	476	372	448	356	370	392
50-54	1079	901	836	782	786	672	636	639	621	595	583
55-59	1620	1364	1235	1083	1083	1035	896	928	874	815	898
60-64	2462	2064	1843	1798	1975	1651	1435	1398	1402	1256	1305
65-69	4474	2659	2817	2718	2699	2483	1910	1871	1918	1686	1744
70-74	5116	4064	3341	3426	3614	3465	3039	2751	2964	2686	2427
75-79						4886	3769	4282	4092	3654	3344
80-84						6290	5741	6385	6237	5257	4923

DATA 0003

MAJOR CARDIOVASCULAR DISEASE IN BLACK FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	38	18	8	11	12	14	9	10	8	2	7
25-29	57	42	46	26	29	20	16	26	20	12	19
30-34	113	76	85	83	63	49	29	37	33	31	32
35-39	227	176	160	133	154	110	59	67	59	59	58
40-44	526	395	313	222	245	180	113	130	88	86	113
45-49	729	641	456	422	314	279	203	216	179	186	172
50-54	1145	1041	862	633	535	491	381	326	328	253	324
55-59	1329	1343	1196	990	853	679	527	512	516	482	466
60-64	2252	2224	1598	1607	1479	1291	764	816	776	723	728
65-69	2033	2040	2158	2040	1885	1697	1254	1271	1167	1104	1068
70-74	3652	3056	3085	3332	2694	2730	2126	2033	1911	1710	1619
75-79						3812	3118	3160	3047	2661	2350
80-84						5566	4399	5103	5113	4325	3892

DATA 0004

DISEASE OF HEART IN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	8	4	5	4	5	4	3	4	3	3	2
25-29	12	12	12	8	9	5	5	6	4	6	5
30-34	30	33	25	22	17	17	15	14	13	13	11
35-39	62	73	69	65	57	52	39	43	36	26	27
40-44	139	158	164	151	147	127	114	98	90	63	52
45-49	285	316	300	297	290	262	236	199	166	130	103
50-54	518	539	540	530	528	453	415	350	301	228	184
55-59	845	876	835	815	817	781	678	590	513	391	302
60-64	1206	1305	1362	1273	1300	1242	1089	981	836	659	502
65-69	1807	1958	2036	1932	1920	1916	1735	1520	1287	1046	802
70-74	2622	2889	2862	2878	3046	2824	2487	2319	2079	1651	1303
75-79						4261	3815	3520	3240	2632	1978
80-84						6344	5749	5326	5026	4180	3429

DISEASE OF HEART IN WHITE FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	11	8	4	4	3	3	1	2	2	2	1
25-29	14	9	8	7	4	3	2	2	3	3	2
30-34	21	13	11	10	7	8	4	7	5	5	4
35-39	42	29	24	16	18	16	13	11	10	8	9
40-44	65	56	43	34	35	31	27	24	25	14	15
45-49	110	104	84	72	73	63	62	48	44	36	27
50-54	207	189	152	140	142	125	116	96	97	81	58
55-59	350	323	305	269	251	242	210	197	177	152	106
60-64	587	590	583	520	467	451	393	365	340	268	216
65-69	1072	1034	1027	921	879	817	675	641	599	487	365
70-74	1855	1854	1733	1621	1647	1465	1243	1115	1053	836	689
75-79						2611	2252	1984	1917	1497	1233
80-84						4534	3838	3586	3399	2726	2309

DATA 0006

DISEASE OF HEART IN BLACK MALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	18	13	13	4	7	11	9	14	11	12	13
25-29	22	20	35	16	16	29	20	20	22	20	17
30-34	49	62	44	44	36	57	25	40	61	26	48
35-39	132	95	85	85	88	127	71	86	96	88	86
40-44	253	252	208	168	189	217	165	196	178	139	173
45-49	427	401	379	330	315	369	281	380	292	307	313
50-54	777	639	634	579	587	543	510	514	527	470	477
55-59	1152	1003	878	782	824	811	726	779	753	705	752
60-64	1178	1492	1400	1321	1419	1316	1156	1120	1170	1057	1107
65-69	1505	1880	1957	1809	1919	1876	1471	1479	1602	1429	1443
70-74	3195	2720	2318	2266	2567	2642	2311	2152	2406	2220	1981
75-79						3582	2899	3323	3260	3046	2673
80-84						4571	4120	4868	5119	4386	3726

DISEASE OF HEART IN BLACK FEMALE

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	31	10	5	4	5	8	6	6	4	1	5
25-29	42	26	27	14	15	7	7	15	14	8	17
30-34	71	39	56	41	34	23	18	21	24	20	22
35-39	138	120	94	76	87	59	37	49	36	35	38
40-44	301	259	208	129	148	109	70	83	67	53	78
45-49	470	422	278	266	189	170	132	154	135	146	124
50-54	700	698	582	406	323	353	266	250	246	206	227
55-59	809	878	874	647	560	493	397	386	404	378	361
60-64	1470	1644	1095	1112	1035	937	605	649	621	601	582
65-69	1313	1344	1392	1292	1190	1198	920	947	932	908	839
70-74	2175	1899	2087	2265	1785	1867	1552	1499	1460	1359	1221
75-79						2595	2304	2360	2376	2079	1884
80-84						3668	2914	3768	4105	3405	2936

DATA 0008

ISCHEMIC HEART DISEASE IN WHITE MALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	1	0	1	0	3	1	1	1	0	1	1
25-29	2	4	4	2	5	2	2	2	1	2	2
30-34	12	14	12	11	12	10	10	7	6	6	5
35-39	31	37	41	40	41	35	25	30	23	15	18
40-44	91	89	105	99	109	88	80	75	61	41	42
45-49	170	188	195	198	218	184	171	151	120	92	99
50-54	301	325	357	362	398	328	301	274	226	166	164
55-59	502	535	550	555	614	565	490	462	388	293	240
60-64	707	770	878	864	977	901	781	784	638	504	353
65-69	935	1101	1246	1297	1432	1397	1260	1225	989	796	648
70-74	1350	1528	1682	1888	2257	2064	1793	1855	1622	1284	1170
75-79						3117	2762	2814	2495	2028	1790
80-84						4591	4137	4193	3788	3184	3285

DATA 0009

ISCHEMIC HEART DISEASE IN WHITE FEMALES											
Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	1	0	0	0	1	0	0	0	0	0	0
25-29	1	1	1	0	2	1	0	0	0	0	0
30-34	5	2	2	2	4	3	2	2	1	1	1
35-39	12	7	6	5	10	7	7	4	4	3	5
40-44	23	16	17	13	23	16	15	14	15	8	12
45-49	42	36	33	34	49	37	37	32	28	22	22
50-54	99	76	72	70	100	78	73	66	64	51	47
55-59	194	143	148	143	179	156	138	137	125	101	80
60-64	312	271	317	302	335	296	267	274	238	185	142
65-69	505	467	546	554	641	569	467	488	436	348	261
70-74	857	823	896	938	1187	1046	873	854	779	611	559
75-79						1857	1605	1534	1411	1089	1048
80-84						3247	2721	2749	2472	2003	1930

DATA 0010

ISCHEMIC HEART DISEASE IN BLACK MALES											
Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	7	0	1	0	5	3	1	1	2	1	1
25-29	1	2	10	3	9	8	3	1	5	4	1
30-34	11	21	10	8	20	26	7	6	7	5	7
35-39	37	26	28	41	55	61	34	20	25	23	27
40-44	59	76	87	83	134	134	105	78	52	40	50
45-49	137	147	179	174	214	235	194	168	110	94	111
50-54	263	269	290	338	418	365	351	216	193	177	220
55-59	391	404	419	426	584	545	507	376	327	292	253
60-64	336	543	666	776	995	910	808	564	542	442	341
65-69	428	676	891	1047	1374	1339	1042	801	814	680	590
70-74	946	1077	1110	1334	1879	1863	1634	1222	1302	1161	1067
75-79						2598	2064	2063	1976	1641	1463
80-84						3336	2918	2827	2864	2519	2319

DATA 0011

ISCHEMIC HEART DISEASE IN BLACK FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	2	1	0	0	3	1	1	1	1	0	0
25-29	3	2	2	2	8	1	2	1	2	1	2
30-34	10	9	12	9	18	9	9	3	5	2	4
35-39	25	24	22	25	49	27	18	9	10	5	6
40-44	75	70	63	42	98	61	38	25	11	15	19
45-49	118	103	87	106	131	101	83	54	56	47	47
50-54	148	228	199	199	216	214	174	126	109	77	104
55-59	198	218	280	332	392	337	254	193	216	196	118
60-64	349	529	406	581	690	639	397	325	320	309	194
65-69	295	428	498	651	848	811	609	535	520	498	393
70-74	414	694	773	1198	1258	1341	1071	918	777	783	648
75-79						1858	1596	1501	1408	1228	1019
80-84						2649	2073	2309	2491	2173	1988

DATA 0012

CEREBROVASCULAR DISEASE IN WHITE MALES											
Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	2	3	2	2	2	2	2	1	1	1	0
25-29	2	2	3	2	3	3	2	2	2	1	0
30-34	5	5	5	5	4	5	2	3	2	2	2
35-39	9	9	10	7	8	8	7	4	5	3	4
40-44	17	17	17	16	18	13	11	11	7	7	8
45-49	40	32	33	31	28	28	22	15	11	11	11
50-54	77	72	58	51	51	49	37	25	24	20	15
55-59	140	129	113	97	90	83	75	46	41	31	30
60-64	235	241	225	184	168	166	136	92	69	54	59
65-69	414	418	437	366	322	309	259	165	134	113	102
70-74	729	829	765	733	710	595	486	354	309	224	193
75-79						1122	960	652	538	427	407
80-84						1906	1704	1254	952	804	810

DATA 0013

DATA NOT AVAILABLE FOR 75-79 80-84 AGE GROUPS PRIOR TO 1970

CEREBROVASCULAR DISEASE IN WHITE FEMALES

Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	1	1	2	1	1	2	1	1	1	1	0
25-29	3	2	2	2	2	3	2	1	1	1	1
30-34	4	4	4	4	5	5	4	2	2	2	2
35-39	10	8	7	6	9	10	7	5	3	4	4
40-44	18	22	16	17	15	15	14	10	7	7	7
45-49	51	45	32	26	26	25	22	14	16	10	10
50-54	100	81	59	50	44	45	34	25	19	19	18
55-59	144	125	102	76	61	61	47	37	29	30	25
60-64	232	221	188	142	111	107	92	65	60	44	41
65-69	434	385	355	295	231	209	176	128	103	80	73
70-74	712	756	664	565	516	419	362	249	194	173	179
75-79						882	747	479	388	340	330
80-84						1596	1066	1017	830	675	709

DATA 0014

		CEREBROVASCULAR DISEASE IN BLACK MALES									
Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	5	11	4	4	0	2	3	2	1	2	3
25-29	4	4	13	4	7	8	6	5	2	3	2
30-34	8	19	11	13	14	13	13	9	13	5	4
35-39	13	35	22	22	18	16	28	17	22	21	13
40-44	46	32	61	55	54	64	46	42	43	36	41
45-49	83	99	78	81	72	74	73	52	54	49	61
50-54	136	216	155	154	147	92	104	98	78	88	77
55-59	224	293	237	222	209	176	141	122	101	81	110
60-64	295	485	376	366	403	281	231	231	166	158	150
65-69	299	552	675	743	632	506	380	309	224	183	224
70-74	919	1048	770	915	801	664	623	462	407	353	333
75-79						1108	790	734	601	422	511
80-84						1373	1383	1179	837	628	881

DATA 0015

CEREBROVASCULAR DISEASE IN BLACK FEMALES											
Age	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
20-24	0	3	1	3	0	5	3	4	3	1	2
25-29	2	8	12	5	6	10	7	11	5	3	1
30-34	15	20	9	26	14	21	9	11	7	9	8
35-39	34	38	34	31	37	39	20	12	19	21	17
40-44	99	105	67	68	77	59	36	36	17	28	29
45-49	125	180	125	111	93	79	55	50	35	32	37
50-54	232	272	228	165	152	116	105	69	67	35	67
55-59	307	393	281	259	214	145	104	103	84	86	89
60-64	424	480	407	404	350	306	136	141	125	91	86
65-69	375	573	639	652	551	443	295	260	183	155	164
70-74	851	931	806	816	687	739	491	420	351	277	304
75-79						1010	713	681	514	458	360
80-84						1606	1211	1120	790	736	755

DATA 0016

HYPERTENSIVE HEART DISEASE IN WHITE MALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	2	1	0	0	2	0	0	1	0	0
35-39	5	4	2	2	4	2	1	1	0	1
40-44	14	8	5	6	4	1	2	2	1	3
45-49	23	14	9	9	11	4	4	3	3	4
50-54	53	37	17	17	13	7	6	4	4	8
55-59	93	58	37	28	23	16	12	7	7	9
60-64	151	118	71	53	43	27	15	11	9	11
65-69	249	217	119	99	66	44	22	15	17	19
70-74	384	352	202	175	110	80	34	27	20	28
75-79					181	124	49	38	35	40
80-84					338	201	75	57	54	62

DATA 0017

HYPERTENSIVE HEART DISEASE IN WHITE FEMALES

Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	1	1	1	0	1	0	0	0	0	0
35-39	4	4	1	1	3	1	0	0	0	0
40-44	12	5	2	2	5	1	1	1	0	1
45-49	26	12	7	8	7	5	1	1	1	1
50-54	51	34	19	12	14	6	3	2	3	4
55-59	84	69	34	21	19	12	7	3	5	5
60-64	153	113	75	40	26	21	8	6	9	6
65-69	257	226	122	98	59	43	21	15	11	14
70-74	476	391	244	186	101	56	28	22	21	21
75-79					214	101	50	37	35	42
80-84					411	178	94	73	78	91

DATA 0018

HYPERTENSIVE HEART DISEASE IN BLACK MALES										
Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	16	13	13	7	26	6	7	1	3	3
35-39	39	33	17	30	34	8	18	2	4	7
40-44	117	79	62	66	47	8	25	10	14	23
45-49	169	108	102	79	83	12	36	13	35	53
50-54	231	239	121	137	108	46	42	21	50	52
55-59	376	312	137	198	90	74	58	48	58	87
60-64	486	462	273	304	74	78	54	60	63	88
65-69	726	793	389	356	121	138	77	79	71	83
70-74	991	695	354	314	231	155	89	67	132	88
75-79					243	174	113	115	99	99
80-84					385	362	164	125	126	86

DATA 0019

	HYPERTENSIVE HEART DISEASE IN BLACK FEMALES									
Age	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
30-34	15	23	12	9	0	0	5	2	0	1
35-39	78	52	28	37	36	3	7	4	5	9
40-44	176	124	61	64	48	11	14	10	4	17
45-49	260	158	121	60	60	25	21	20	25	20
50-54	364	325	159	79	117	38	33	40	22	36
55-59	499	534	234	143	105	64	30	32	28	40
60-64	963	545	321	270	202	71	56	35	48	42
65-69	737	703	335	251	201	124	77	37	42	42
70-74	819	1009	621	355	231	149	98	84	69	38
75-79					326	190	115	105	93	81
80-84					274	288	180	180	120	83

DATA 0020

MAJOR CARDIOVASCULAR DISEASE IN WHITE MALES BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											14	9	9	7	7	7	6	5	4	4	3
25-29										19	16	17	11	12	9	7	9	7	7	7	
30-34									43	42	34	30	23	23	19	18	17	16	15		
35-39								86	86	82	75	69	63	48	49	41	31	36			
40-44							188	181	186	172	172	143	127	111	99	72	70				
45-49						368	359	345	338	327	295	262	220	179	145	133					
50-54					673	631	619	603	599	515	462	385	335	256	233						
55-59				1100	1024	978	952	945	896	780	657	572	439	386							
60-64			1611	1602	1643	1534	1541	1466	1281	1113	946	747	661								
65-69		2534	2469	2577	2432	2385	2338	2086	1767	1505	1228	1065									
70-74	3831	3937	3847	3858	4056	3613	3164	2835	2529	2002	1775										
75-79					5679	5093	4468	4019	3266	2794											
80-84				8944	7994	7151	6425	5332	4935												

DATA 0021

CENTRAL BIRTH YEAR IS SHOWN FOR A GIVEN 5-YEAR PERIOD

MAJOR CARDIOVASCULAR DISEASE IN WHITE FEMALES BY BIRTH YEAR (COHORT EFFECT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											17	11	8	7	6	5	3	3	3	2	2
25-29										21	13	12	12	8	7	5	4	4	5	3	
30-34									31	20	17	17	15	13	8	10	8	8	7		
35-39								63	42	34	26	30	28	22	16	13	12	15			
40-44							100	85	66	56	59	48	42	35	34	23	26				
45-49						191	156	122	106	106	93	87	65	62	48	44					
50-54					363	282	221	201	199	178	155	124	121	103	89						
55-59				591	470	425	366	335	306	268	242	214	192	154							
60-64			979	841	803	700	614	581	501	446	417	323	305								
65-69		1809	1485	1440	1293	1177	1069	890	799	732	599	523									
70-74	3084	2779	2524	2332	2317	1971	1679	1436	1306	1069	1020										
75-79					3702	3174	2598	2435	1941	1818											
80-84				6573	5561	4941	4488	3601	3501												

DATA 0022

MAJOR CARDIOVASCULAR DISEASE IN BLACK MALES BY BIRTH YEAR(COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											26	25	17	8	8	15	13	17	13	15	21
25-29										35	25	48	26	30	41	27	26	24	24	20	
30-34									71	95	63	71	63	77	43	55	78	32	54		
35-39								178	157	120	135	127	149	106	108	122	114	104			
40-44							368	318	298	266	266	310	226	252	227	184	221				
45-49						604	540	514	434	420	476	372	448	356	370	392					
50-54					1079	901	836	782	786	672	636	639	621	595	583						
55-59				1620	1364	1235	1083	1083	1035	896	928	874	815	898							
60-64			2462	2064	1843	1798	1975	1651	1435	1398	1402	1256	1305								
65-69		4474	2659	2817	2718	2699	2483	1910	1871	1918	1686	1744									
70-74	5116	4064	3341	3426	3614	3465	3039	2751	2964	2686	2427										
75-79					4886	3769	4282	4092	3654	3344											
80-84				6290	5741	6385	6237	5257	4923												

DATA 0023

MAJOR CARDIOVASCULAR DISEASE IN BLACK FEMALES BY BIRTH YEAR (COHORT)

	Birth Year																				
	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923										
20-24											38	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
25-29										57	42	18	8	11	12	14	9	10	8	2	7
30-34									113	76	85	46	26	29	20	16	26	20	12	19	
35-39								227	176	160	133	83	63	49	29	37	33	31	32		
40-44							526	395	313	222	245	154	110	59	67	59	59	58			
45-49						729	641	456	422	314	279	180	113	130	88	86	113				
50-54					1145	1041	862	633	535	491	381	203	216	179	186	172					
55-59				1329	1343	1196	990	853	679	527	512	326	328	253	324						
60-64			2252	2224	1598	1607	1479	1291	764	816	776	516	482	466							
65-69		2033	2040	2158	2040	1885	1697	1254	1271	1167	1104	723	728								
70-74	3652	3056	3085	3332	2694	2730	2126	2033	1911	1710	1619	1068									
75-79					3812	3118	3160	3047	2661	2350											
80-84				5566	4399	5103	5113	4325	3892												

DATA 0024

DISEASE OF HEART IN WHITE MALES BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											8	4	5	4	5	4	3	4	3	3	2
25-29										12	12	12	8	9	5	5	6	4	6	5	
30-34									30	33	25	22	17	17	15	14	13	13	11		
35-39								62	73	69	65	57	52	39	43	36	26	27			
40-44							139	158	164	151	147	127	114	98	90	63	52				
45-49						285	316	300	297	290	262	236	199	166	130	103					
50-54					518	539	540	530	528	453	415	350	301	228	184						
55-59				845	876	835	815	817	781	678	590	513	391	302							
60-64			1206	1305	1362	1273	1300	1242	1089	981	836	659	502								
65-69		1807	1958	2036	1932	1920	1916	1735	1520	1287	1046	802									
70-74	2622	2889	2862	2878	3046	2824	2487	2319	2079	1651	1303										
75-79					4261	3815	3520	3240	2632	1978											
80-84				6344	5749	5326	5026	4180	3429												

DATA 0025

DISEASE OF HEART IN WHITE FEMALES BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											11	8	4	4	3	3	1	2	2	2	1
25-29										14	9	8	7	4	3	2	2	3	3	2	
30-34									21	13	11	10	7	8	4	7	5	5	4		
35-39								42	29	24	16	18	16	13	11	10	8	9			
40-44							65	56	43	34	35	31	27	24	25	14	15				
45-49						110	104	84	72	73	63	62	48	44	36	27					
50-54					207	189	152	140	142	125	116	96	97	81	58						
55-59				350	323	305	269	251	242	210	197	177	152	106							
60-64			587	590	583	520	467	451	393	365	340	268	216								
65-69		1072	1034	1027	921	879	817	675	641	599	487	365									
70-74	1855	1854	1733	1621	1647	1465	1243	1115	1053	836	689										
75-79					2611	2252	1984	1917	1497	1233											
80-84				4534	3838	3586	3399	2726	2309												

DATA 0026

DISEASE OF HEART IN BLACK MALE BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											18	13	13	4	7	11	9	14	11	12	13
25-29										22	20	35	16	16	29	20	20	22	20	17	
30-34									49	62	44	44	36	57	25	40	61	26	48		
35-39								132	95	85	85	88	127	71	86	96	88	86			
40-44							253	252	208	168	189	217	165	196	178	139	173				
45-49						427	401	379	330	315	369	281	380	292	307	313					
50-54					777	639	634	579	587	543	510	514	527	470	477						
55-59				1152	1003	878	782	824	811	726	779	753	705	752							
60-64			1178	1492	1400	1321	1419	1316	1156	1120	1170	1057	1107								
65-69		1505	1880	1957	1809	1919	1876	1471	1479	1602	1429	1443									
70-74	3195	2720	2318	2266	2567	2642	2311	2152	2406	2220	1981										
75-79					3582	2899	3323	3260	3046	2673											

DATA 0027

DISEASE OF HEART IN BLACK FEMALE BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											31	10	5	4	5	8	6	6	4	1	5
25-29										42	26	27	14	15	7	7	15	14	8	17	
30-34									71	39	56	41	34	23	18	21	24	20	22		
35-39								138	120	94	76	87	59	37	49	36	35	38			
40-44							301	259	208	129	148	109	70	83	67	53	78				
45-49						470	422	278	266	189	170	132	154	135	146	124					
50-54					700	698	582	406	323	353	266	250	246	206	227						
55-59				809	878	874	647	560	493	397	386	404	378	361							
60-64			1470	1644	1095	1112	1035	937	605	649	621	601	582								
65-69		1313	1344	1392	1292	1190	1198	920	947	932	908	839									
70-74	2175	1899	2087	2265	1785	1867	1552	1499	1460	1359	1221										
75-79					2595	2304	2360	2376	2079	1884											
80-84				3668	2914	3768	4105	3405	2936												

DATA 0028

ISCHEMIC HEART DISEASE IN WHITE MALE BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											1	0	1	0	3	1	1	1	0	1	1
25-29										2	4	4	2	5	2	2	2	1	2	2	
30-34									12	14	12	11	12	10	10	7	6	6	5		
35-39								31	37	41	40	41	35	25	30	23	15	18			
40-44							91	89	105	99	109	88	80	75	61	41	42				
45-49						170	188	195	198	218	184	171	151	120	92	99					
50-54					301	325	357	362	398	328	301	274	226	166	164						
55-59				502	535	550	555	614	565	490	462	388	293	240							
60-64			707	770	878	864	977	901	781	784	638	504	353								
65-69		935	1101	1246	1297	1432	1397	1260	1225	989	796	648									
70-74	1350	1528	1682	1888	2257	2064	1793	1855	1622	1284	1170										
75-79					3117	2762	2814	2495	2028	1790											
80-84				4591	4137	4193	3788	3184	3285												

DATA 0029

ISCHEMIC HEART DISEASE IN WHITE FEMALE BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											1	0	0	0	1	0	0	0	0	0	0
25-29										1	1	1	0	2	1	0	0	0	0	0	
30-34									5	2	2	2	4	3	2	2	1	1	1		
35-39								12	7	6	5	10	7	7	4	4	3	5			
40-44							23	16	17	13	23	16	15	14	15	8	12				
45-49						42	36	33	34	49	37	37	32	28	22	22					
50-54					99	76	72	70	100	78	73	66	64	51	47						
55-59				194	143	148	143	179	156	138	137	125	101	80							
60-64			312	271	317	302	335	296	267	274	238	185	142								
65-69		505	467	546	554	641	569	467	488	436	348	261									
70-74	857	823	896	938	1187	1046	873	854	779	611	559										
75-79					1857	1605	1534	1411	1089	1048											
80-84				3247	2721	2749	2472	2003	1930												

DATA 0030

ISCHEMIC HEART DISEASE IN BLACK MALE BY BIRTH YEAR (COHORT)																					
								Birth Year													
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											7	0	1	0	5	3	1	1	2	1	1
25-29										1	2	10	3	9	8	3	1	5	4	1	
30-34									11	21	10	8	20	26	7	6	7	5	7		
35-39								37	26	28	41	55	61	34	20	25	23	27			
40-44							59	76	87	83	134	134	105	78	52	40	50				
45-49						137	147	179	174	214	235	194	168	110	94	111					
50-54					263	269	290	338	418	365	351	216	193	177	220						
55-59				391	404	419	426	584	545	507	376	327	292	253							
60-64			336	543	666	776	995	910	808	564	542	442	341								
65-69		428	676	891	1047	1374	1339	1042	801	814	680	590									
70-74	946	1077	1110	1334	1879	1863	1634	1222	1302	1161	1067										
75-79					2598	2064	2063	1976	1641	1463											
80-84				3336	2918	2827	2864	2519	2319												

DATA 0031

ISCHEMIC HEART DISEASE IN BLACK FEMALE BY BIRTH YEAR (COHORT)

Age	Birth Year 1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											2	1	0	0	3	1	1	1	1	0	0
25-29										3	2	2	2	8	1	2	1	2	1	2	
30-34									10	9	12	9	18	9	9	3	5	2	4		
35-39								25	24	22	25	49	27	18	9	10	5	6			
40-44							75	70	63	42	98	61	38	25	11	15	19				
45-49						118	103	87	106	131	101	83	54	56	47	47					
50-54					148	228	199	199	216	214	174	126	109	77	104						
55-59				198	218	280	332	392	337	254	193	216	196	118							
60-64			349	529	406	581	690	639	397	325	320	309	194								
65-69		295	428	498	651	848	811	609	535	520	498	393									
70-74	414	694	773	1198	1258	1341	1071	918	777	783	648										
75-79					1858	1596	1501	1408	1228	1019											
80-84				2649	2073	2309	2491	2173	1988												

DATA 0032

CEREBROVASCULAR DISEASE IN WHITE MALES BY BIRTH (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											2	3	2	2	2	2	2	1	1	1	0
25-29										2	2	3	2	3	3	2	2	2	1	0	
30-34									5	5	5	5	4	5	2	3	2	2	2		
35-39								9	9	10	7	8	8	7	4	5	3	4			
40-44							17	17	17	16	18	13	11	11	7	7	8				
45-49						40	32	33	31	28	28	22	15	11	11	11					
50-54					77	72	58	51	51	49	37	25	24	20	15						
55-59				140	129	113	97	90	83	75	46	41	31	30							
60-64			235	241	225	184	168	166	136	92	69	54	59								
65-69		414	418	437	366	322	309	259	165	134	113	102									
70-74	729	829	765	733	710	595	486	354	309	224	193										
75-79					1122	960	652	538	427	407											
80-84				1906	1704	1254	952	804	810												

DATA 0033

CEREBROVSCULAR DISEASE IN WHITE FEMALES BY BIRTH YEAR (COHORT)

							Birth Year														
Age	1873	###	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											1	1	2	1	1	2	1	1	1	1	0
25-29										3	2	2	2	2	3	2	1	1	1	1	
30-34									4	4	4	4	5	5	4	2	2	2	2		
35-39								10	8	7	6	9	10	7	5	3	4	4			
40-44							18	22	16	17	15	15	14	10	7	7	7				
45-49						51	45	32	26	26	25	22	14	16	10	10					
50-54					100	81	59	50	44	45	34	25	19	19	18						
55-59				144	125	102	76	61	61	47	37	29	30	25							
60-64			232	221	188	142	111	107	92	65	60	44	41								
65-69		434	385	355	295	231	209	176	128	103	80	73									
70-74	712	756	664	565	516	419	362	249	194	173	179										
75-79					882	747	479	388	340	330											
80-84				1596	1066	1017	830	675	709												

DATA 0034

CEREBROVASCULAR DISEASE IN BLACK MALES BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											5	11	4	4	0	2	3	2	1	2	3
25-29										4	4	13	4	7	8	6	5	2	3	2	
30-34									8	19	11	13	14	13	13	9	13	5	4		
35-39								13	35	22	22	18	16	28	17	22	21	13			
40-44							46	32	61	55	54	64	46	42	43	36	41				
45-49						71	99	78	81	72	74	73	52	54	49	61					
50-54					136	216	155	154	147	92	104	98	78	88	77						
55-59				224	293	237	222	209	176	141	122	101	81	110							
60-64			419	485	376	366	403	281	231	231	166	158	150								
65-69		211	552	675	743	632	506	380	309	224	183	224									
70-74	920	1048	770	915	801	664	623	462	407	353	333										
75-79					1108	790	734	601	422	511											
80-84				1373	1383	1179	837	628	881												

DATA 0035

CEREBROVASCULAR DISEASE IN BLACK FEMALES BY BIRTH YEAR (COHORT)

	Birth Year																				
Age	1873	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963	1968	1973
20-24											0	3	1	3	0	5	3	4	3	1	2
25-29										2	8	12	5	6	10	7	11	5	3	1	
30-34									15	20	9	26	14	21	9	11	7	9	8		
35-39								34	38	34	31	37	39	20	12	19	21	17			
40-44							99	105	67	68	77	59	36	36	17	28	29				
45-49						125	180	125	111	93	79	55	50	35	32	37					
50-54					232	272	228	165	152	116	105	69	67	35	67						
55-59				307	393	281	259	214	145	104	103	84	86	89							
60-64			424	480	407	404	350	306	136	141	125	91	86								
65-69		375	573	639	652	551	443	295	260	183	155	164									
70-74	851	931	806	816	687	739	491	420	351	277	304										
75-79					1010	713	681	514	458	360											
80-84				1606	1211	1120	790	736	755												

DATA 0036

HYPERTENSIVE HEART DISEASE IN WHITE MALES BY BIRTH YEAR (COHORT)

	Birth Year																	
Age	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963
30-34									2	1	0	0	2	0	0	1	0	0
35-39								5	4	2	2	4	2	1	1	0	1	
40-44							14	8	5	6	4	1	2	2	1	3		
45-49						23	14	9	9	11	4	4	3	3	4			
50-54					53	37	17	17	13	7	6	4	4	8				
55-59				93	58	37	28	23	16	12	7	7	9					
60-64			151	118	71	53	43	27	15	11	9	11						
65-69		249	217	119	99	66	44	22	15	17	19							
70-74	384	352	202	175	110	80	34	27	20	28								
75-79				181	124	49	38	35	40									
80-84			338	201	75	57	54	62										

DATA 0037

HYPERTENSIVE HEART DISEASE IN WHITE FEMALES BY BIRTH YEAR (COHORT)

	Birth Year																	
Age	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963
30-34									1	1	1	0	1	0	0	0	0	0
35-39								4	4	1	1	3	1	0	0	0	0	
40-44							12	5	2	2	5	1	1	1	0	1		
45-49						26	12	7	8	7	5	1	1	1	1			
50-54					51	34	19	12	14	6	3	2	3	4				
55-59				84	69	34	21	19	12	7	3	5	5					
60-64			153	113	75	40	26	21	8	6	9	6						
65-69		257	226	122	98	59	43	21	15	11	14							
70-74	476	391	244	186	101	56	28	22	21	21								
75-79				214	101	50	37	35	42									
80-84			411	178	94	73	78	91										

DATA 0038

HYPERTENSIVE HEART DISEASE IN BLACK MALES BY BIRTH YEAR (COHORT)

	Birth Year																	
Age	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963
30-34									16	13	13	7	26	6	7	1	3	3
35-39								39	33	17	30	34	8	18	2	4	7	
40-44							117	79	62	66	47	8	25	10	14	23		
45-49						169	108	102	79	83	12	36	13	35	53			
50-54					231	239	121	137	108	46	42	21	50	52				
55-59				376	312	137	198	90	74	58	48	58	87					
60-64			486	462	273	304	74	78	54	60	63	88						
65-69		726	793	389	356	121	138	77	79	71	83							
70-74	991	695	354	314	231	155	89	67	132	88								
75-79				243	174	113	115	99	99									
80-84			385	362	164	125	126	86										

DATA 0039

HYPERTENSIVE HEART DISEASE IN BLACK FEMALES BY BIRTH YEAR

	Birth Year																	
Age	1878	1883	1888	1893	1898	1903	1908	1913	1918	1923	1928	1933	1938	1943	1948	1953	1958	1963
30-34									15	23	12	9	0	0	5	2	0	1
35-39								78	52	28	37	36	3	7	4	5	9	
40-44							176	124	61	64	48	11	14	10	4	17		
45-49						260	158	121	60	60	25	21	20	25	20			
50-54					364	325	159	79	117	38	33	40	22	36				
55-59				499	534	234	143	105	64	30	32	28	40					
60-64			963	545	321	270	202	71	56	35	48	42						
65-69		737	703	335	251	201	124	77	37	42	42							
70-74	819	1009	621	355	231	149	98	84	69	38								
75-79				326	190	115	105	93	81									
80-84			274	288	180	180	120	83										

DATA 0040

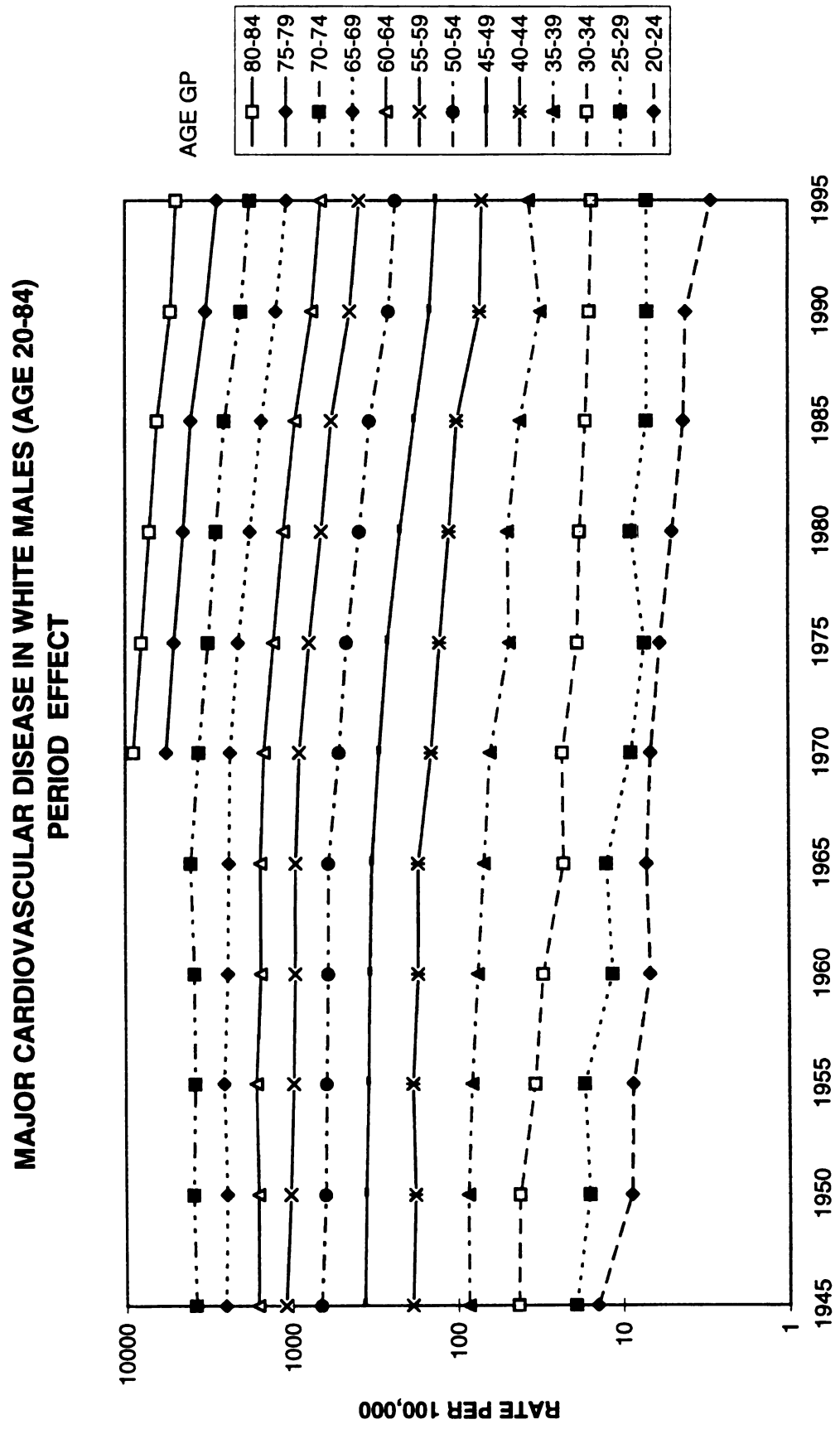

MAJOR CARDIOVASCULAR DISEASE IN WHITE MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0001

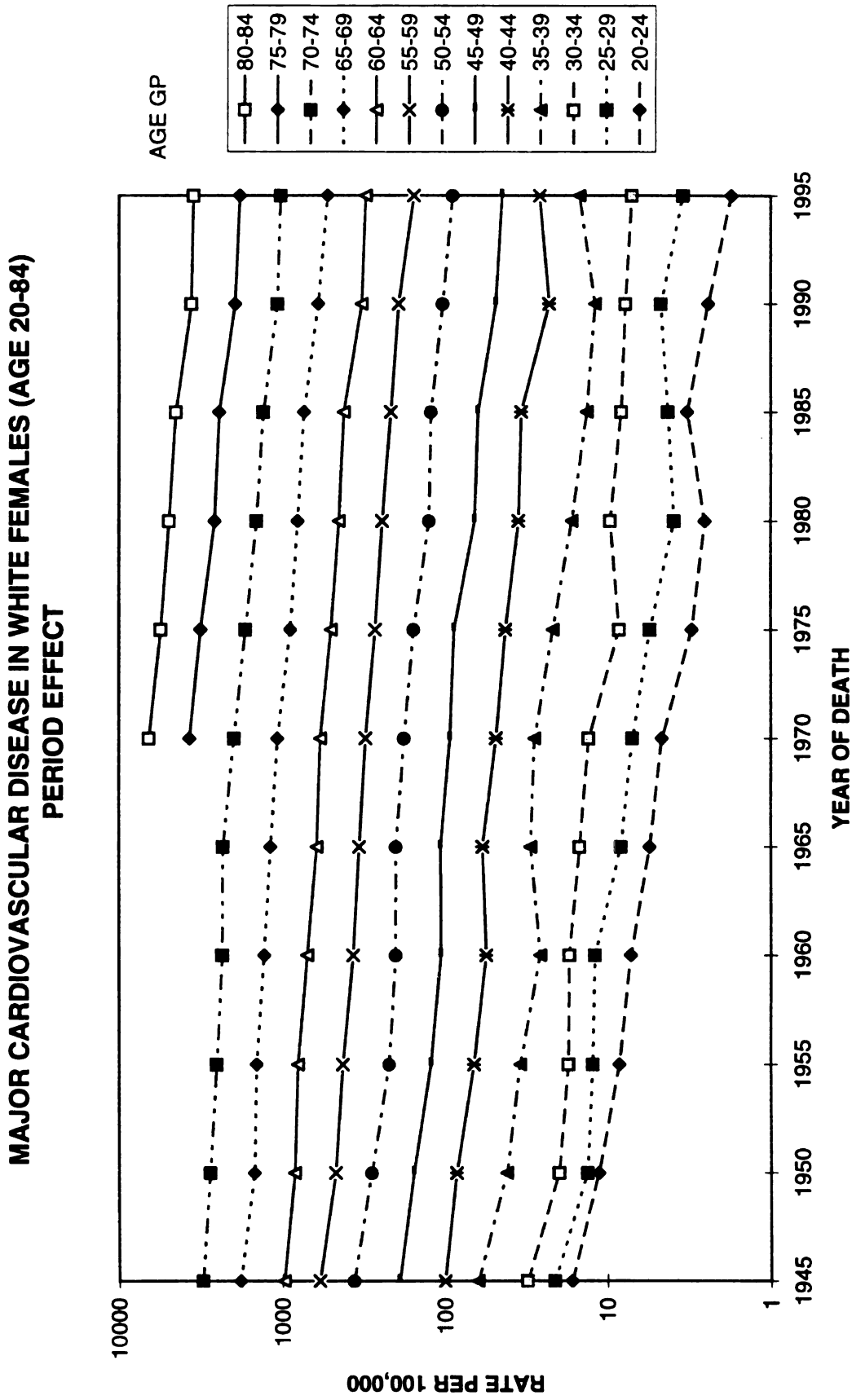

MAJOR CARDIOVASCULAR DISEASE IN WHITE FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0002

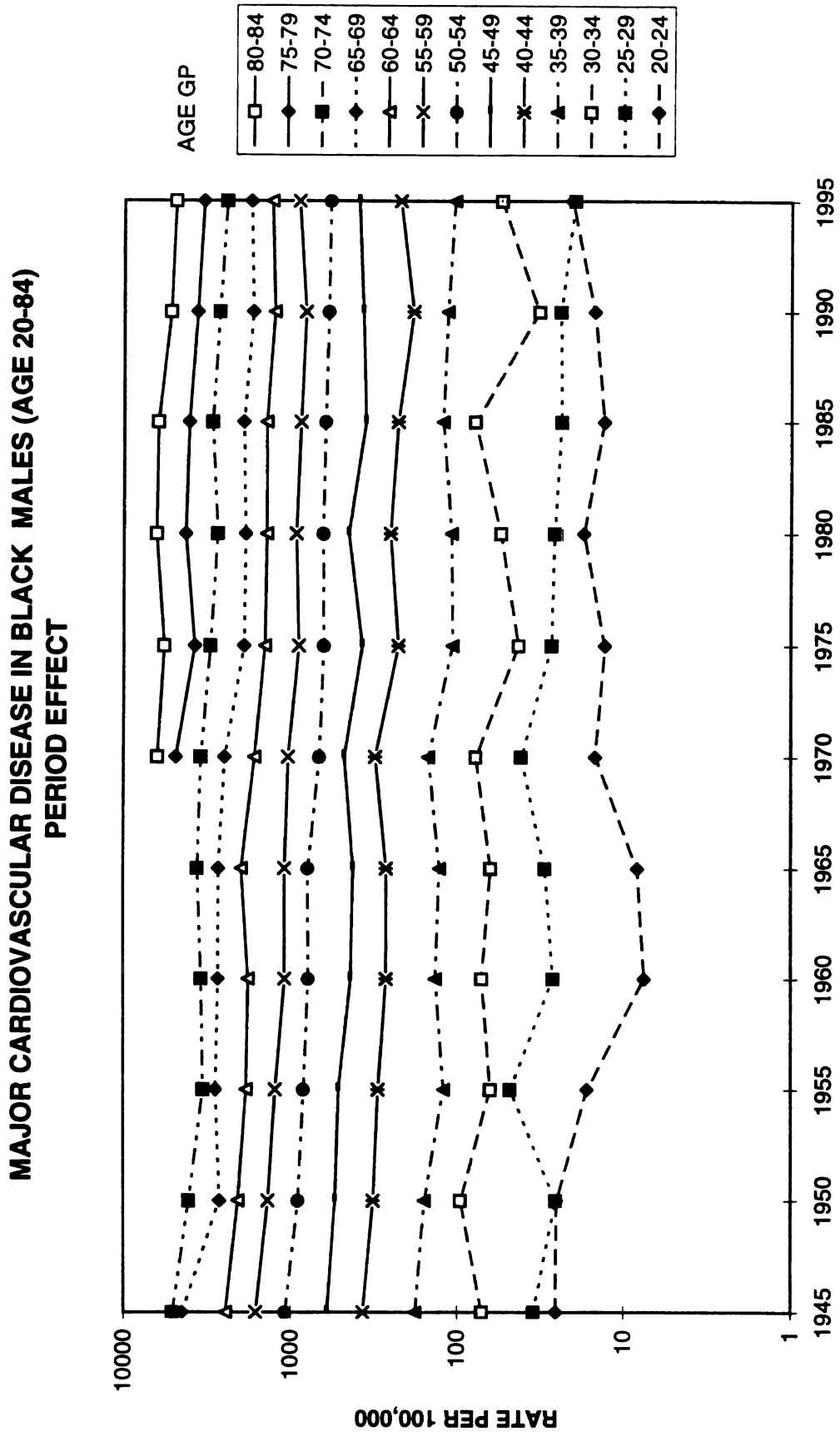

MAJOR CARDIOVASCULAR DISEASE IN BLACK MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0003

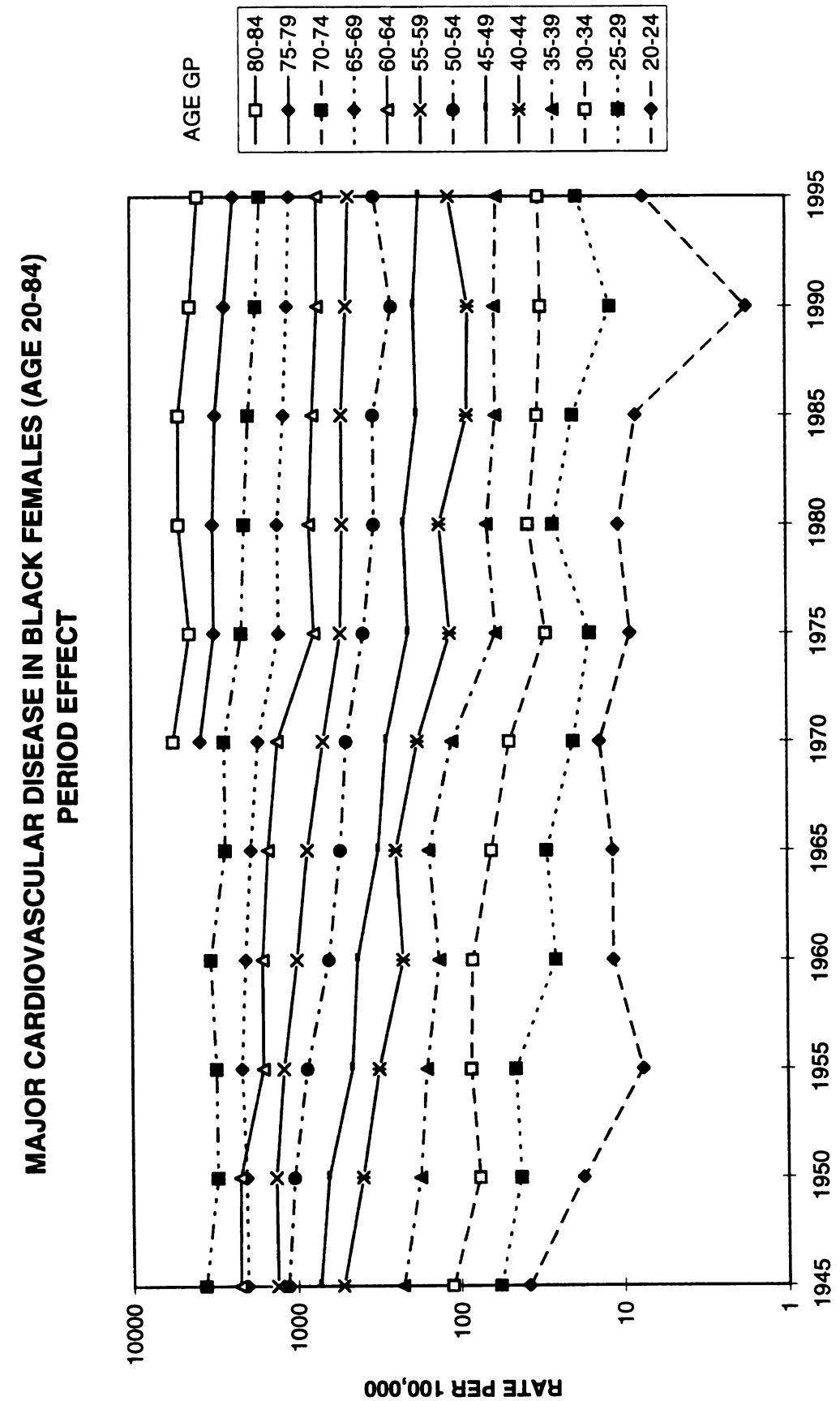

MAJOR CARDIOVASCULAR DISEASE IN BLACK FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0004

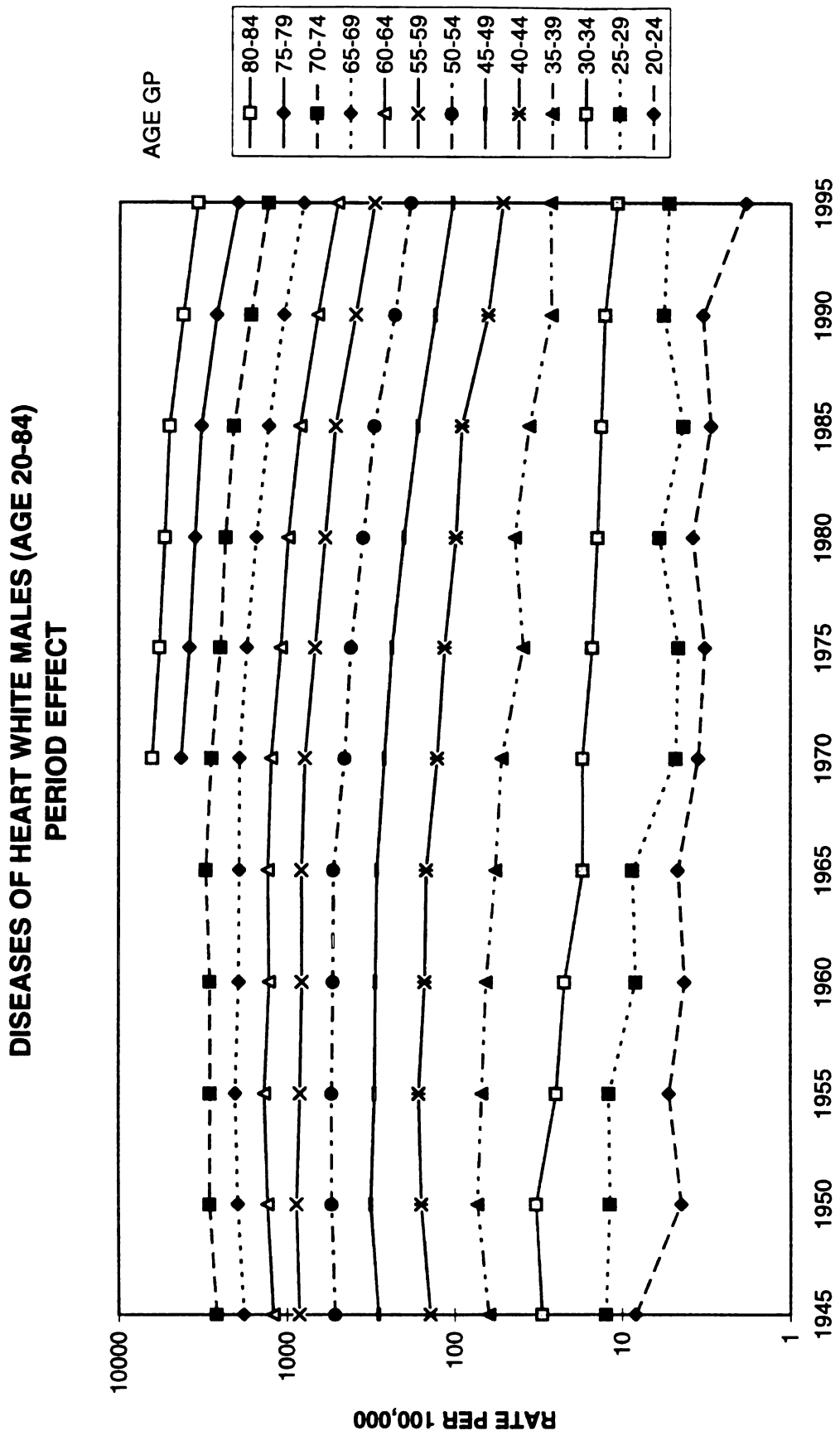

DISEASES OF HEART WHITE MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0005

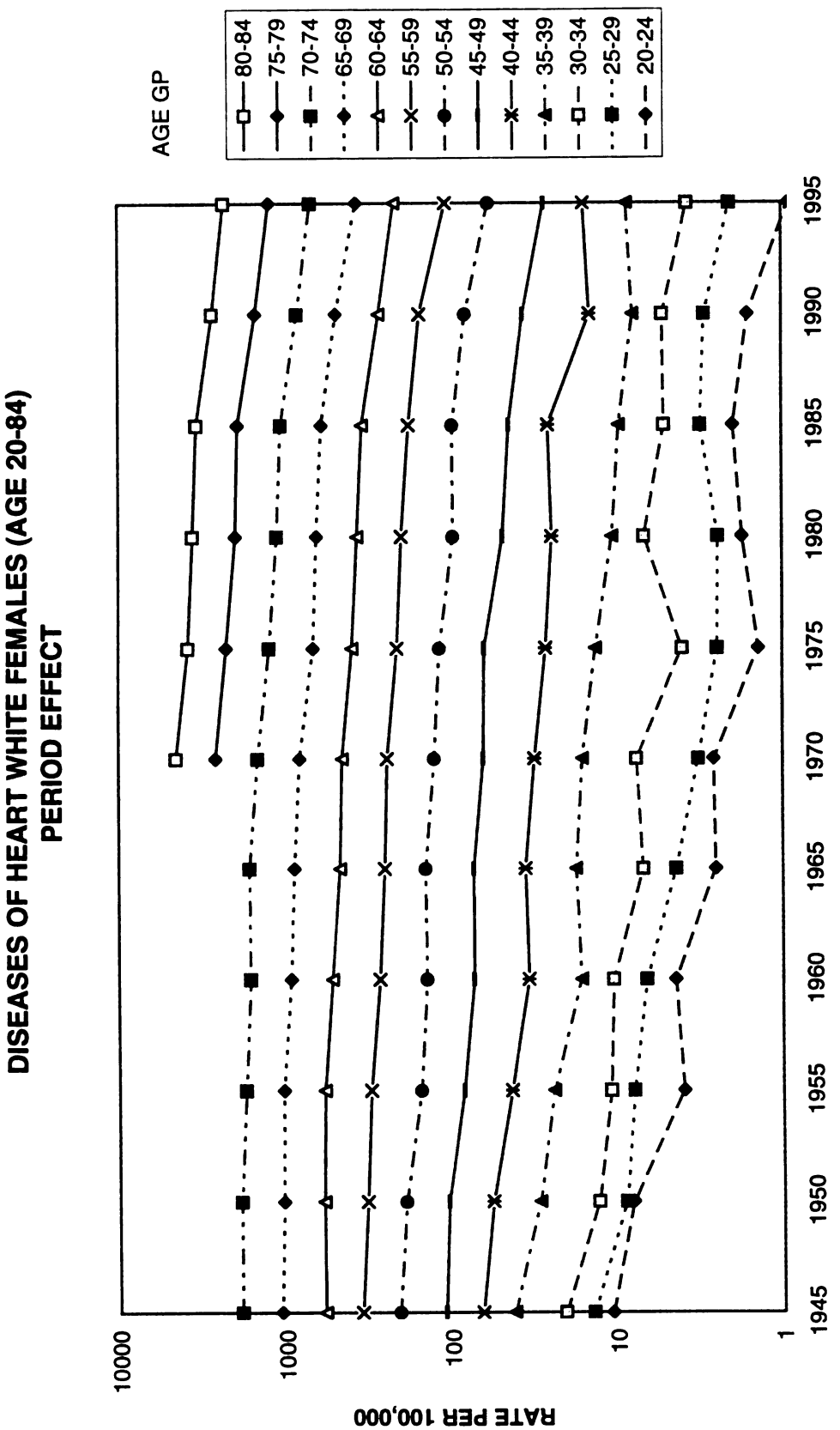

DISEASES OF HEART WHITE FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0006

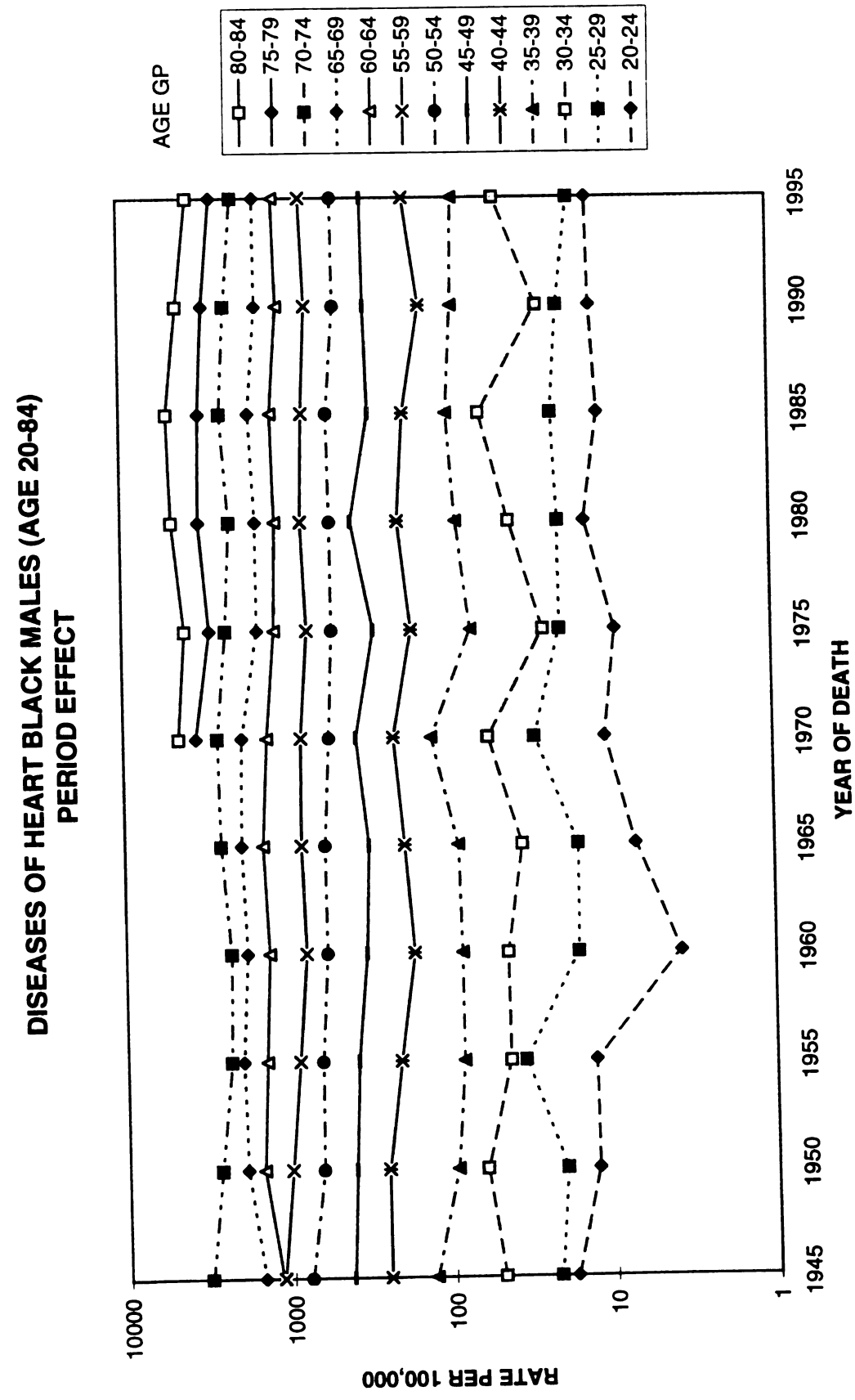

DISEASES OF HEART BLACK MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0007

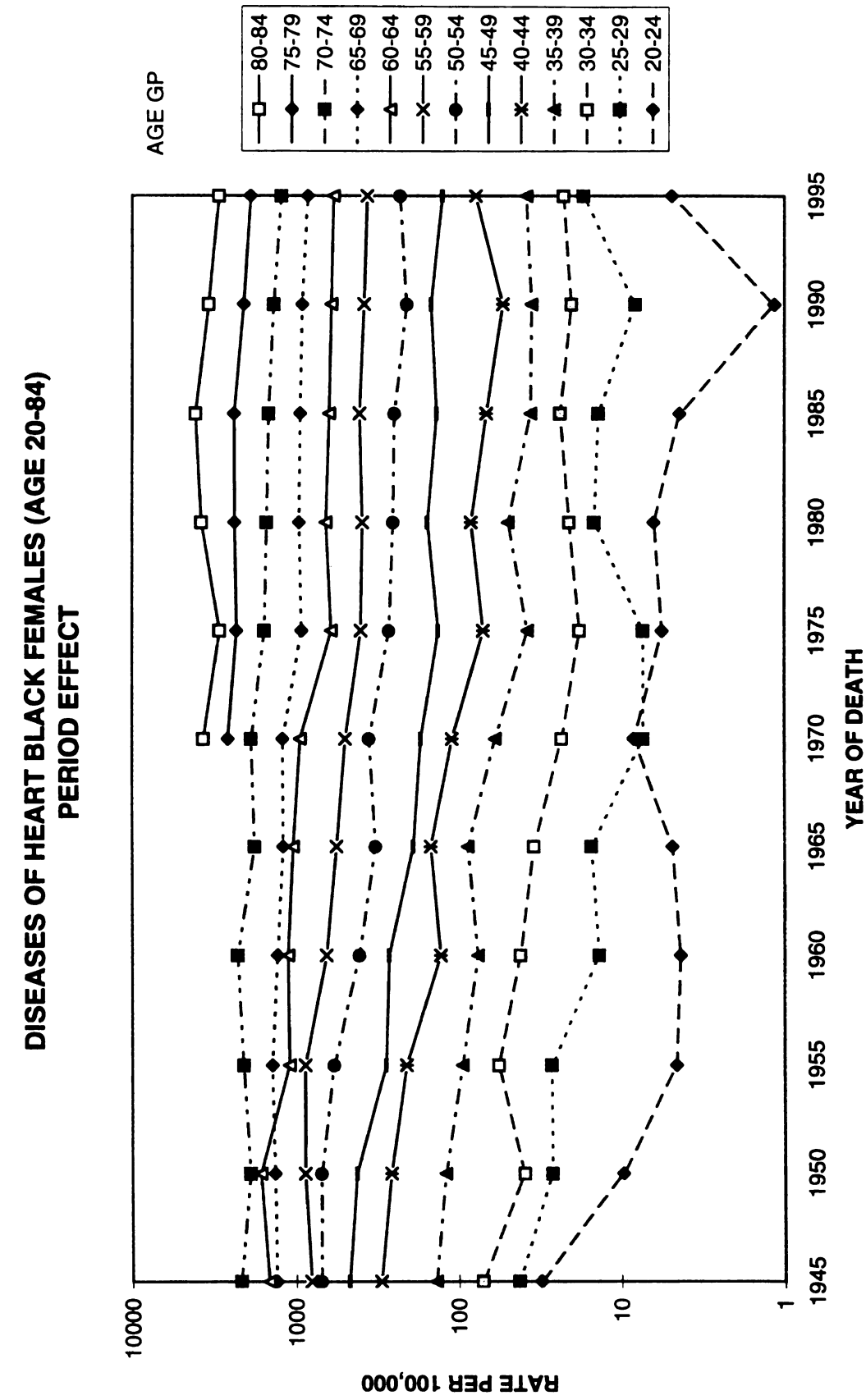

DISEASES OF HEART BLACK FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0008

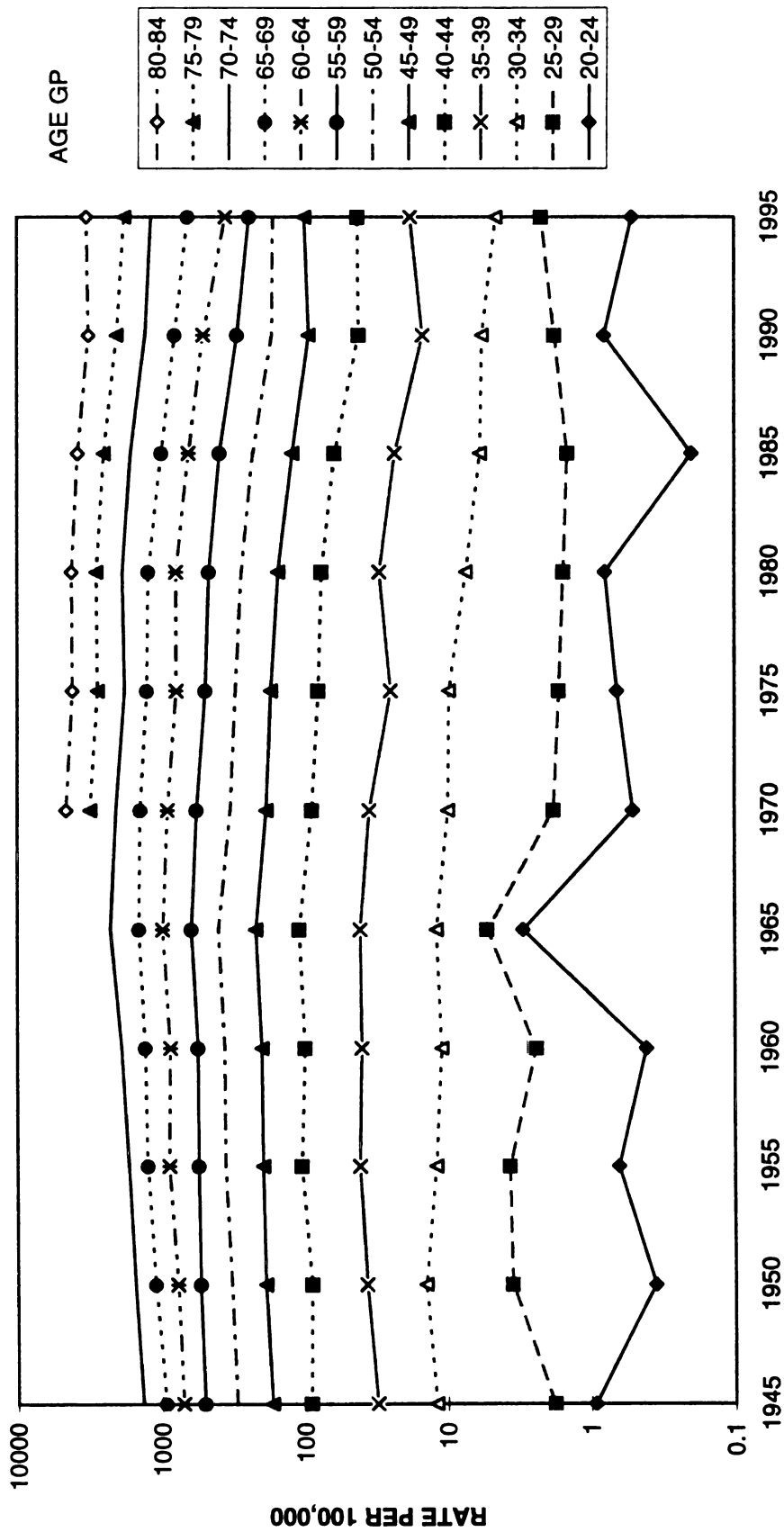

ISCHEMIC HEART DISEASE IN WHITE MALES (20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0009

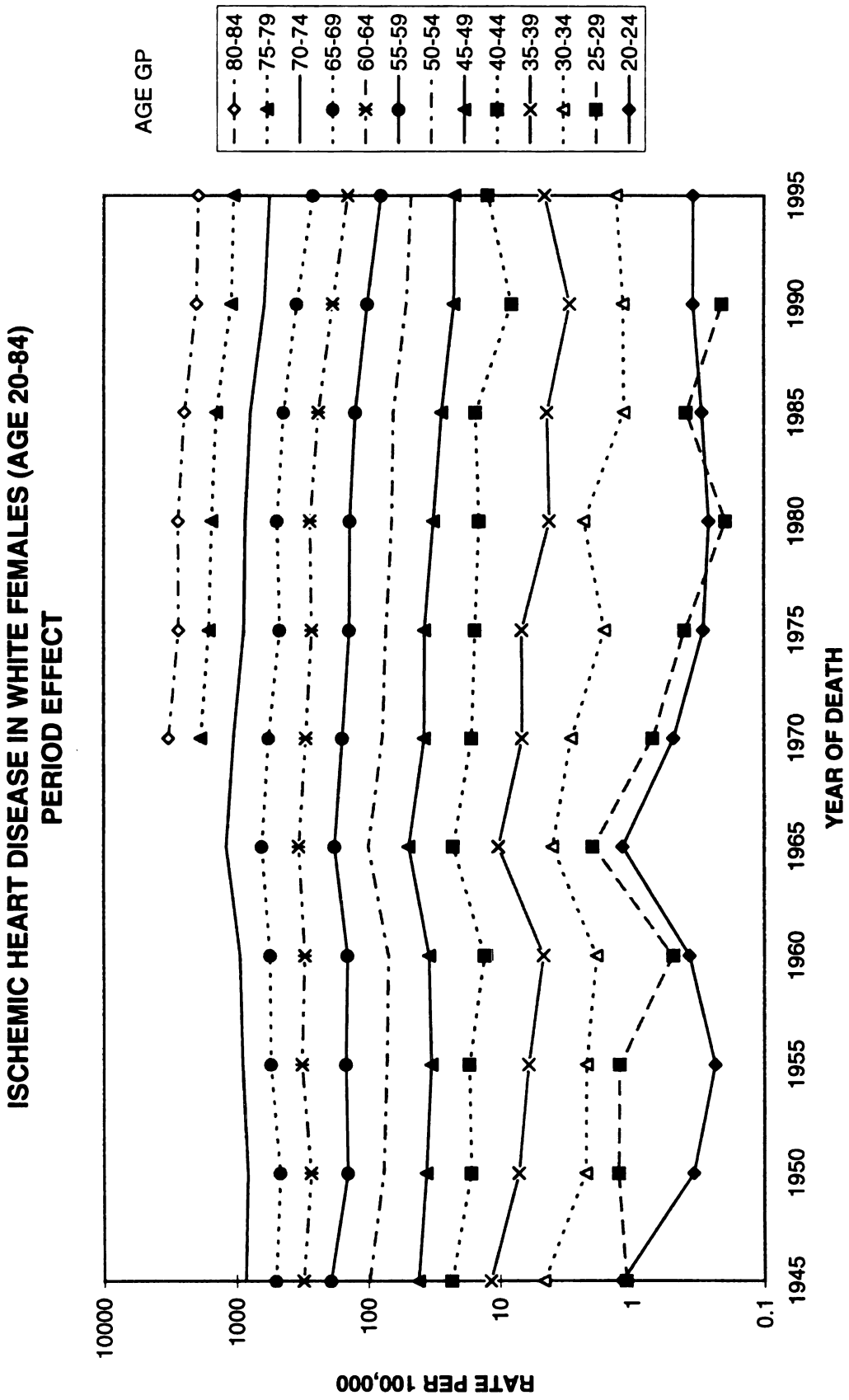

ISCHEMIC HEART DISEASE IN WHITE FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0010

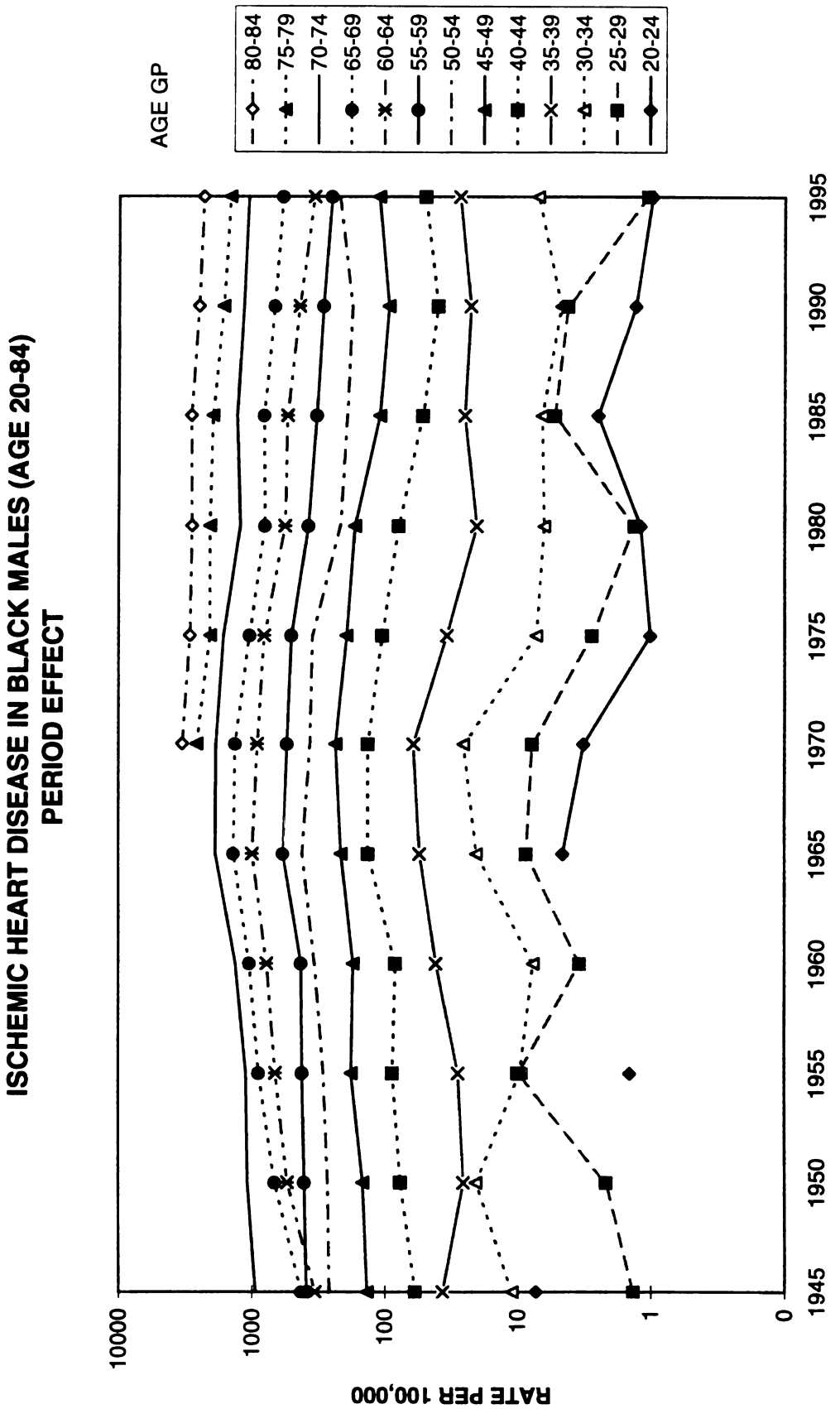

ISCHEMIC HEART DISEASE IN BLACK MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0011

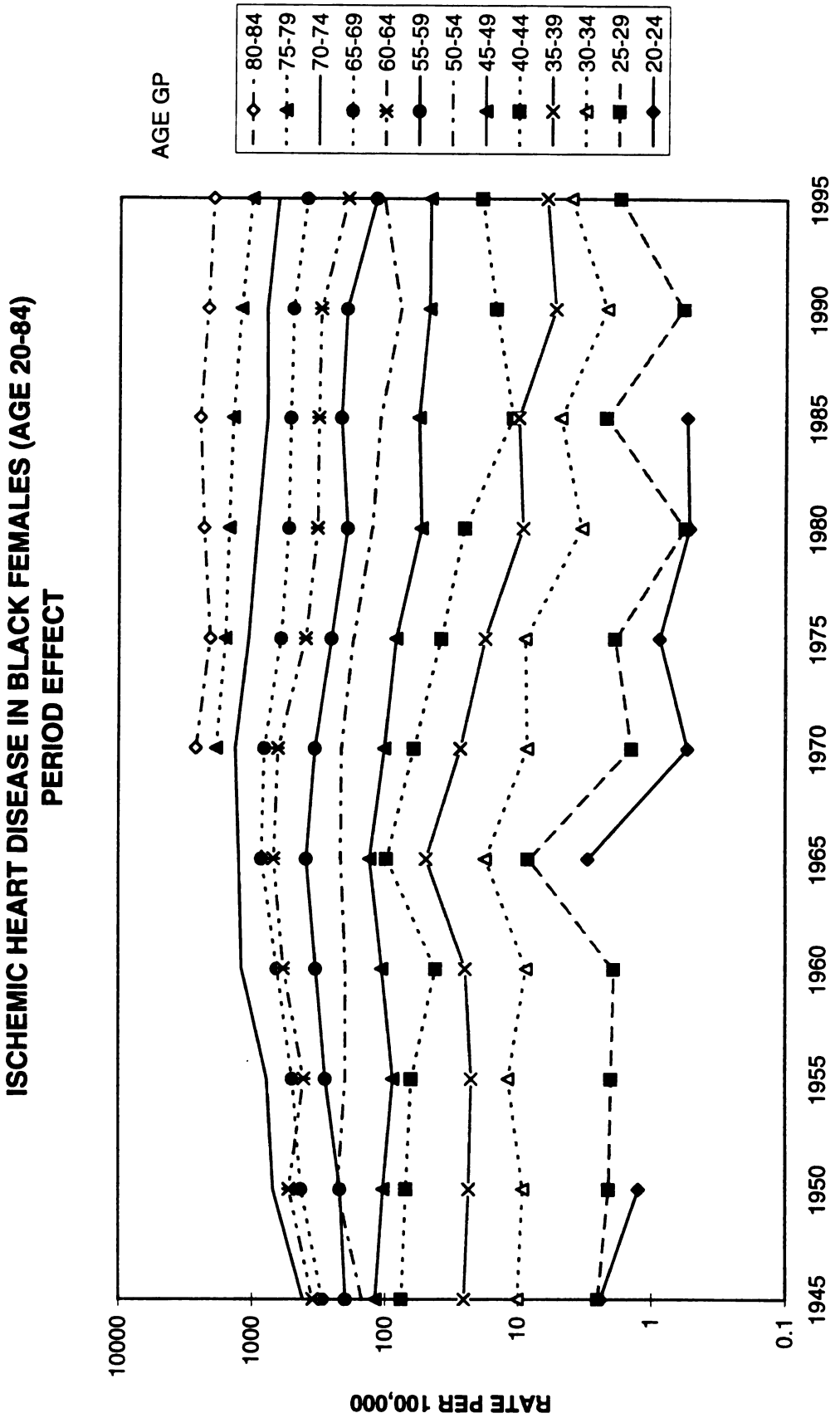

ISCHEMIC HEART DISEASE IN BLACK FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0012

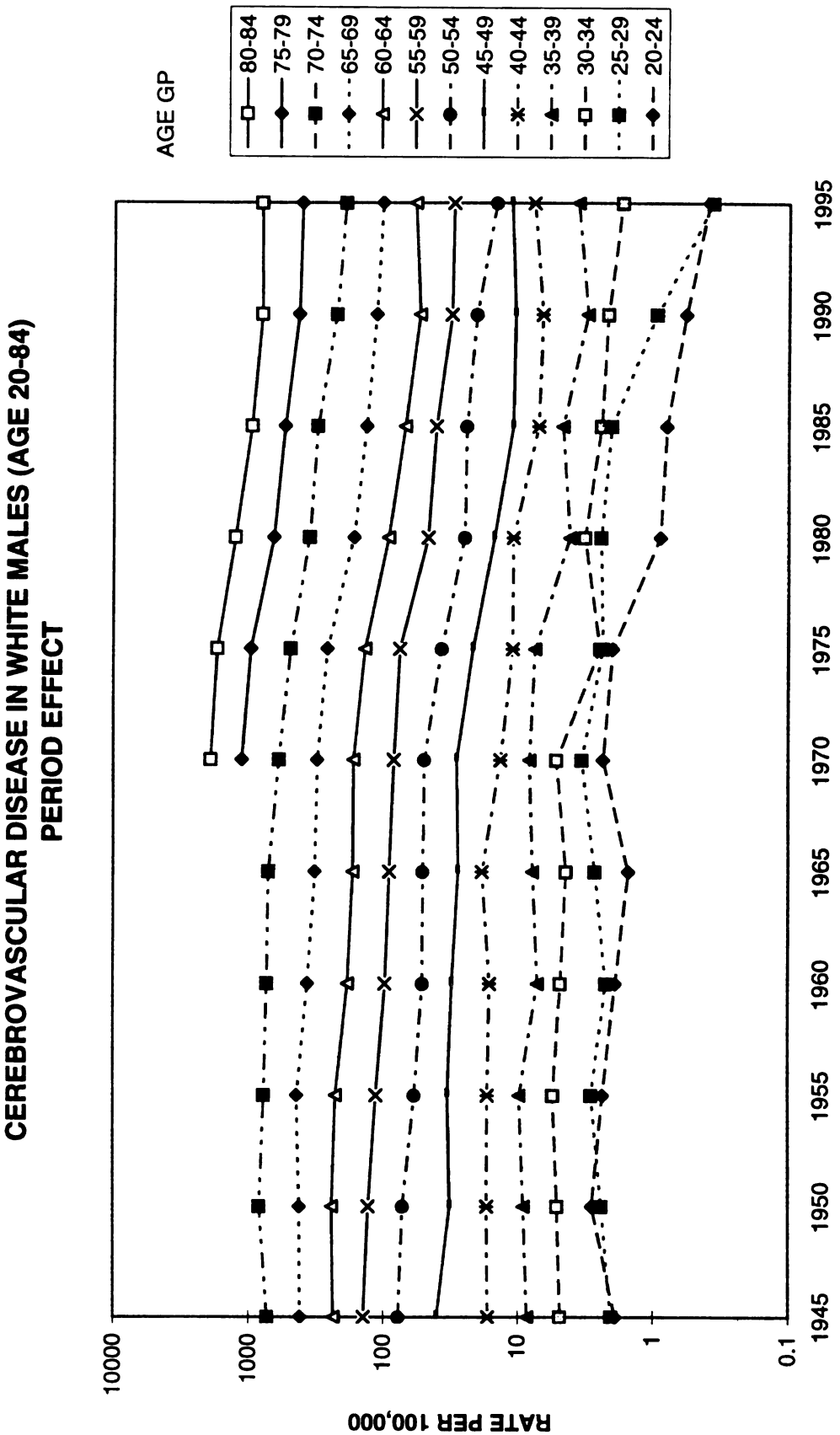

CEREBROVASCULAR DISEASE IN WHITE MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0013

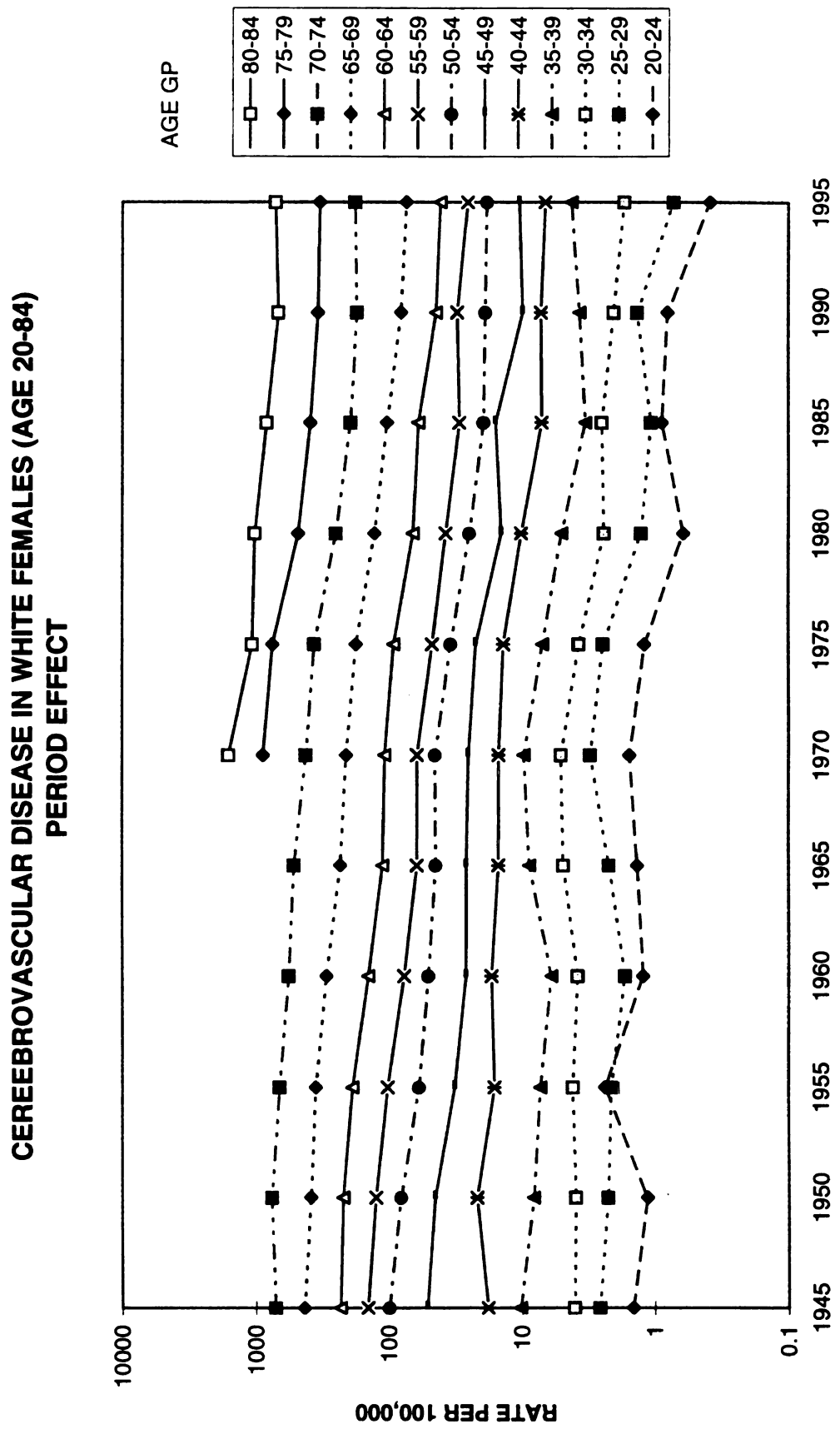

CEREBROVASCULAR DISEASE IN WHITE FEMALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0014

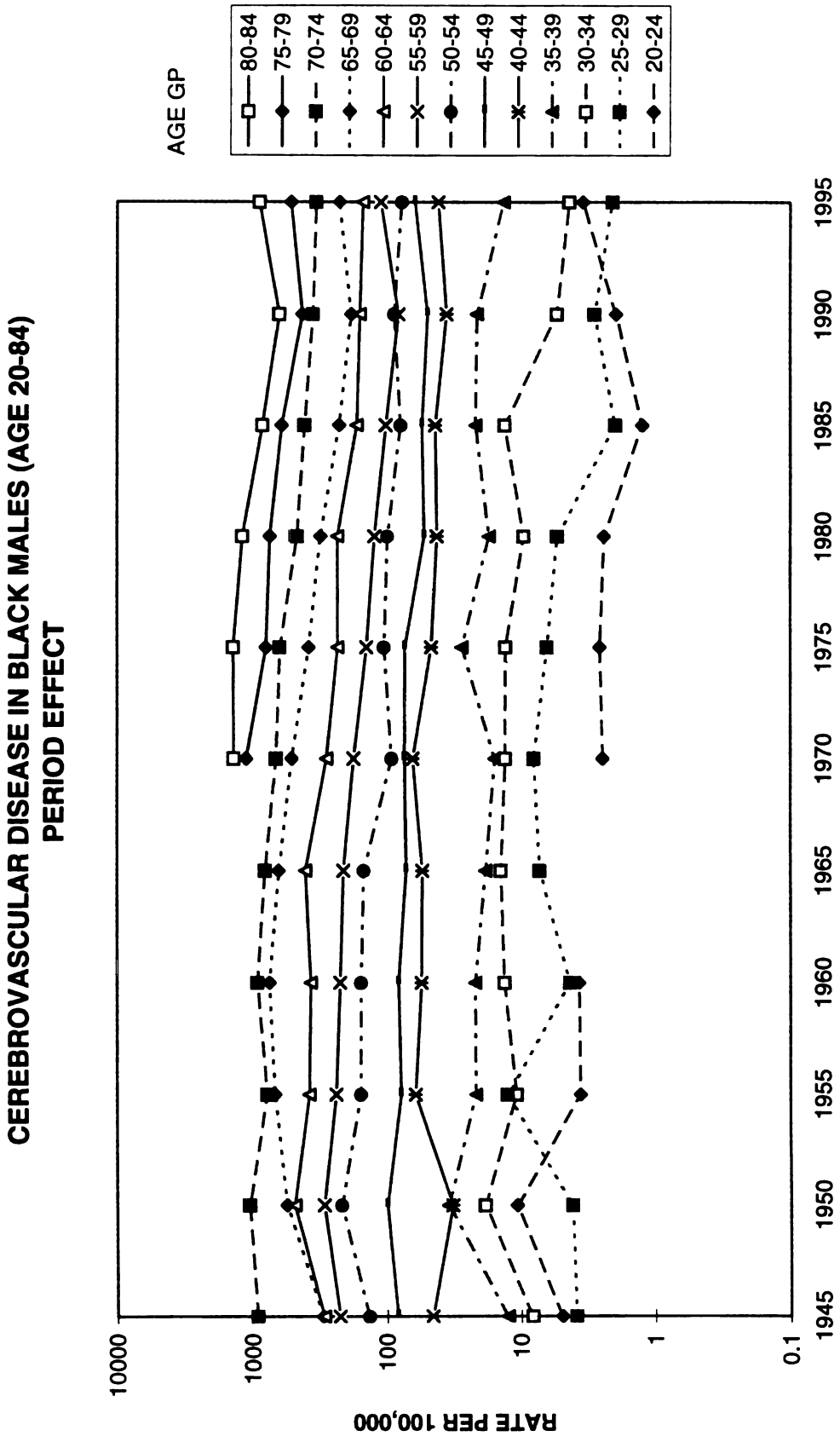

CEREBROVASCULAR DISEASE IN BLACK MALES (AGE 20-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0015

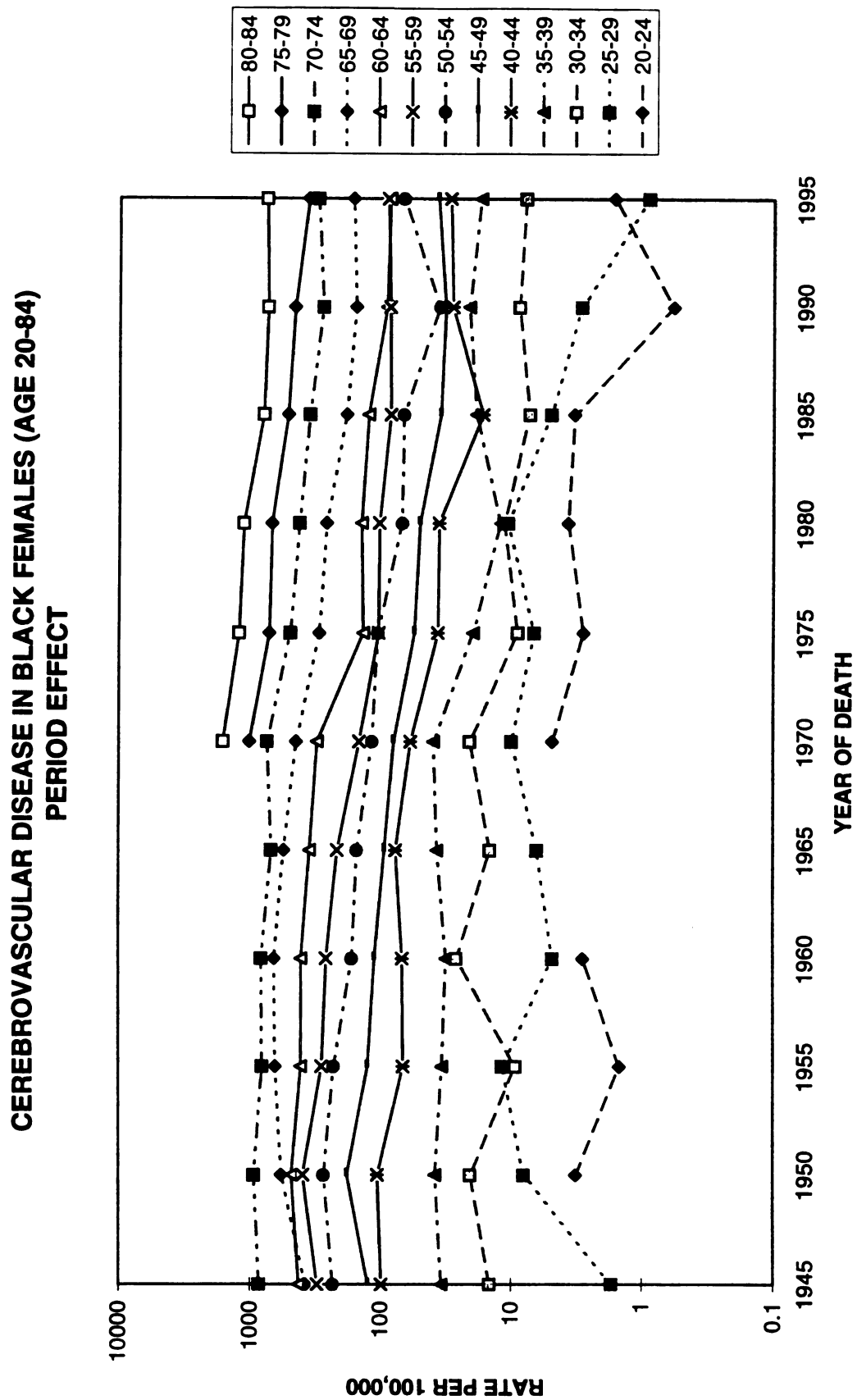

CEREBROVASCULAR DISEASE IN BLACK FEMALES (AGE 20-84)
PERIOD EFFECT
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
10000
1000
100
10
1
0.1
RATE PER 100,000
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0016

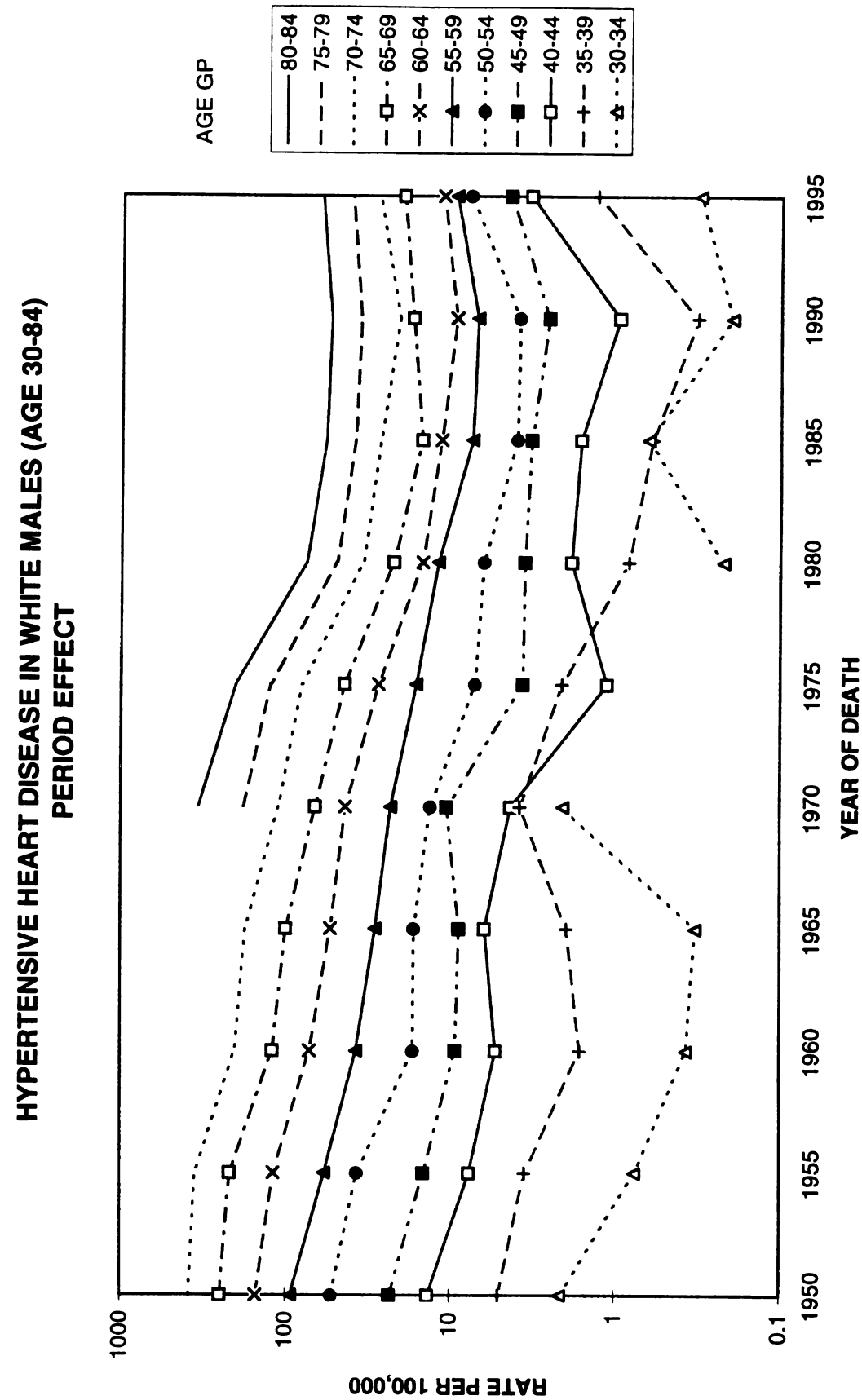

HYPERTENSIVE HEART DISEASE IN WHITE MALES (AGE 30-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
1000
100
10
1
0.1
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0017

HYPERTENSIVE HEART DISEASE IN WHITE FEMALES (AGE 30-84)
PERIOD EFFECT

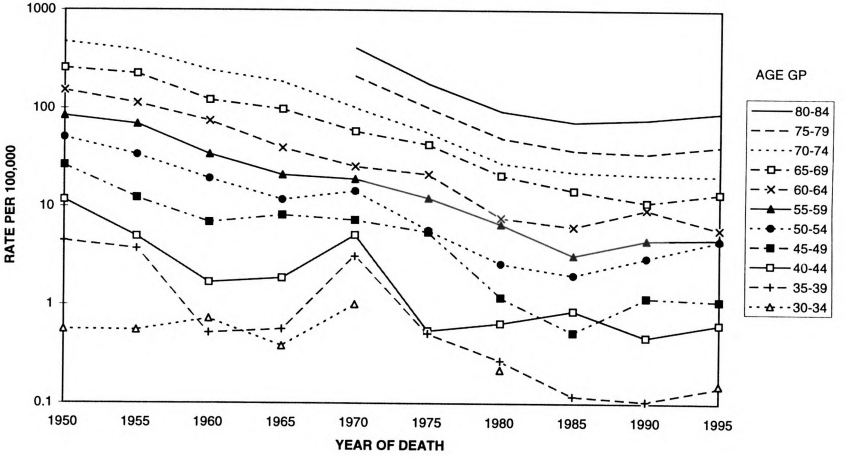


FIGURE 0018

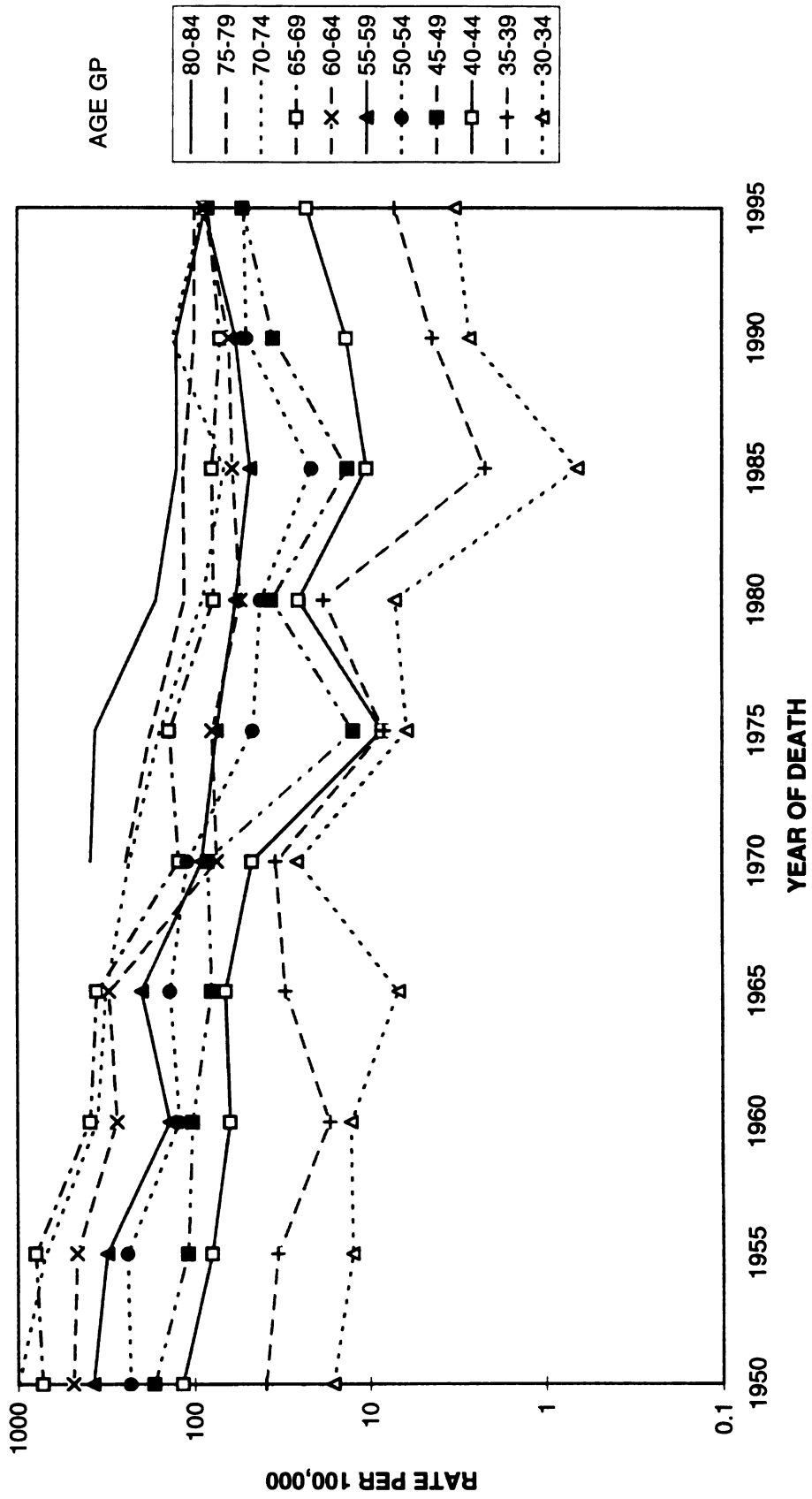

HYPERTENSIVE HEART DISEASE IN BLACK MALES (AGE 30-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
1000
100
10
1
0.1
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0019

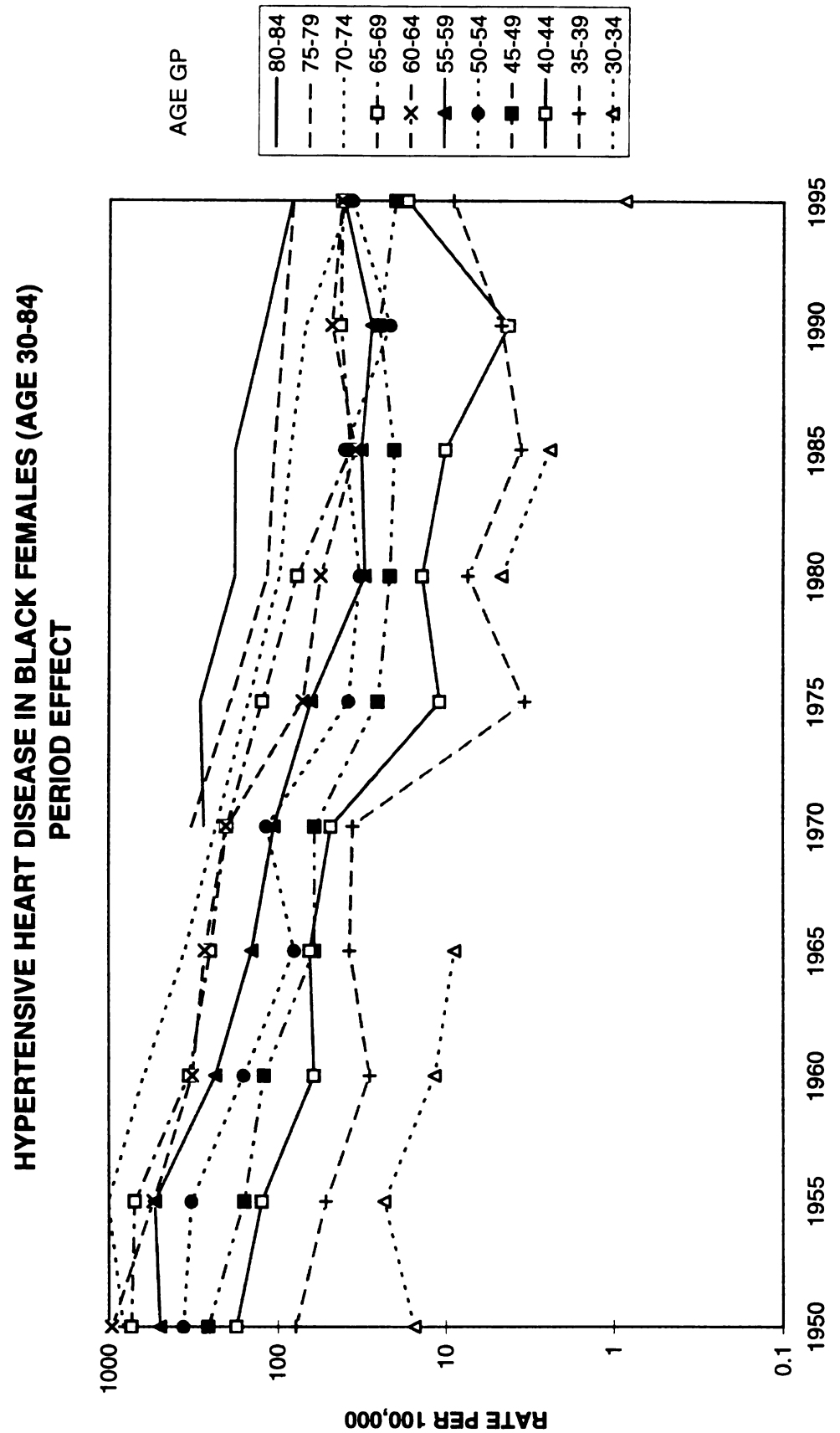

HYPERTENSIVE HEART DISEASE IN BLACK FEMALES (AGE 30-84)
PERIOD EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
1000
100
10
1
0.1
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
YEAR OF DEATH

FIGURE 0020

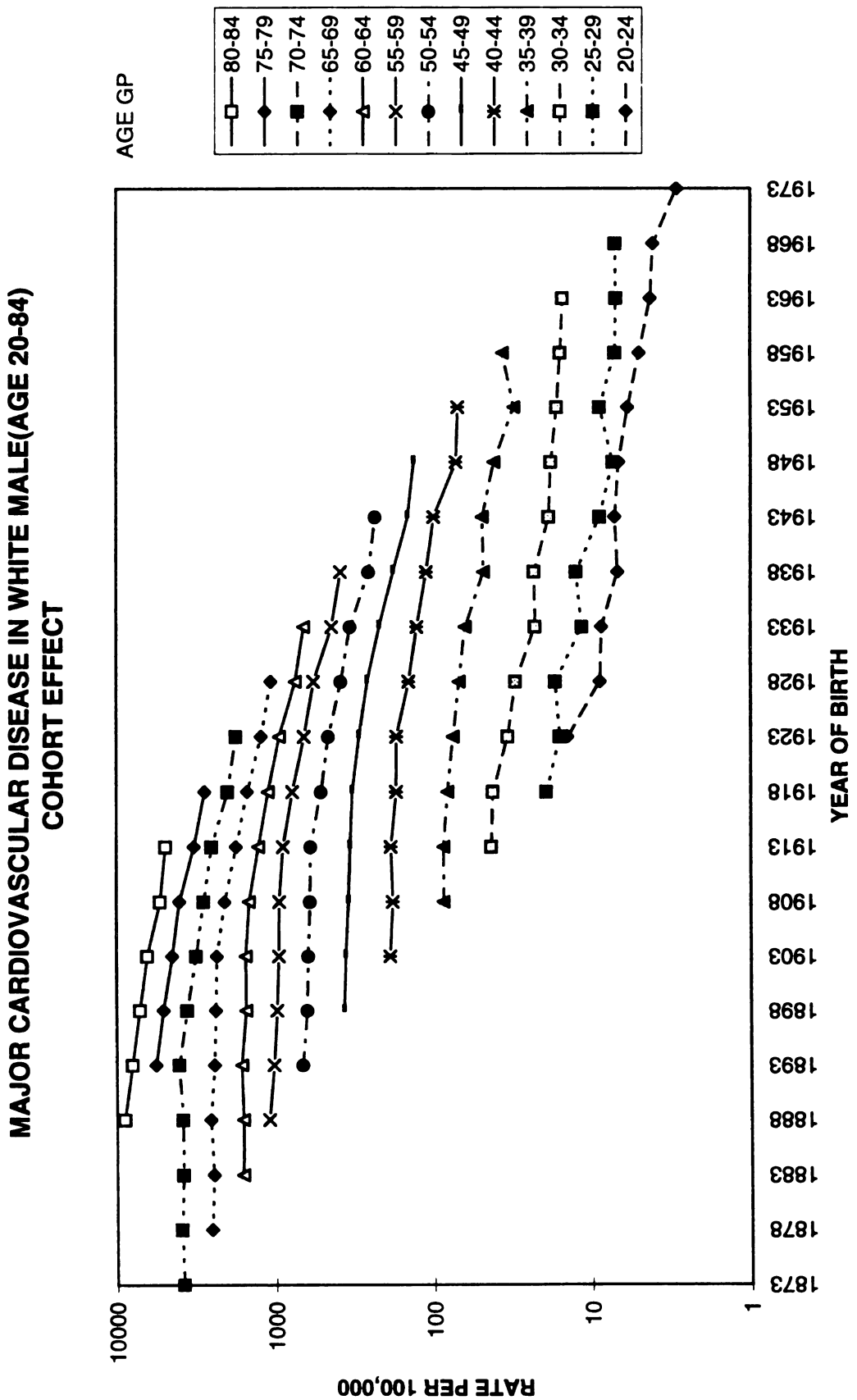
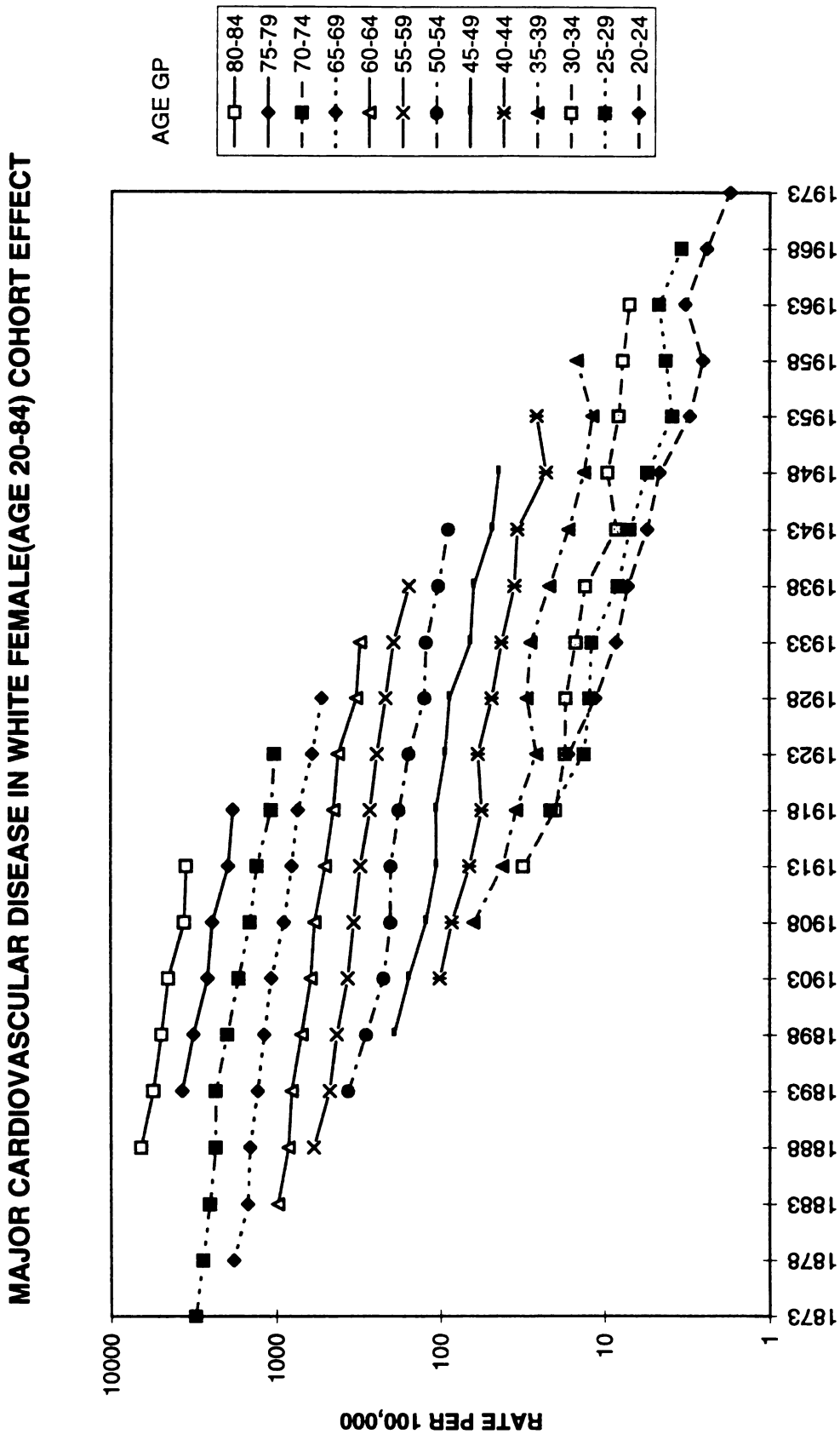

MAJOR CARDIOVASCULAR DISEASE IN WHITE MALE(AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
YEAR OF BIRTH
1873
1878
1883
1888
1893
1898
1903
1908
1913
1918
1923
1928
1933
1938
1943
1948
1953
1958
1963
1968
1973

FIGURE 0021


MAJOR CARDIOVASCULAR DISEASE IN WHITE FEMALE(AGE 20-84) COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
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YEAR OF BIRTH
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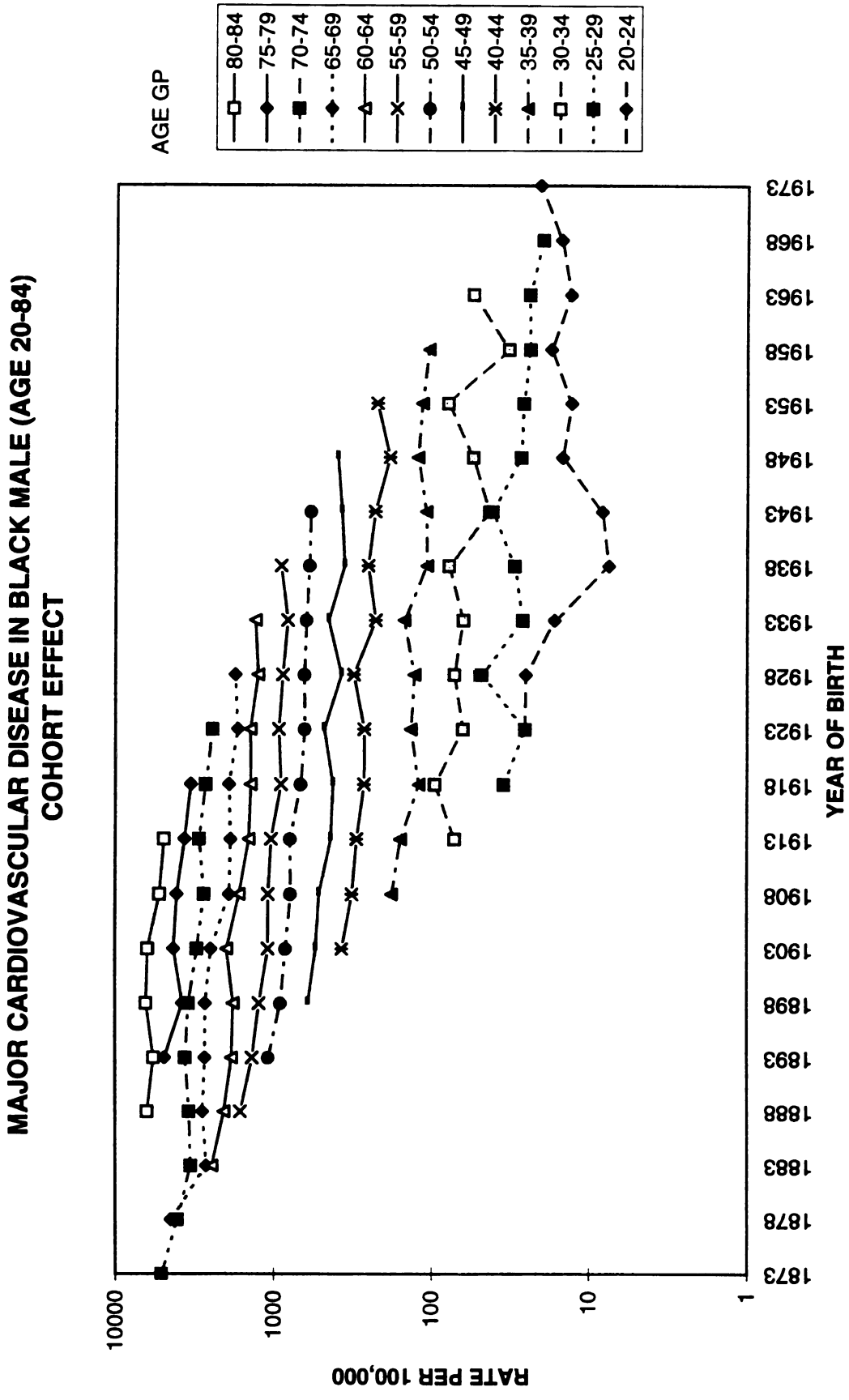
FIGURE 0022


MAJOR CARDIOVASCULAR DISEASE IN BLACK MALE (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
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YEAR OF BIRTH
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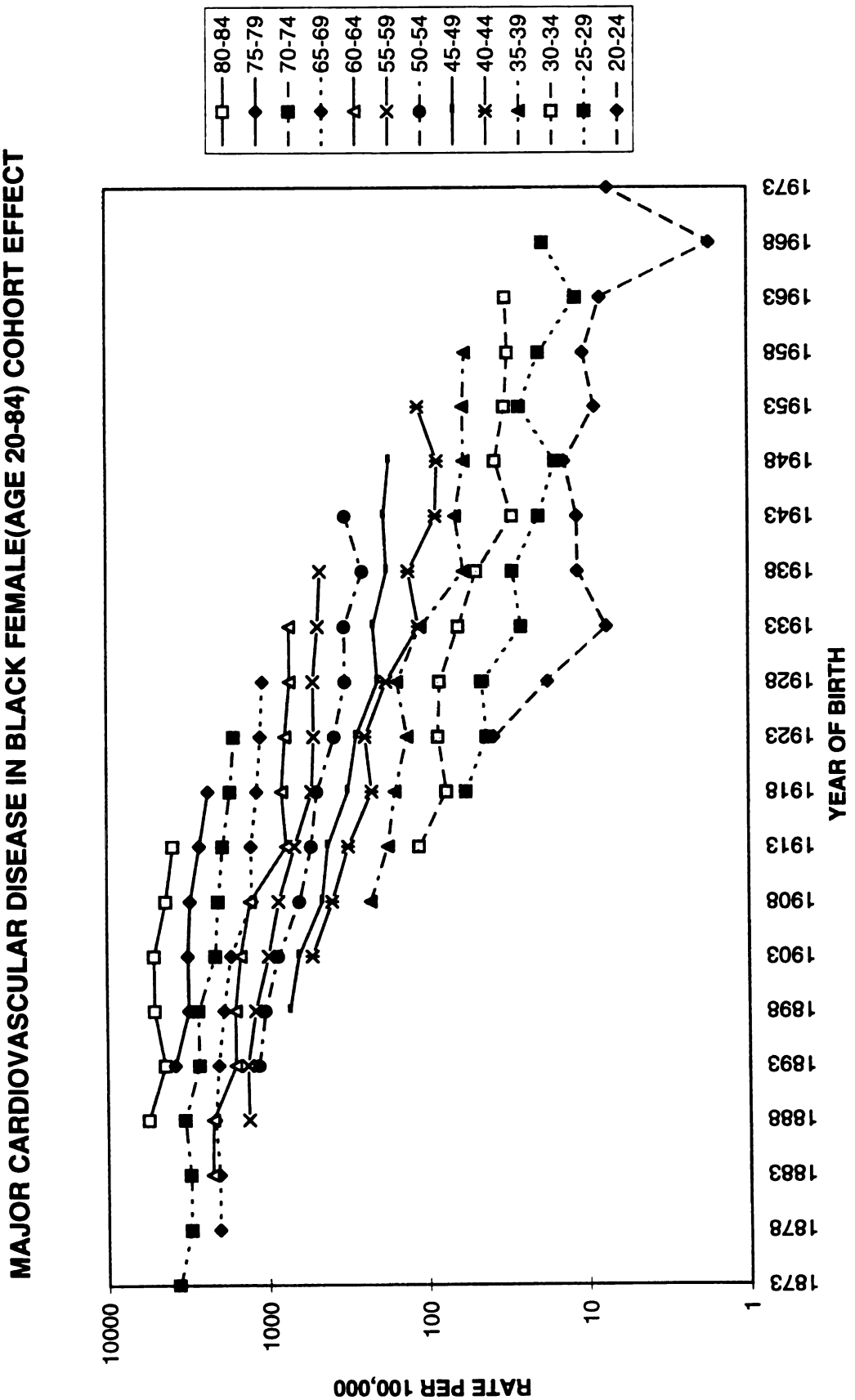
FIGURE 0023


MAJOR CARDIOVASCULAR DISEASE IN BLACK FEMALE(AGE 20-84) COHORT EFFECT
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
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YEAR OF BIRTH
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FIGURE 0024

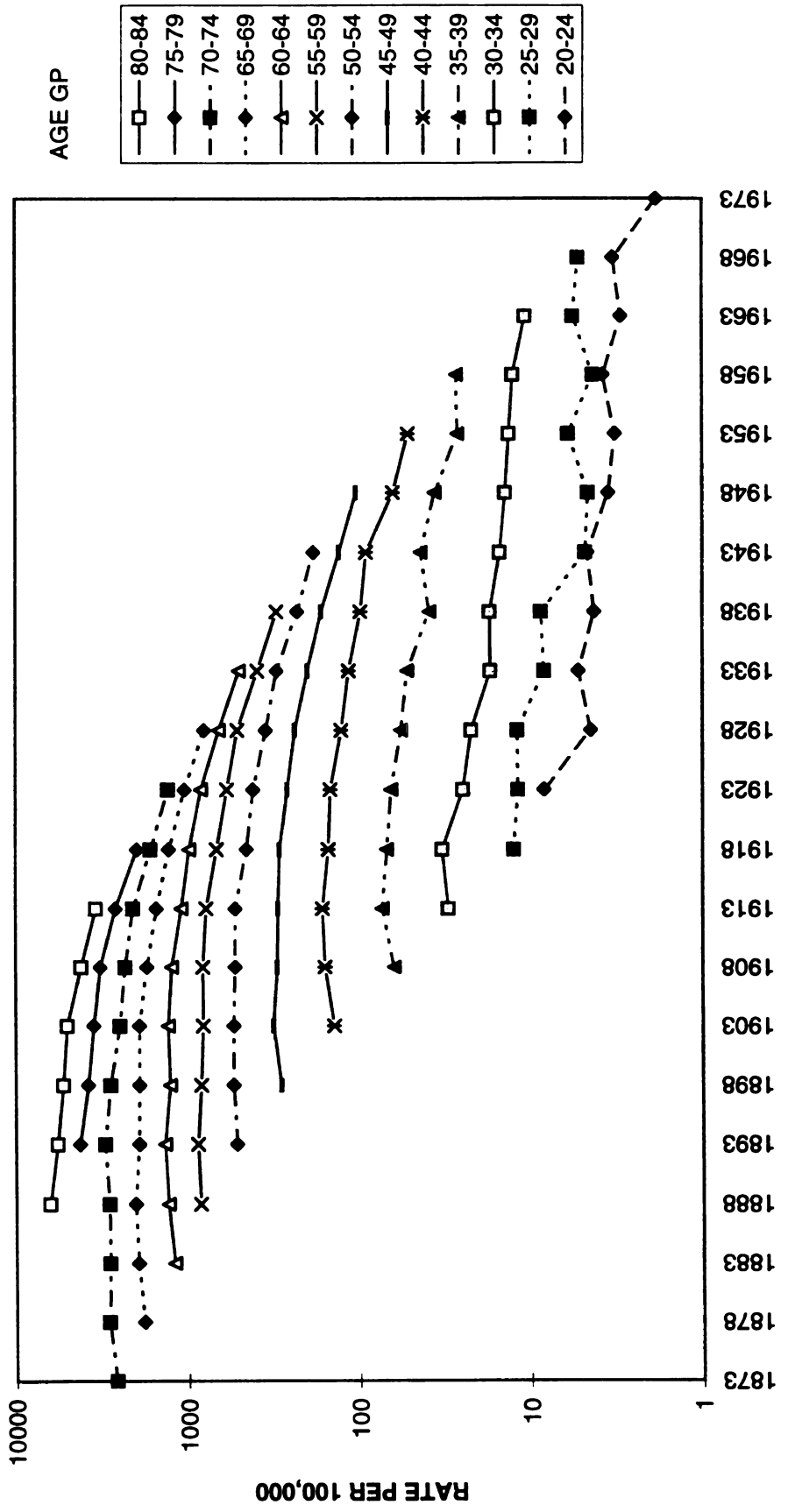
DISEASES OF HEART IN WHITE MALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
YEAR OF BIRTH
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FIGURE 0025

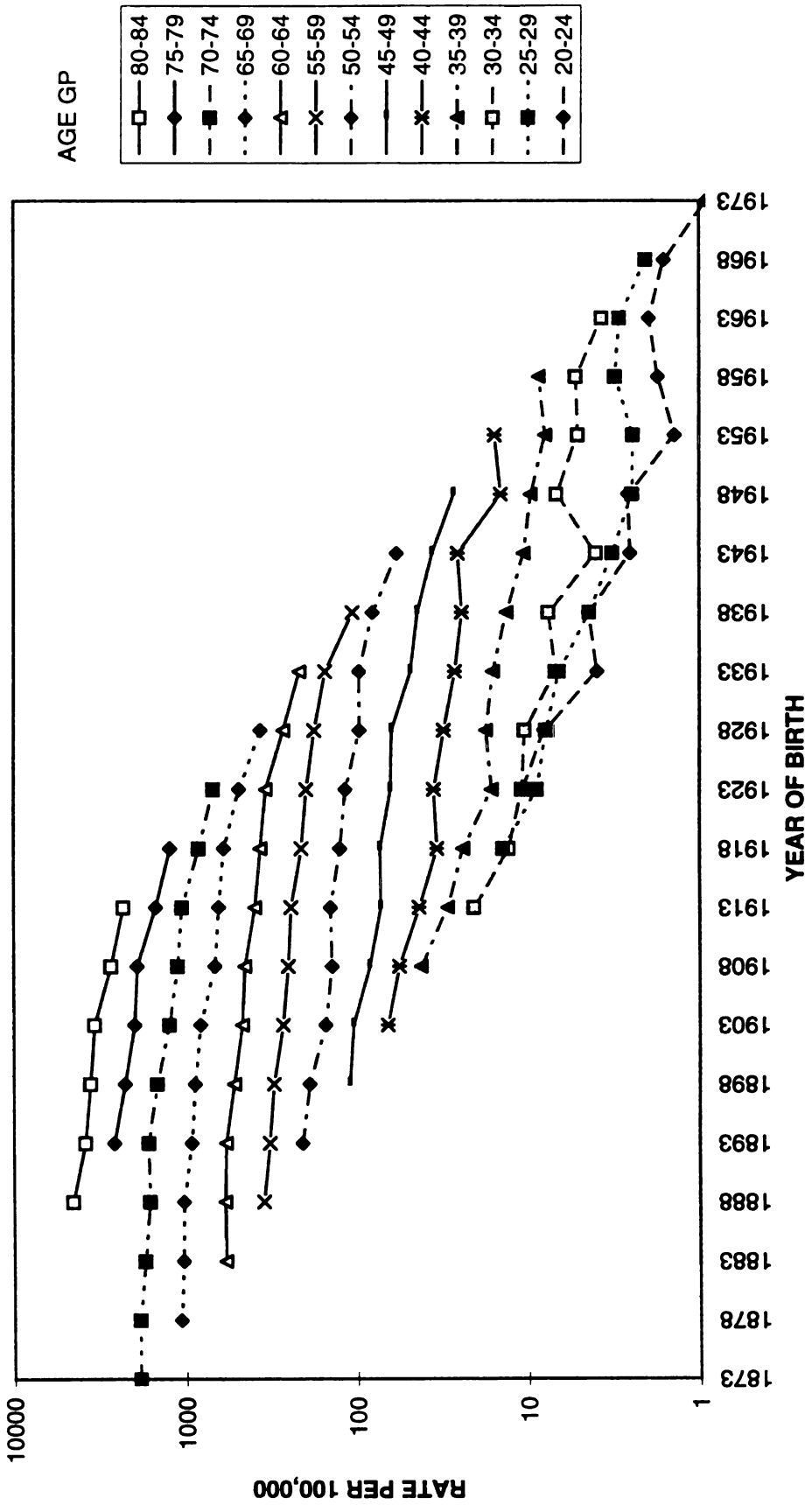
DISEASES OF HEART WHITE FEMALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
YEAR OF BIRTH
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FIGURE 0026

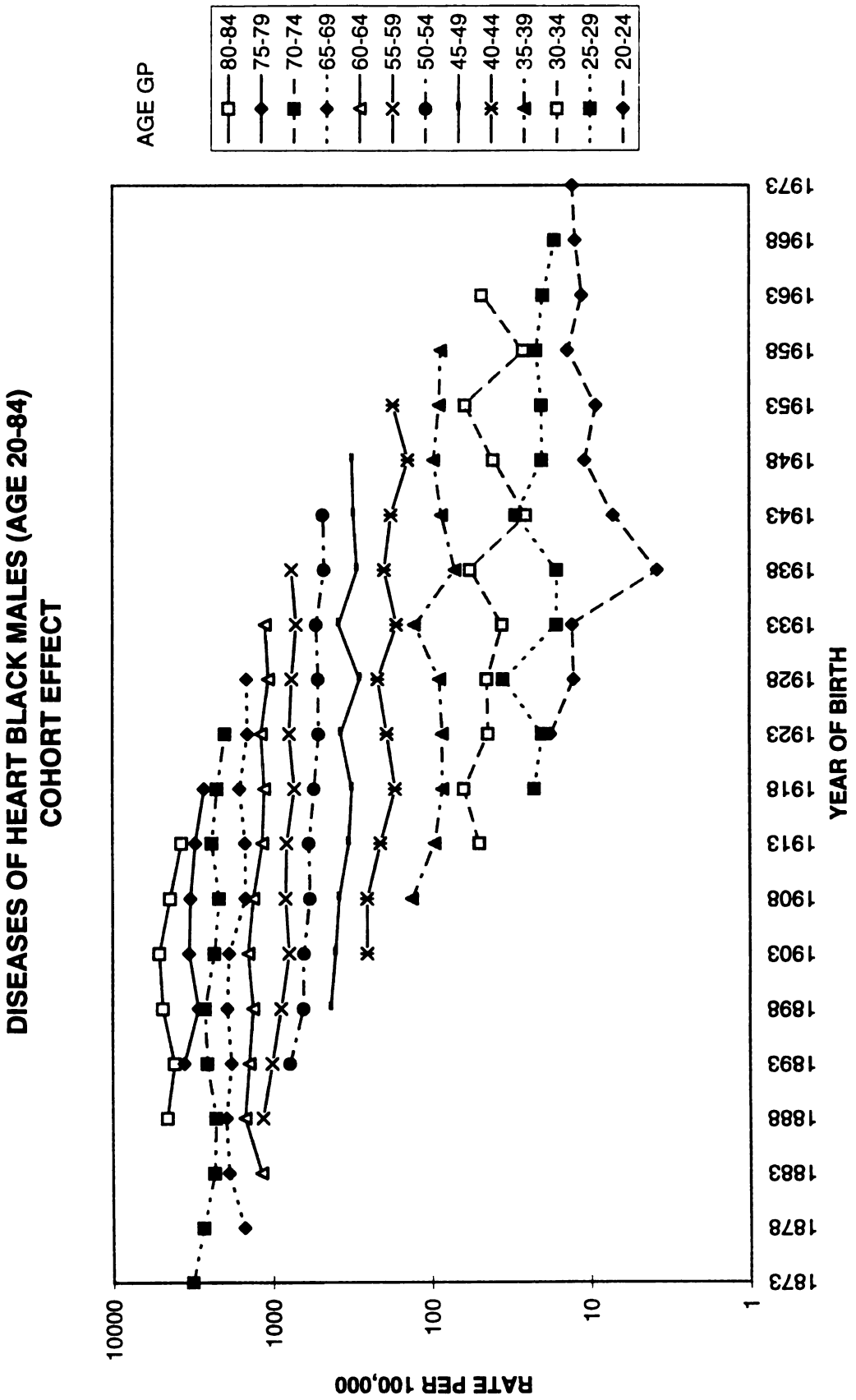
DISEASES OF HEART BLACK MALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
YEAR OF BIRTH
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FIGURE 0027

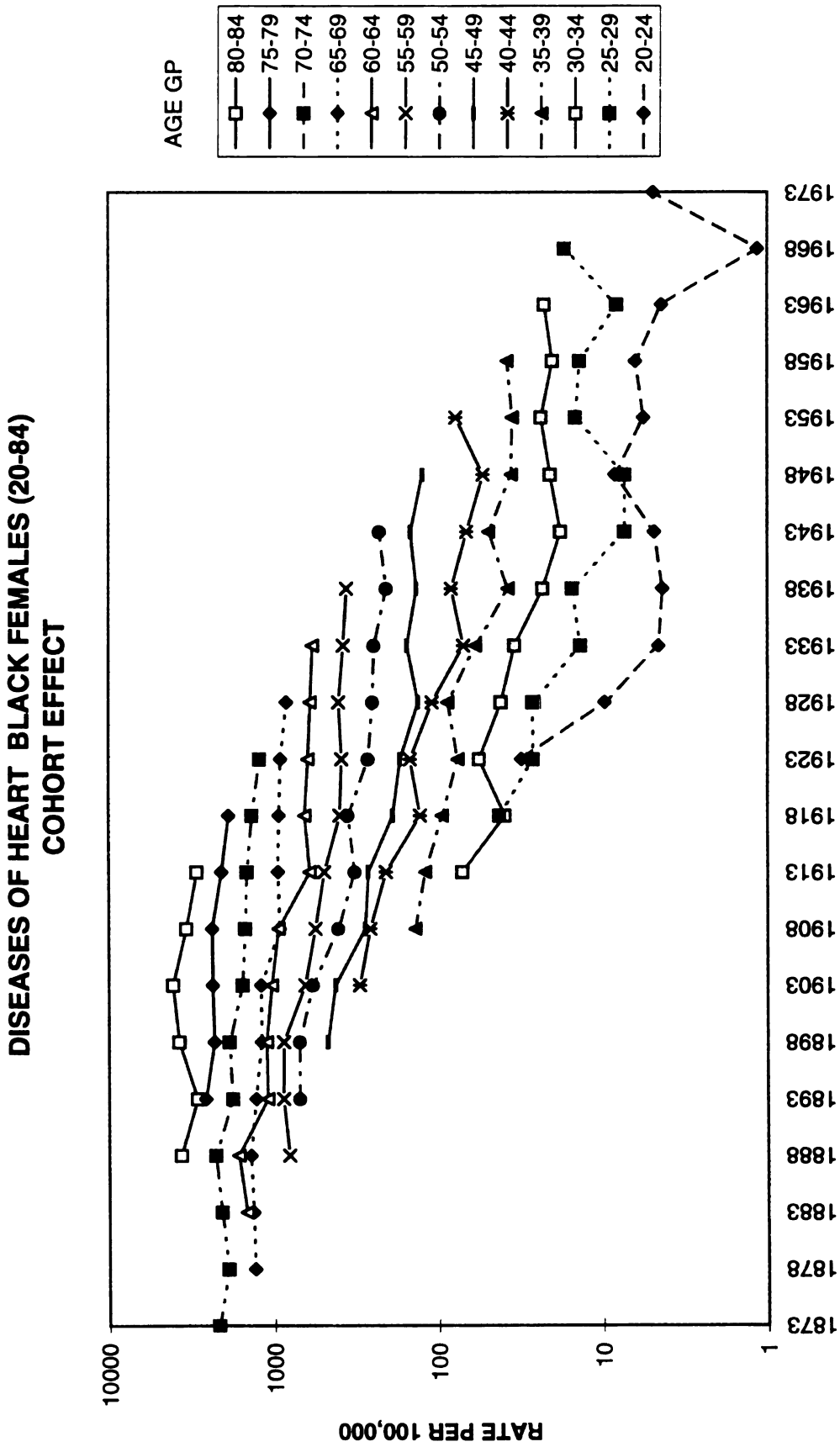
DISEASES OF HEART BLACK FEMALES (20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
YEAR OF BIRTH
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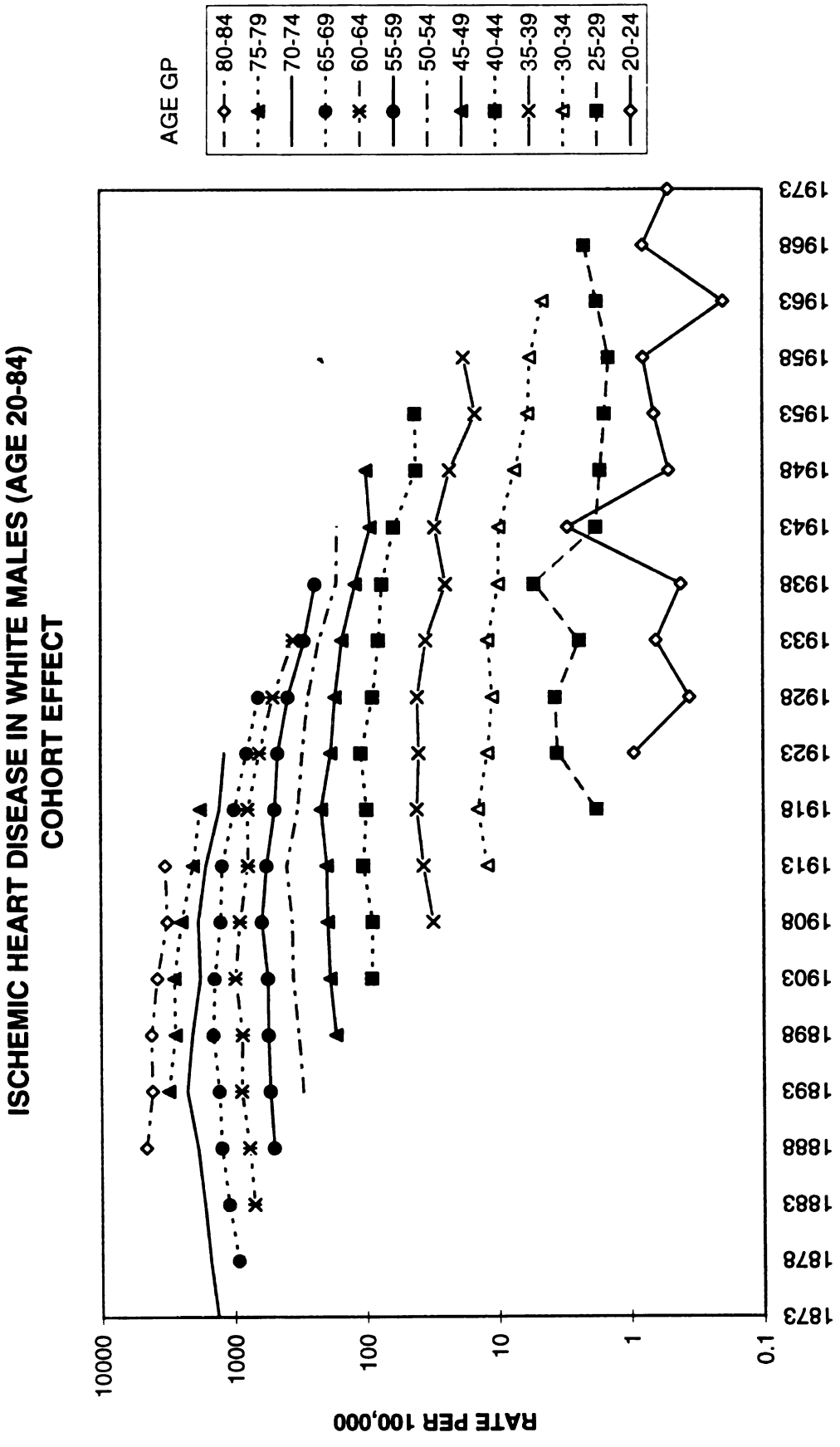
FIGURE 0028


ISCHEMIC HEART DISEASE IN WHITE MALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
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10
1
0.1
YEAR OF BIRTH
1873
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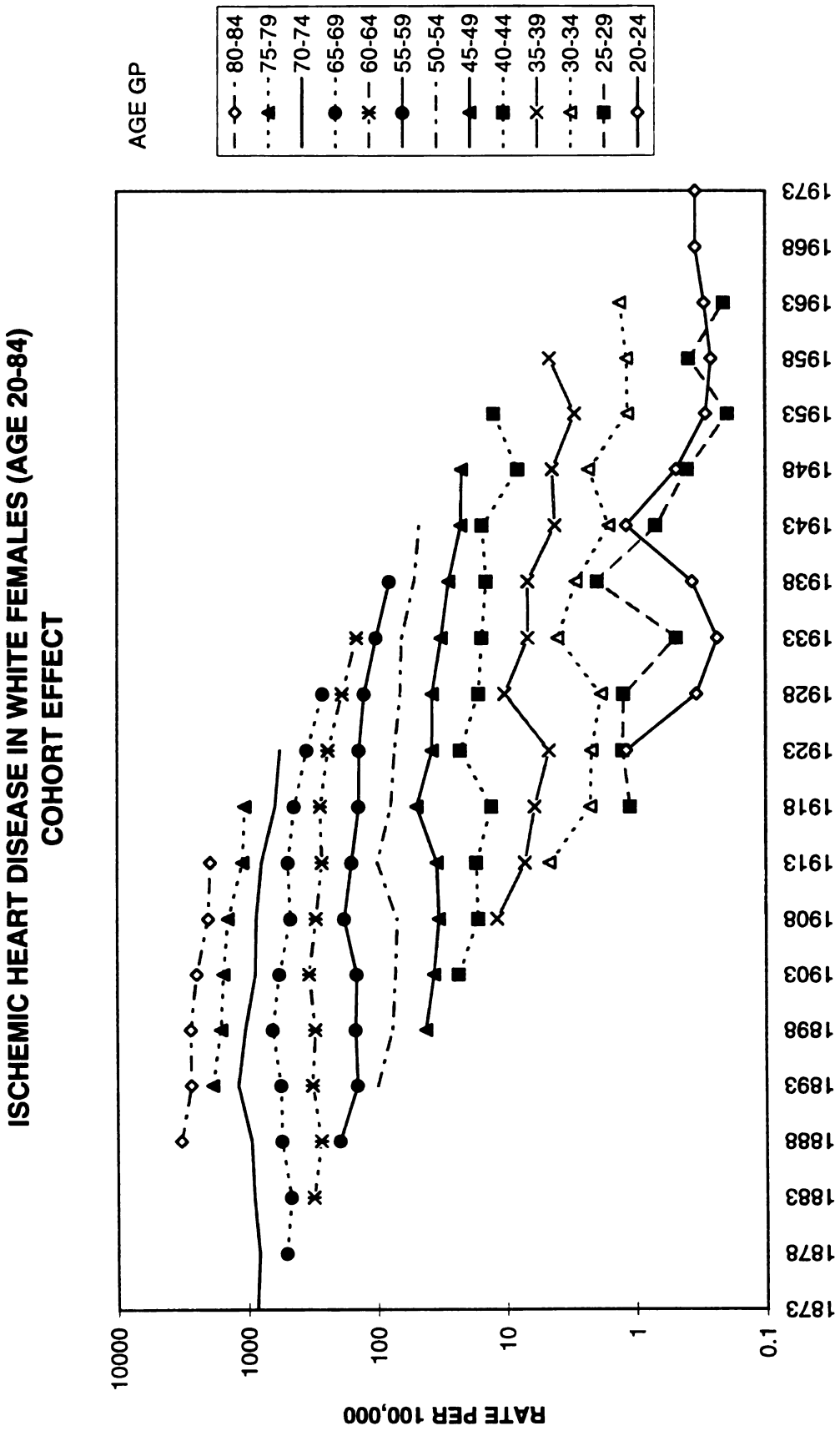
FIGURE 0029


ISCHEMIC HEART DISEASE IN WHITE FEMALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
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30-34
25-29
20-24
RATE PER 100,000
10000
1000
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YEAR OF BIRTH
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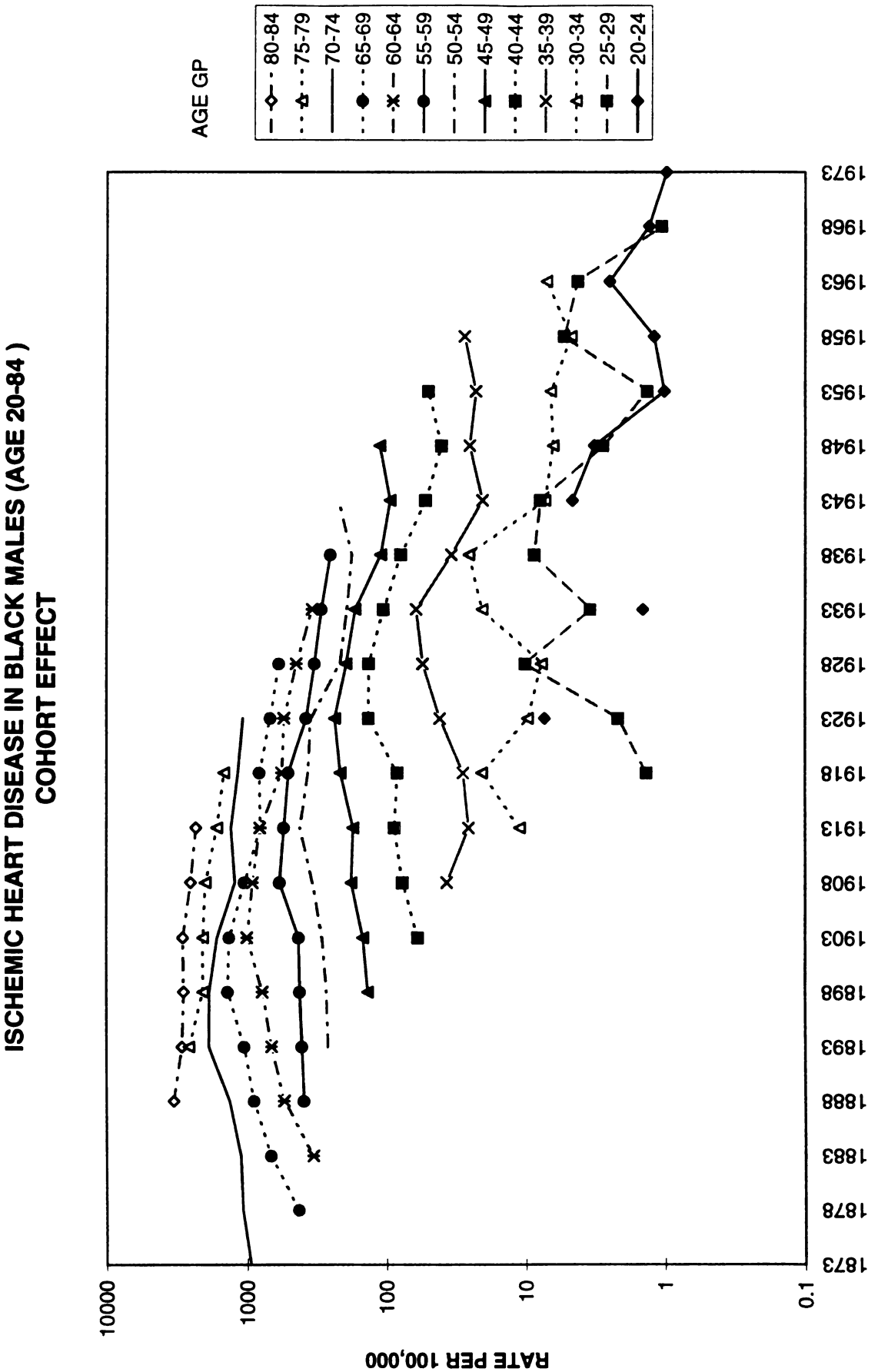
FIGURE 0030


ISCHEMIC HEART DISEASE IN BLACK MALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
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10
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YEAR OF BIRTH
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FIGURE 0031

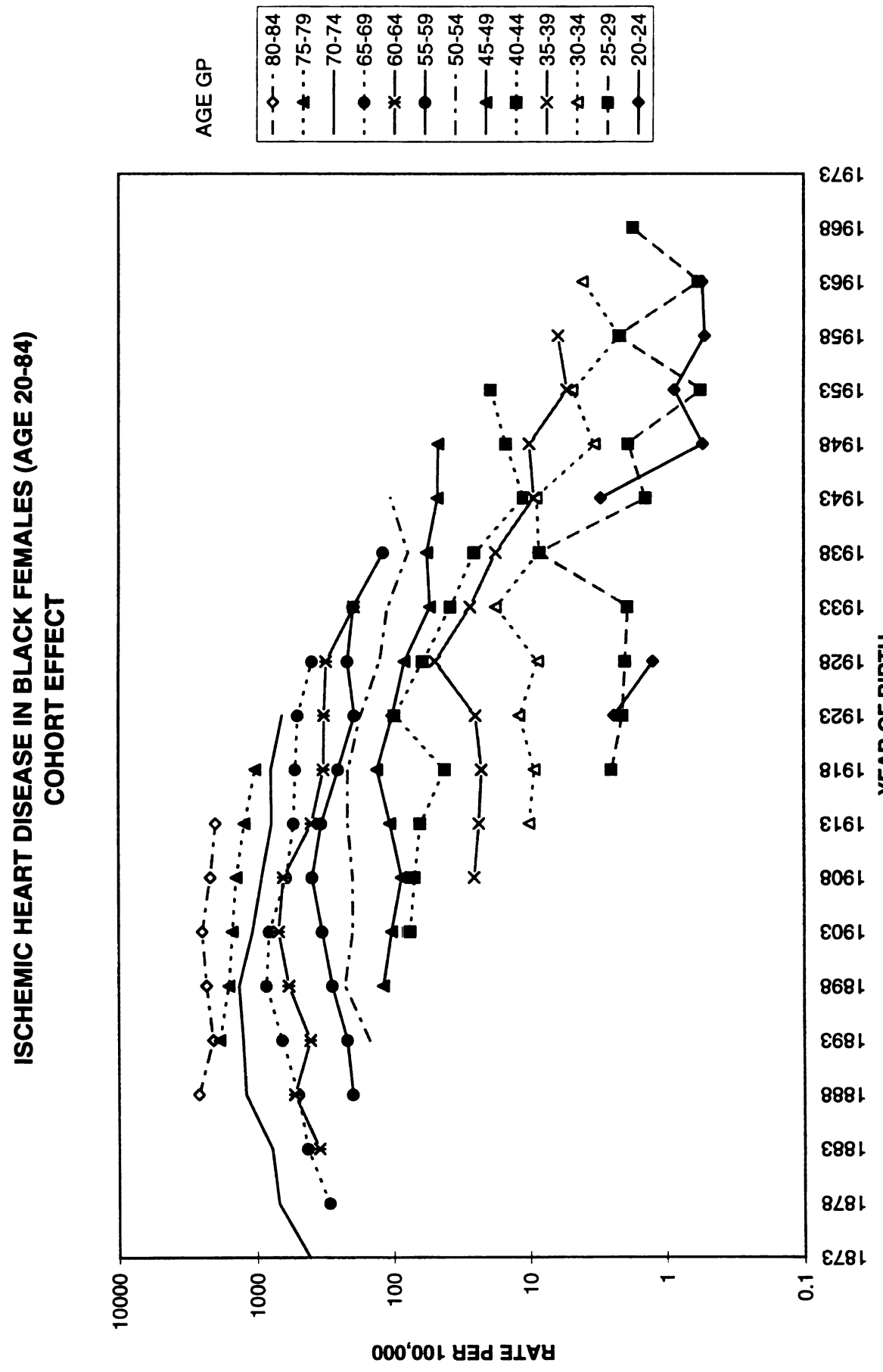
ISCHEMIC HEART DISEASE IN BLACK FEMALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
YEAR OF BIRTH
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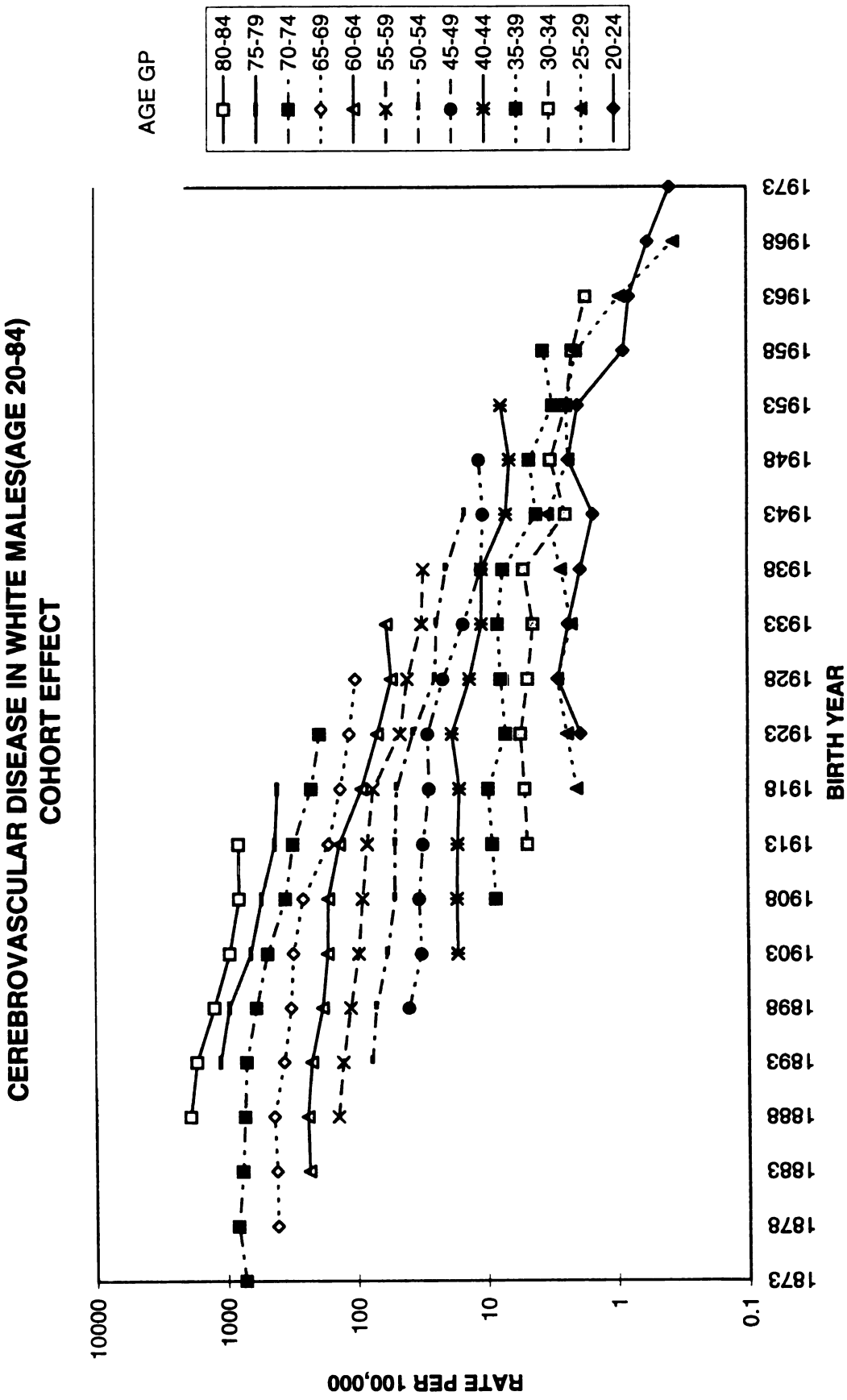
FIGURE 0032


CEREBROVASCULAR DISEASE IN WHITE MALES(AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
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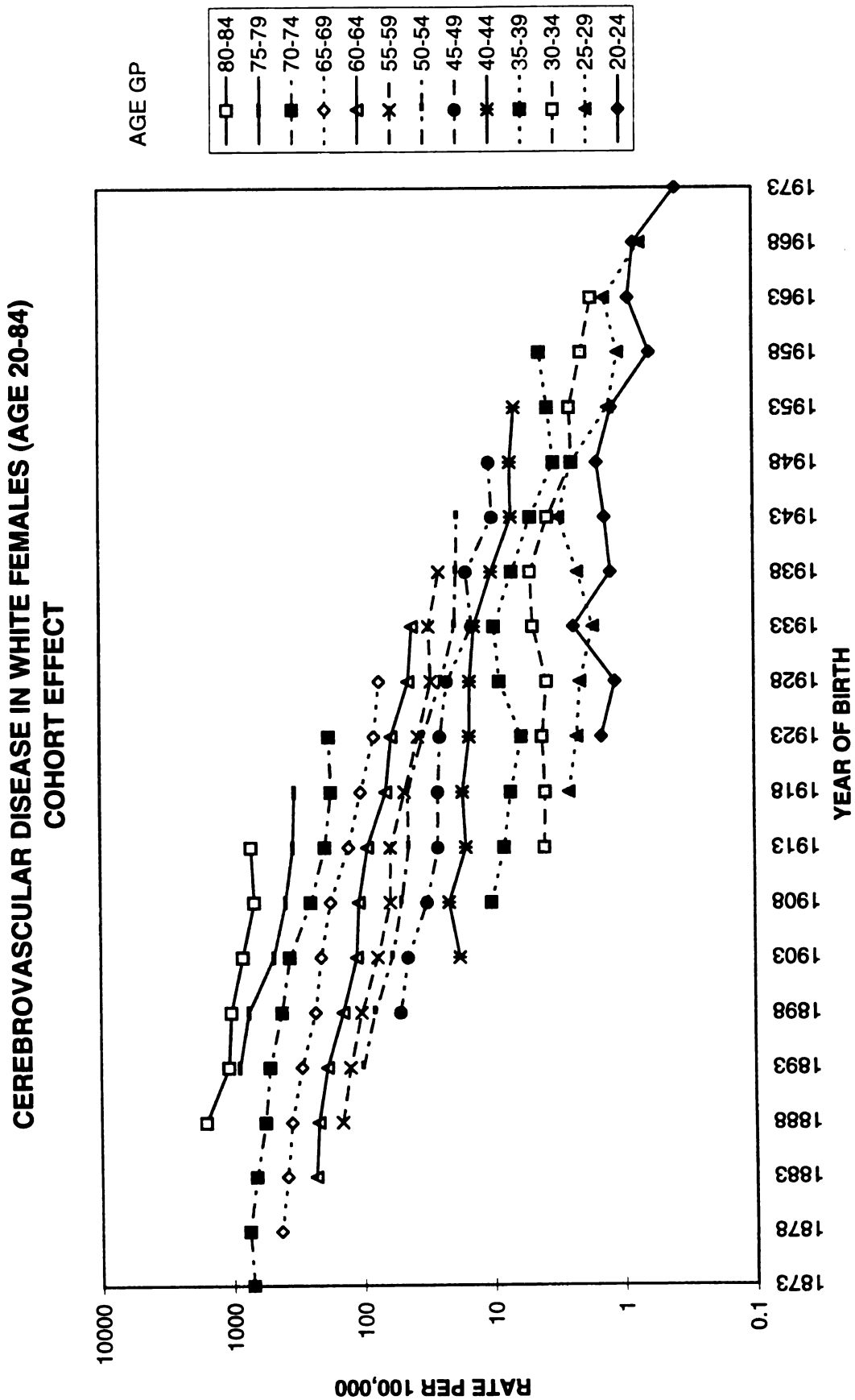
1968
1973
BIRTH YEAR

FIGURE 0033


CEREBROVASCULAR DISEASE IN WHITE FEMALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
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YEAR OF BIRTH
1873
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FIGURE 0034

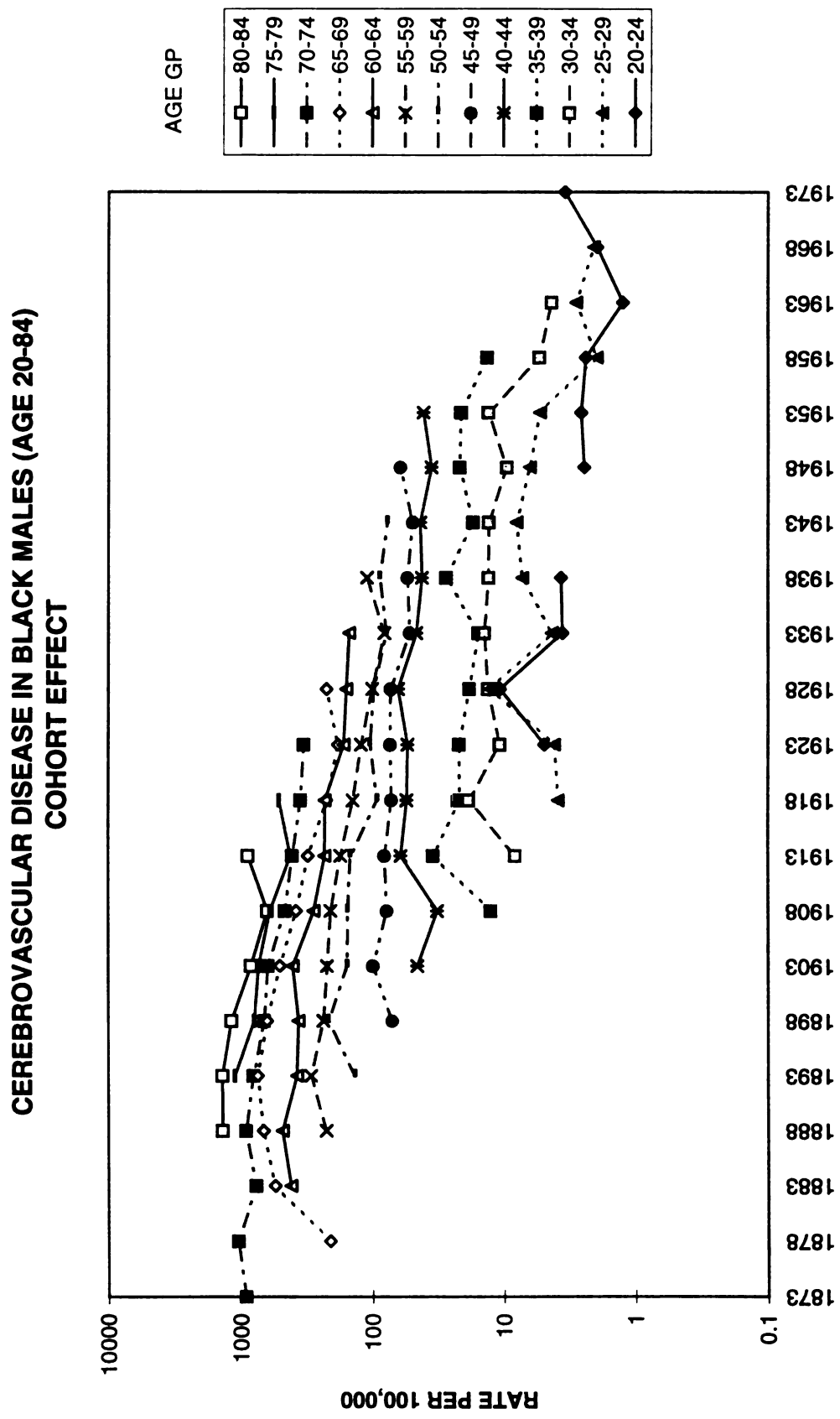
CEREBROVASCULAR DISEASE IN BLACK MALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
YEAR OF BIRTH
1873
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FIGURE 0035

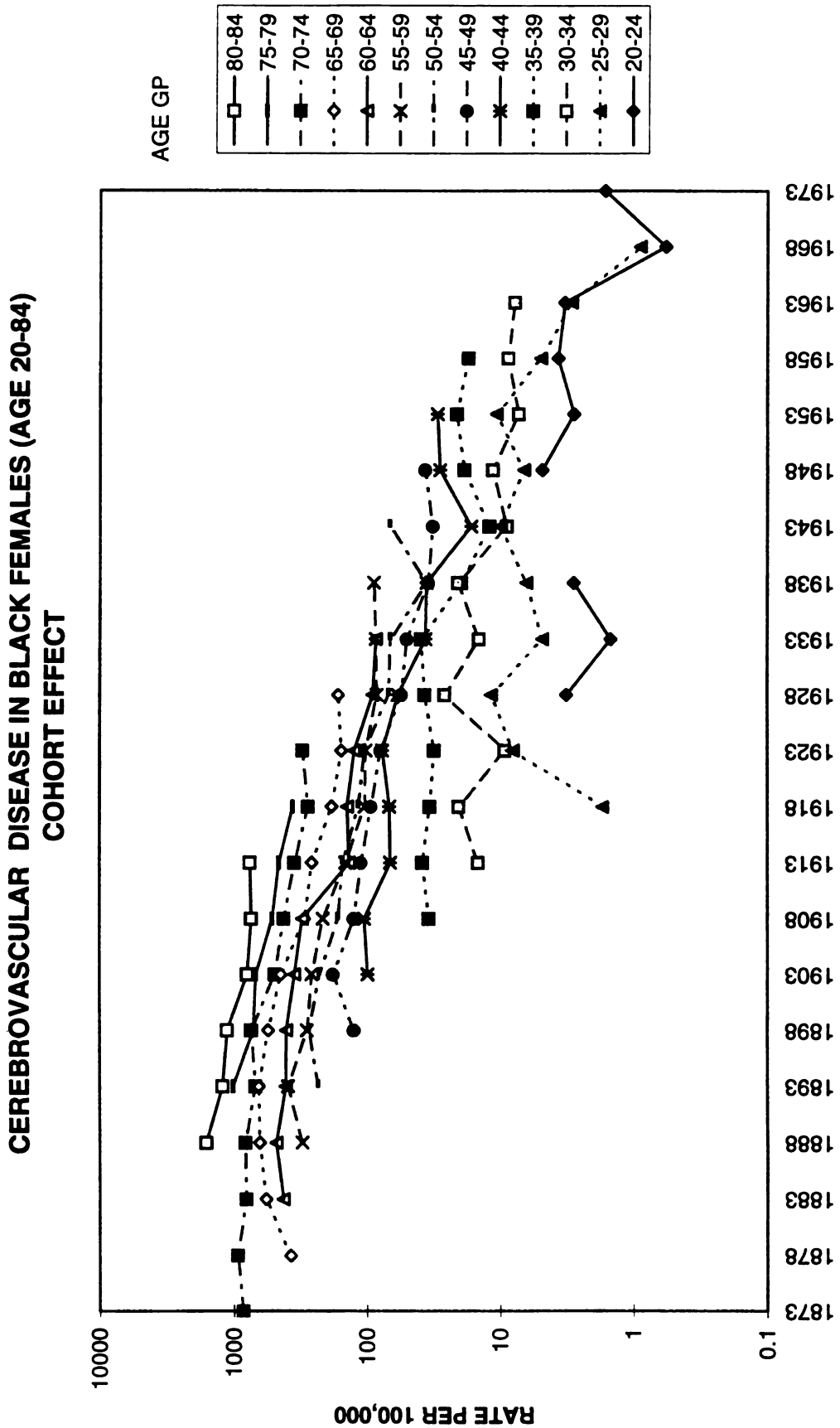
CEREBROVASCULAR DISEASE IN BLACK FEMALES (AGE 20-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
RATE PER 100,000
10000
1000
100
10
1
0.1
BIRTH YEAR
1873
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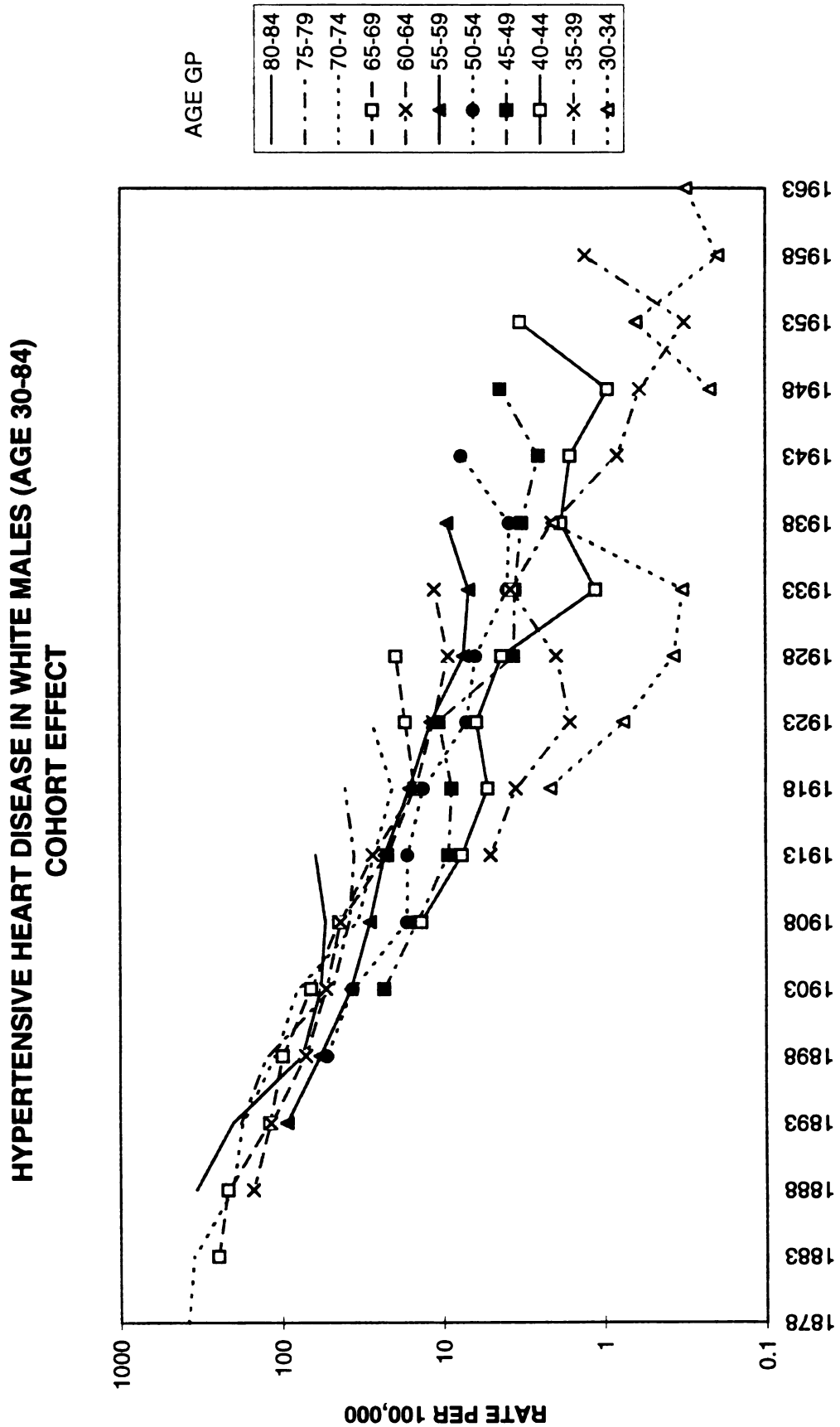
FIGURE 0036


HYPERTENSIVE HEART DISEASE IN WHITE MALES (AGE 30-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
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100
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1
0.1
YEAR OF BIRTH
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FIGURE 0037

HYPERTENSIVE HEART DISEASE IN WHITE FEMALES (AGE 30-84)
COHORT EFFECT

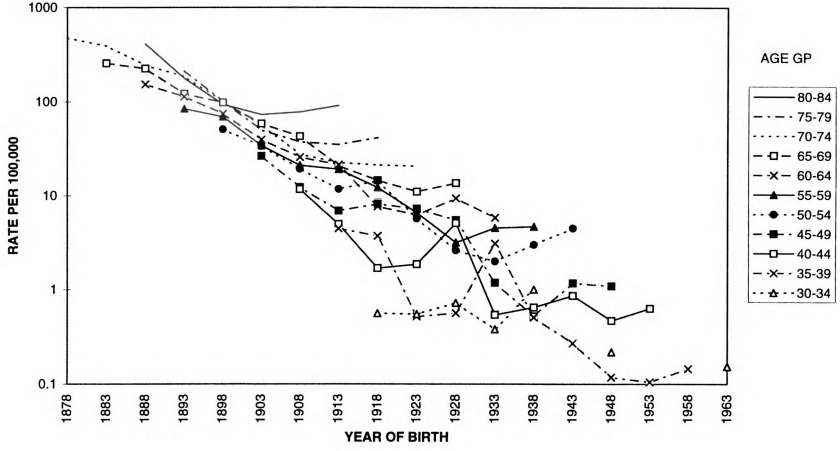
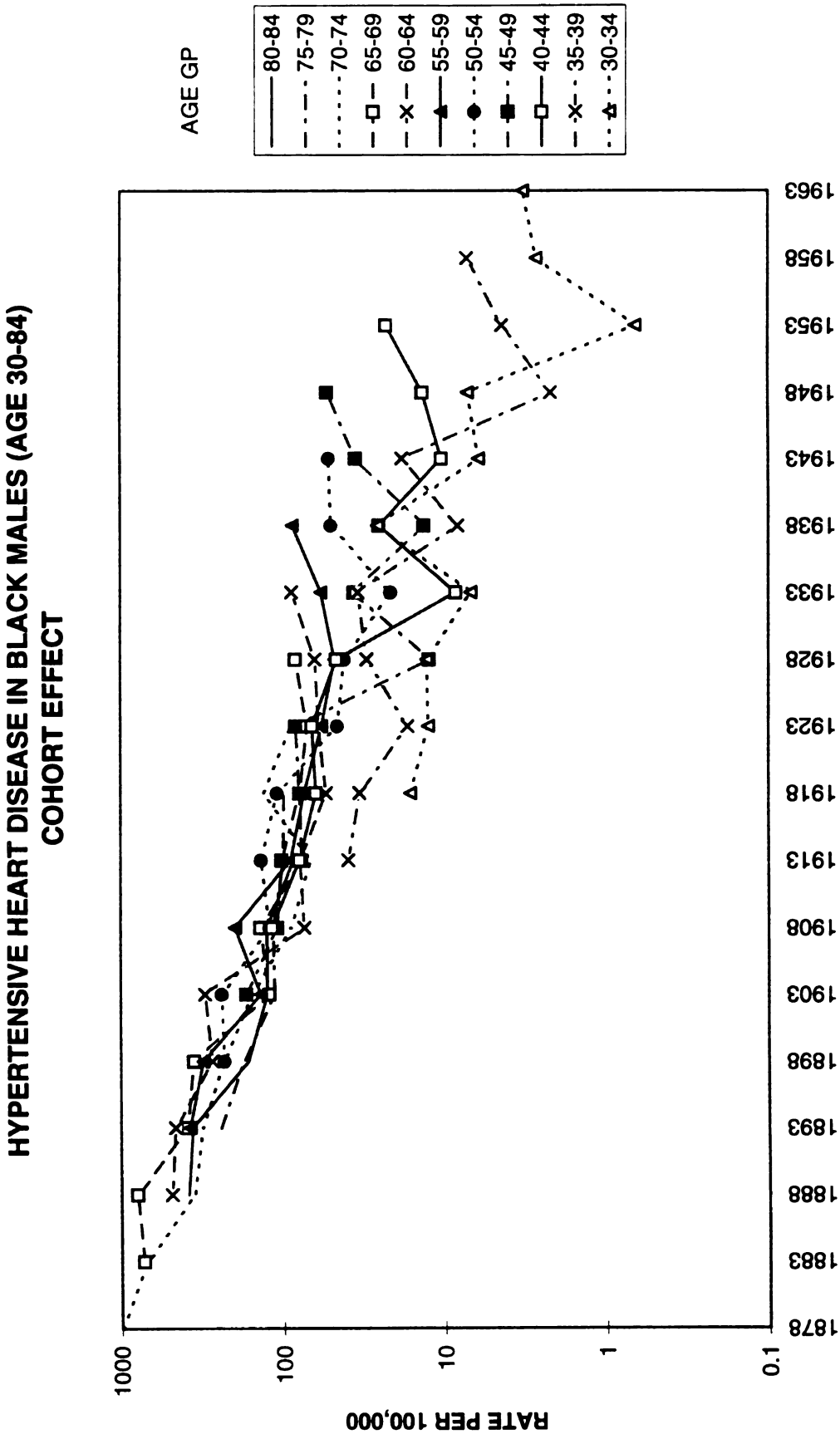


FIGURE 0038


HYPERTENSIVE HEART DISEASE IN BLACK MALES (AGE 30-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
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YEAR OF BIRTH
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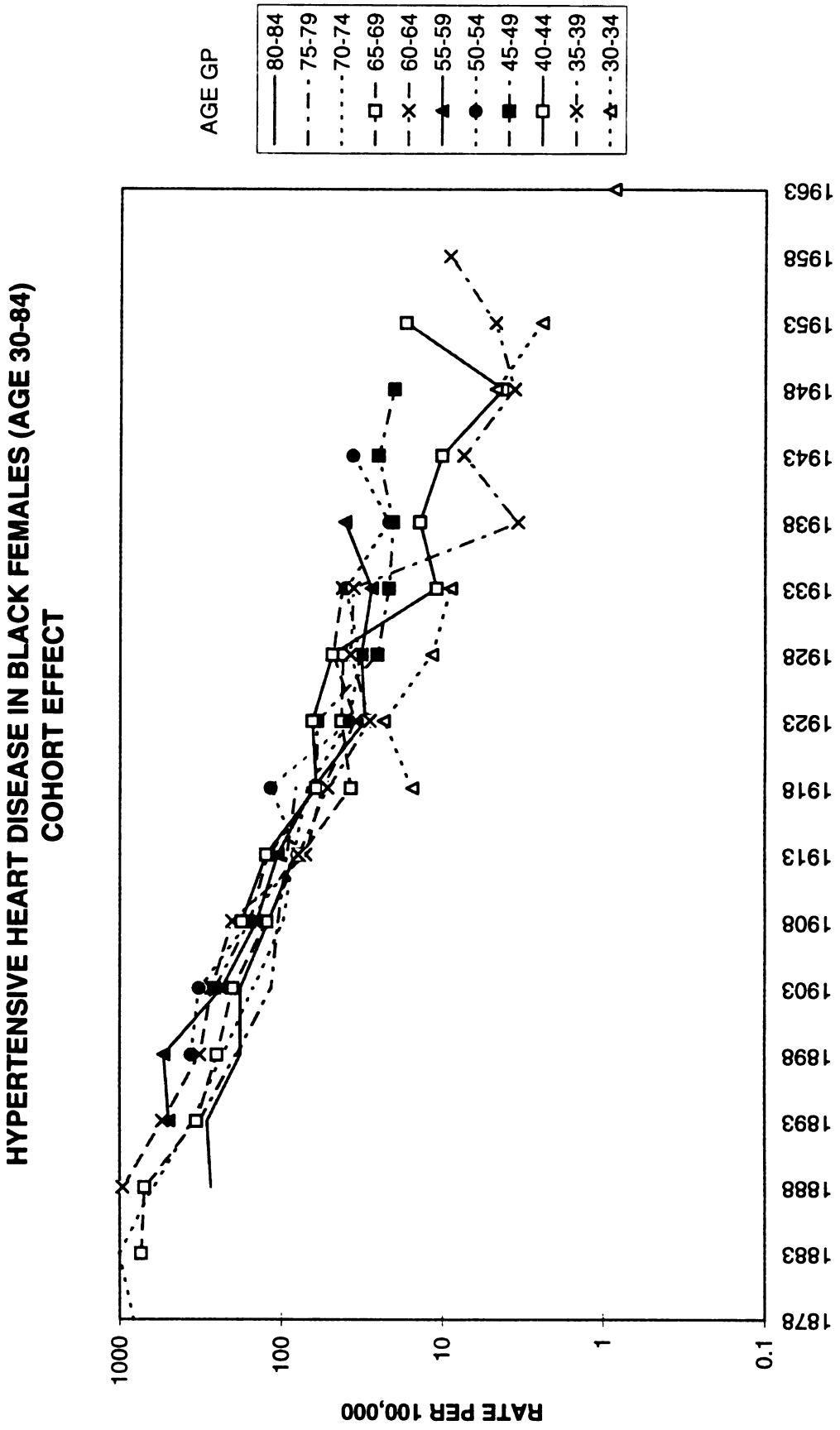
FIGURE 0039


HYPERTENSIVE HEART DISEASE IN BLACK FEMALES (AGE 30-84)
COHORT EFFECT
AGE GP
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
RATE PER 100,000
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1
0.1
YEAR OF BIRTH
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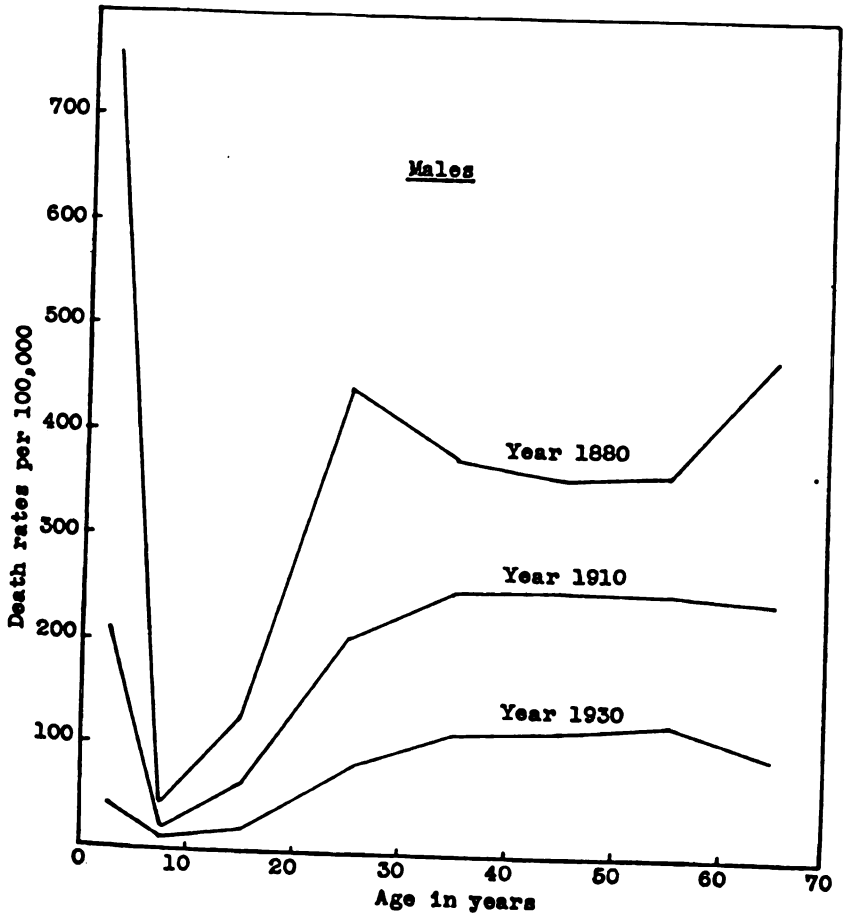
FIGURE 0040

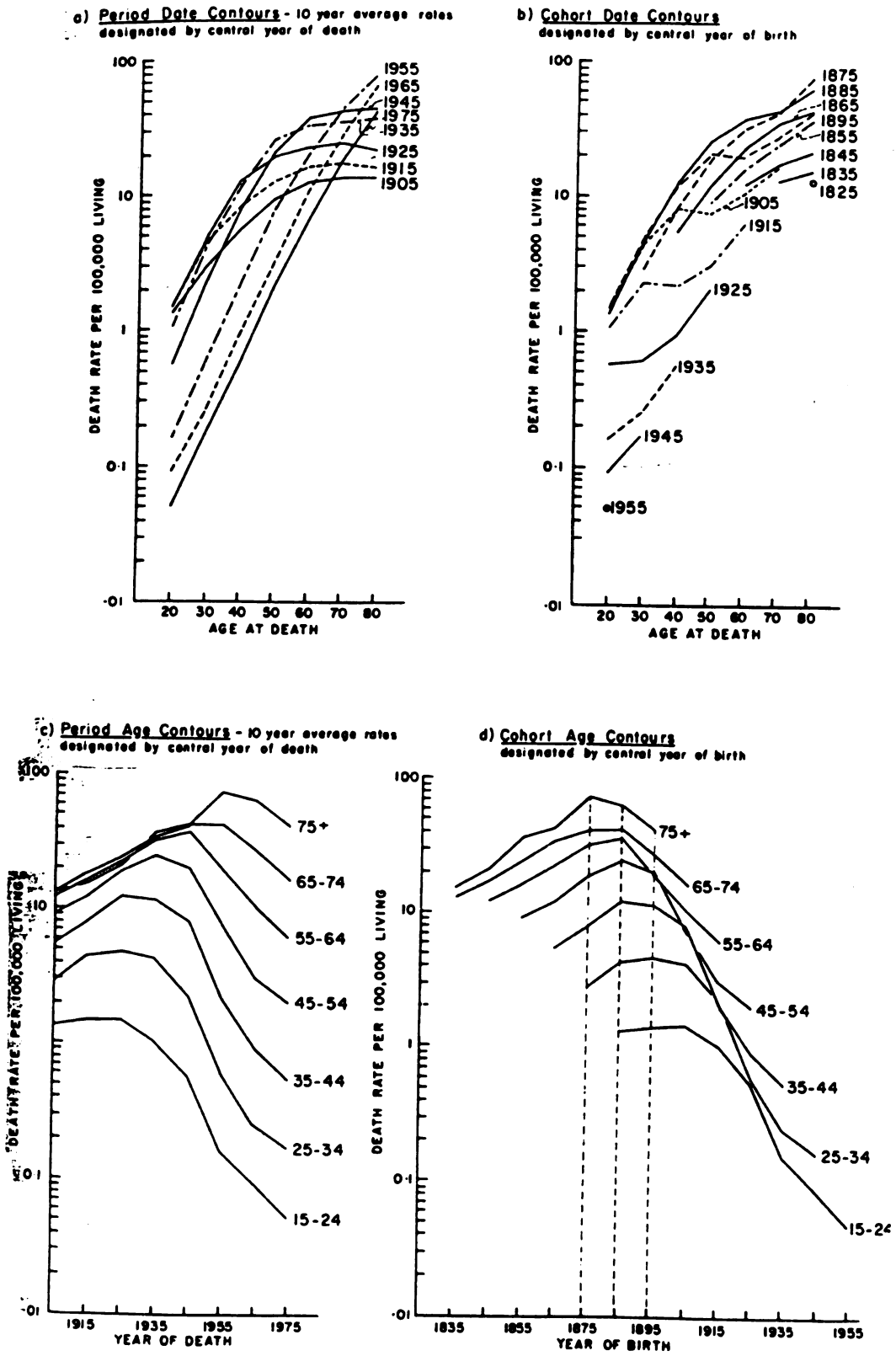
APPENDICES

Appendix A



Massachusetts death rates from tuberculosis—all forms—by age, 1880, 1910, 1930.

Appendix B



Death rates from gastric ulcer in males. England and Wales, 1900–1977.

LIST OF REFERENCES

LIST OF REFERENCES

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