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TRENDS IN THE INCIDENCE OF MYOCARDIAL INFARCTION AND IN MORTALITY DUE TO CORONARY HEART DISEASE, 1987 TO 1994

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ABSTRACT

Background and Methods To clarify the determinants of contemporary trends in mortality from coronary heart disease (CHD), we conducted surveillance of hospital admissions for myocardial infarction and of in-hospital and out-of-hospital deaths due to CHD among 35-to-74-year-old residents of four communities of varying size in the United States (a total of 352,481 persons in 1994). Between 1987 and 1994, we estimate that there were 11,869 hospitalizations for myocardial infarction (on the basis of 8572 hospitalizations sampled) and 3407 fatal coronary events (3023 sampled).

Results The largest average annual decrease in mortality due to CHD occurred among white men (change in mortality, −4.7 percent; 95 percent confidence interval, −2.2 to −7.1 percent), followed by white women (−4.5 percent; 95 percent confidence interval, −0.7 to −8.2 percent), black women (−4.1 percent; 95 percent confidence interval, −10.3 to +2.5 percent), and black men (−2.5 percent; 95 percent confidence interval, −6.9 to +2.2 percent). Overall, in-hospital mortality from CHD fell by 5.1 percent per year, whereas out-of-hospital mortality declined by 3.6 percent per year. There was no evidence of a decline in the incidence of hospitalization for a first myocardial infarction among either men or women; in fact, such hospital admissions increased by 7.4 percent per year (95 percent confidence interval, 0.5 to 14.8 percent) among black women and 2.9 percent per year (95 percent confidence interval, −3.6 to +9.9 percent) among black men. Rates of recurrent myocardial infarction decreased, and survival after myocardial infarction improved.

Conclusions From 1987 to 1994, we observed a stable or slightly increasing incidence of hospitalization for myocardial infarction. Nevertheless, there were significant annual decreases in mortality from CHD. The decline in mortality in the four communities we studied may be due largely to improvements in the treatment and secondary prevention of myocardial infarction. (N Engl J Med 1998;339:861-7.)

MORTALITY from coronary heart disease (CHD) has declined steadily in the United States for the past 30 years.[1,2] Between 1990 and 1994, age-adjusted mortality from CHD among people 35 years of age or older in the United States declined by 10.3 percent[3]; the rate of decline was highest for white men (2.9 percent per year) and lowest for black women (1.6 percent per year). National vital statistics provide mortality rates for CHD, and national hospital-discharge surveys yield rates of hospitalization for myocardial infarction. Neither measure is adequate to evaluate the incidence of CHD, however, since they are based on unvalidated codes from the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM)[4]; thus, it may not be possible to compare rates over time and between communities.[5-7]

The use of accurate measures of the incidence of CHD is particularly important if the effects of primary prevention are to be distinguished from those of treatment. Much of what is known about the incidence of acute myocardial infarction and fatal CHD in the United States comes from isolated community-surveillance studies,[8-11] cohort studies of cardiovascular disease,[12,13] or studies of managed-care medical programs.[14] Although these studies have provided valuable insights into recent trends in the occurrence of CHD, none of them alone provide an-

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nual data on the incidence of CHD in multiple large, geographically and ethnically diverse populations. Furthermore, data on incidence in the 1990s and data on out-of-hospital deaths confirmed as due to CHD are largely unavailable.

We studied population-based trends in mortality from CHD and in the incidence of myocardial infarction from 1987 to 1994. The data come from the Atherosclerosis Risk in Communities (ARIC) study, which examined the incidence of CHD in four areas of varying size, referred to in this study as communities, in the United States.[15,16]

METHODS

Study Population

The ARIC study used a retrospective surveillance system for the continuous monitoring and analysis of hospital admissions for myocardial infarction and deaths due to CHD that occurred in or out of the hospital among all residents 35 through 74 years of age in Forsyth County, North Carolina; the city of Jackson, Mississippi; eight northern suburbs of Minneapolis; and Washington County, Maryland.

Data on Mortality Due to CHD

Death certificates that met criteria based on age, residence, and underlying cause of death (ICD-9-CM codes 250, 401, 402, 410 through 414, 427 through 429, 440, 518.4, 798, and 799) were reviewed by trained personnel, who abstracted data for the study. Few deaths among community residents occurred out of state[15]; such deaths were omitted. Deaths in nursing homes or emergency rooms and hospital admissions of persons classified as dead on arrival were considered to be out-of-hospital deaths. For out-of-hospital deaths, additional information was sought from the next of kin and other informants, the certifying and family physicians, and coroners or medical examiners. Because Maryland state law prohibited contacting persons listed on death certificates, we were unable to use the same method to validate causes of death for out-of-hospital deaths in Washington County. For this reason, rates of mortality due to confirmed CHD are not reported for Washington County.

Using standardized criteria,[15] the ARIC Mortality and Morbidity Classification Committee reviewed out-of-hospital deaths and assigned a final diagnosis; disagreements were adjudicated by the committee chairman. In-hospital deaths were classified after a review of hospital records and death-certificate information. The rate of death due to CHD includes deaths classified as due to either a definite fatal myocardial infarction or definite CHD. This category included deaths for which no probable cause other than atherosclerosis was known in patients with a history of hospitalization for myocardial infarction within 28 days before death, as well as deaths for which there was evidence of chest pain within 72 hours before death or a history of myocardial infarction and no known nonatherosclerotic cause.

Rates of mortality due to CHD based only on the ICD-9-CM codes for the underlying cause of death are also presented in this report. A death due to unconfirmed CHD was defined by the presence of an ICD-9-CM code of 410 through 414 or 429.2 for the underlying cause of death.

Data on Hospitalization for Myocardial Infarction

Annual lists of eligible hospital discharges were obtained for each of 28 hospitals serving the four communities in the ARIC study.[15] Eligibility was based on age, residence, date of discharge, and diagnosis codes (ICD-9-CM codes 402, 410 through 414, 427, 428, and 518.4). Hospitalizations of community residents outside the study area were not identified. Trained staff members recorded the following information from eligible medical records: symptoms on presentation, presence or absence of chest pain, history with respect to myocardial infarction or other cardiovascular-related conditions, and cardiac-enzyme levels on the first four days after the event. Copies of up to three electrocardiograms were made and sent to the University of Minnesota Electrocardiographic Reading Center for classification according to the Minnesota code.[17] A computerized algorithm was applied to data on symptoms, cardiac enzymes, and electrocardiographic evidence to determine each patient's computer diagnosis.[15] Cases with multiple hospitalizations and those with certain types of discrepancy between the discharge-diagnosis codes and the computer diagnosis were reviewed by the Mortality and Morbidity Classification Committee.

Trends in rates of hospitalization for myocardial infarction were also calculated on the basis of discharge-diagnosis codes alone. These nonvalidated events were defined by the presence of an ICD-9-CM discharge-diagnosis code of 410 (acute myocardial infarction).

Definition of a First Event

A first myocardial infarction was defined as one in a patient for whom the medical record either stated that there was no history of myocardial infarction or did not contain any reference to a history of myocardial infarction. For patients who died from cardiovascular events outside the hospital, the history was based on information obtained from the next of kin and other informants, the certifying and family physicians, the coroner or medical examiner, or the medical record for any eligible hospitalization within 28 days before death.

During the eight-year study period, 13 percent of patients hospitalized for myocardial infarction had no recorded history of myocardial infarction; this percentage was generally stable over time. The proportion of medical records in which there was no information on the history was higher for women (15 percent) and blacks (18 percent) than for men (11 percent) and whites (12 percent).

Statistical Analysis

The types of deaths and discharge diagnoses that are relatively unlikely to be confirmed as related to CHD were sampled. Sampling was based on the ICD-9-CM code and the date of discharge or death. Hospitalizations were categorized according to four mutually exclusive codes or groups of codes (ICD-9-CM codes 410; 411; 412 through 414; and 402, 427, 428, and 518.4 — with sampling probabilities of 1.0, 0.5, 0.25, and 0.1, respectively). Similarly, deaths were categorized according to two code groups (ICD-9-CM codes 410 through 414 and 429.2; and 250, 401, 402, 427, 428, 440, 518.4, 798, and 799 — with sampling probabilities of 1.0 and 0.25, respectively). Our analysis was weighted to reflect this sampling.

Rates specific for sex, race, and community were computed on the basis of dynamic population estimates derived by interpolation from U.S. Census data. Rates were adjusted for age by the direct method, according to the distribution in U.S. population in 1990. The logs of the weighted rates were modeled as linear functions of year and of age (the midpoints of five-year age groups), by Poisson regression with SAS Proc Genmod (SAS Institute, Cary, N.C.), using annual projections of the numbers of people in each group defined by five-year age group, race, and sex in the 1990 Census. Variances for the estimators of the coefficients in the model were programmed in SAS IML to account for the additional variance, beyond the Poisson variance, due to the sampling of events. Seventy-nine coronary events in persons with missing data on race or in persons who were identified as neither black nor white were excluded from these analyses.

RESULTS

From 1987 through 1994, there were an estimated 11,869 hospital admissions (on the basis of 8572

TABLE 1. EVENTS CONFIRMED AS DUE TO CHD, 1987 TO 1994.*

VARIABLE	HOSPITALIZATION FOR MYOCARDIAL INFARCTION			DEATH DUE TO CHD			POPULATION†	
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN
	number (percent with first event)							
Race								
Black	1118 (67)	1003 (70)	2121	477 (55)	408 (62)	885	29,886	36,809
White	6774 (62)	2974 (68)	9748	1838 (45)	684 (48)	2522	135,832	149,954
Total	7892 (62)	3977 (69)	11,869	2315 (47)	1092 (53)	3407	165,718	186,763
Community								
Forsyth County, N.C.	2993 (65)	1526 (70)	4519	1055 (47)	471 (52)	1526	58,059	65,716
Jackson, Miss.	1734 (64)	977 (74)	2711	775 (50)	404 (64)	1179	34,755	42,462
Minneapolis suburbs	1688 (60)	745 (68)	2433	485 (40)	217 (36)	702	47,196	51,247
Washington County, Md.‡	1477 (59)	729 (60)	2206	—	—	—	25,708	27,338

*The numbers shown in the table were estimated from sampled events: 5938 hospitalizations for myocardial infarction in men and 2814 in women; 2086 deaths due to CHD in men and 937 in women. The percentages show how many of those with an event had no history of myocardial infarction.

†Numbers shown are of blacks and whites from 35 to 74 years of age in 1994.

‡Out-of-hospital deaths due to CHD could not be validated in Washington County.

hospitalizations sampled) for fatal or nonfatal, definite or probable acute myocardial infarctions among residents who were from 35 through 74 years old in the four communities (Table 1). There were an estimated 3407 deaths due to CHD (3023 sampled), including both in-hospital and out-of-hospital deaths. Sixty-one percent of all coronary events occurred in persons with no recorded history of myocardial infarction (66 percent for blacks and 60 percent for whites; 65 percent for women and 59 percent for men).

Trends in Mortality Due to CHD

Among men, the age-adjusted mortality from confirmed CHD fell from 3.1 per 1000 persons (95 percent confidence interval, 2.7 to 3.5) in 1987 to 2.2 per 1000 (95 percent confidence interval, 1.9 to 2.6) in 1994 (Fig. 1). The decline was observed between 1987 and 1991, with no further decline through 1994. Among women, mortality from CHD fell from 1.1 per 1000 (95 percent confidence interval, 0.9 to 1.4) in 1987 to 0.90 per 1000 (95 percent confidence interval, 0.7 to 1.1) in 1994. Mortality rates based solely on deaths for which CHD was listed as an underlying cause showed a similar pattern of change (Fig. 1). Mortality from confirmed CHD among blacks showed declines similar to the overall trends. For black men, mortality fell from 3.0 per 1000 persons (95 percent confidence interval, 2.0 to 3.9) in 1987 to 2.3 per 1000 (95 percent confidence interval, 1.4 to 3.2) in 1994, and for black women, it fell from 2.4 per 1000 (95 percent confidence interval, 1.4 to 3.3) in 1987 to 1.9 per 1000 (95 percent confidence interval, 1.2 to 2.7). The annual male-to-female rate ratio for mortality from CHD was consistently greater among whites than among blacks, with overall ratios of 3.3 and 1.7, respectively.

Expressed as a percentage, age-adjusted mortality from confirmed CHD declined 27.6 percent from 1987 to 1994 (95 percent confidence interval, 13.4 to 39.4 percent), an average decline of 4.0 percent per year, for men, and 31.3 percent (95 percent confidence interval, 8.8 to 48.3 percent), or 4.6 percent per year, for women (Table 2). The average declines among white men and white women were similar and statistically significant. The average declines of 2.5 percent per year for black men and 4.1 percent per year for black women were not significantly different from no decline.

Among men, 64 percent of all deaths due to CHD occurred outside the hospital, with essentially

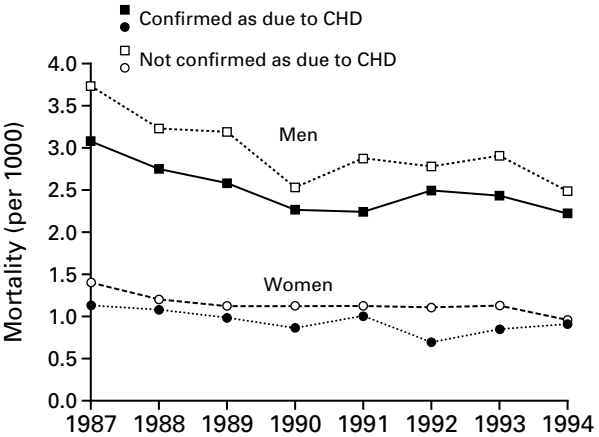

Figure 1. Age-Adjusted Mortality from CHD among Men and Women 35 to 74 Years Old, 1987 to 1994.

TABLE 2. AVERAGE ANNUAL CHANGE IN MORTALITY DUE TO CONFIRMED CHD AND CASE FATALITY RATES, ADJUSTED FOR AGE, 1987 TO 1994.*

VARIABLE†	MEN			WOMEN		
	BLACK	WHITE	TOTAL	BLACK	WHITE	TOTAL
	percent change (95% confidence interval)					
Death due to CHD	−2.5 (−6.9 to +2.2)	−4.7 (−2.2 to −7.1)	−4.0 (−1.8 to −6.1)	−4.1 (−10.3 to +2.5)	−4.5 (−0.7 to −8.2)	−4.6 (−1.2 to −7.9)
First myocardial infarction	2.9 (−3.6 to +9.9)	−0.3 (−2.2 to +1.6)	0.1 (−1.7 to +2.0)	7.4 (+0.5 to +14.8)	−2.5 (−5.3 to +0.3)	−0.2 (−2.9 to +2.5)
Recurrent myocardial infarction	−0.9 (−7.0 to +5.5)	−3.0 (−0.7 to −5.1)	−2.6 (−0.5 to −4.6)	0.1 (−6.8 to +7.5)	−2.8 (−6.4 to +0.9)	−1.9 (−5.2 to +1.4)
First myocardial infarction or death due to CHD	2.3 (−3.1 to +8.0)	−1.9 (−3.9 to +0.1)	−1.1 (−3.1 to +0.8)	5.9 (0.2 to +11.9)	−2.1 (−5.2 to +1.1)	0.4 (−2.4 to +3.2)
Attack rate for myocardial infarction	1.2 (−3.3 to +6.0)	−1.6 (−0.1 to −3.0)	−1.2 (−2.6 to +0.2)	3.7 (−1.2 to +8.9)	−2.7 (−0.4 to −4.9)	−0.9 (−3.0 to +1.2)
Attack rate for CHD	1.4 (−2.2 to +5.2)	−2.4 (−0.9 to −3.8)	−1.7 (−0.3 to −3.0)	1.4 (−2.8 to +5.7)	−1.8 (−4.2 to +0.7)	−0.7 (−2.8 to +1.5)
Case fatality rate for myocardial infarction	2.0 (−16.7 to +24.9)	−5.1 (−11.8 to +2.1)	−4.1 (−10.5 to +2.8)	−3.1 (−18.6 to +15.4)	−12.1 (−4.1 to −19.4)	−9.8 (−2.3 to −16.7)
Case fatality rate for CHD	1.6 (−7.7 to +11.8)	−5.5 (−1.4 to −9.4)	−3.9 (−0.2 to −7.5)	−2.7 (−12.8 to +8.5)	−8.4 (−1.4 to −14.9)	−6.1 (−0.3 to −11.6)

*Negative numbers indicate a decrease, and positive numbers an increase.

†Death due to CHD includes deaths of persons with a history of myocardial infarction; first myocardial infarction includes only hospitalization for a first myocardial infarction; recurrent myocardial infarction includes persons hospitalized for myocardial infarction who had a history of myocardial infarction; first myocardial infarction or death due to CHD excludes events in persons with a history of myocardial infarction; the attack rate for myocardial infarction includes both first and recurrent events; the attack rate for CHD includes myocardial infarction and death due to CHD; case fatality rates are at 28 days; the case fatality for CHD includes patients hospitalized for myocardial infarction plus out-of-hospital deaths due to CHD.

no change in this percentage between 1987 and 1994. About half of all deaths due to CHD among women during this period were out-of-hospital deaths, except in 1988 and 1994, when this proportion was about a third. The percentage of deaths due to CHD that occurred outside the hospital among blacks was as high as 74 percent and was generally higher than among whites.

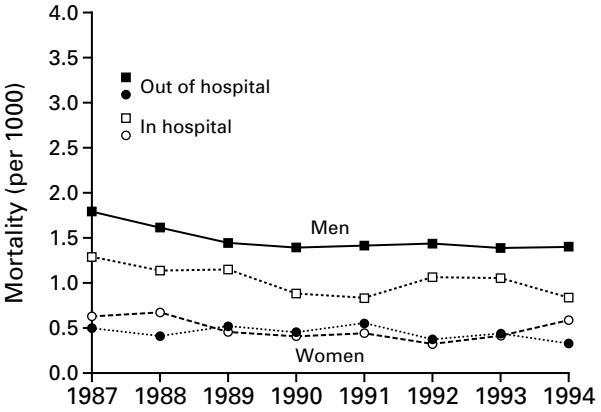

Figure 2. Age-Adjusted Mortality from CHD among Men and Women 35 to 74 Years Old, 1987 to 1994, According to Whether Death Occurred in or out of the Hospital.

Both out-of-hospital and in-hospital mortality due to CHD declined (Fig. 2). Overall, in-hospital mortality from CHD fell by 5.1 percent per year (95 percent confidence interval, 2.1 to 8.1 percent), whereas out-of-hospital mortality declined by 3.6 percent per year (95 percent confidence interval, 1.3 to 5.8 percent). For men, the decline in the rate of in-hospital death from CHD was 5.1 percent (95 percent confidence interval, 1.5 to 8.5 percent) per year, and the decline in the rate of out-of-hospital death was 3.4 percent (95 percent confidence interval, 0.7 to 6.0 percent) per year. Trends among women were similar. Declines in mortality from CHD were also similar for persons less than 55 years of age and for those 55 or older.

Trends in the Incidence of Hospitalization for Myocardial Infarction

The age-adjusted incidence of hospitalization for myocardial infarction changed little over the eight-year period (Fig. 3). The rate of such hospitalization among women was 1.9 per 1000 persons (95 percent confidence interval, 1.6 to 2.2) in 1987 and 1.8 per 1000 (95 percent confidence interval, 1.5 to 2.1) in 1994. For men, the rate was the same in 1994 as in 1987 — 4.1 hospitalizations per 1000. The annual male-to-female rate ratio for hospitalization for myocardial infarction was consistently higher among whites than among blacks, with overall ratios of 2.5 and 1.4, respectively.

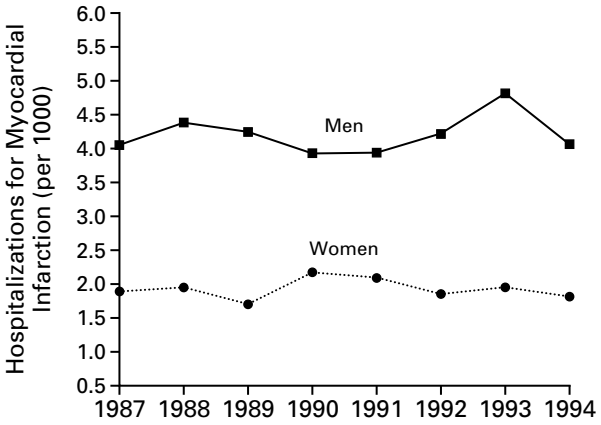

Figure 3. Age-Adjusted Incidence of Hospitalization for Acute Myocardial Infarction among Men and Women 35 to 74 Years Old, 1987 to 1994.

Expressed as a percentage, the age-adjusted rate of hospitalization for myocardial infarction from 1987 to 1994 increased by 1.1 percent (95 percent confidence interval, −13.1 to +17.5 percent), an average increase of 0.1 percent per year, for men, and declined by 1.7 percent (95 percent confidence interval, 20.8 to −22.0 percent [the negative number indicates an increase]), an average decline of 0.2 percent per year, for women (Table 2). When the average annual percent change in incidence was calculated on the basis of nonvalidated events, the changes were close to zero both for men (an increase of 1.0 percent [95 percent confidence interval, −0.2 to +2.3 percent]) and for women (an increase of 0.6 percent [95 percent confidence interval, −1.2 to +2.4]).

Although the incidence of hospitalization for myocardial infarction was more variable among blacks, there was evidence of an increase in this rate. The age-adjusted annual incidence increased by 2.9 percent per year among black men and by 7.4 percent per year among black women (the increase among women was statistically significant). The incidence declined an average of 2.5 percent per year among white women, whereas there was essentially no change in the annual rate among white men (a decrease of 0.3 percent per year). In addition, the incidence among men 55 to 74 years of age increased significantly, by 4.6 percent per year (95 percent confidence interval, 2.1 to 7.2), whereas other age-specific rates for men 35 through 54 years of age and for women did not change significantly.

The rate of a combined end point defined as the incidence of acute myocardial infarction or fatal CHD in patients (without a history of myocardial infarction) changed little between 1987 and 1994 (Table 2), declining by only 1.1 percent annually for men and increasing by only 0.4 percent per year for women (P not significant for both comparisons).

Trends in Recurrent Myocardial Infarction

In contrast to the flat trends in the rates of hospitalization for myocardial infarction, the annual rates of recurrent myocardial infarction showed a significant 18.8 percent decline among men (2.6 percent per year) and a nonsignificant 14.5 percent decline among women (1.9 percent per year) (Table 2).

Trends in the Case Fatality Rate at 28 Days

The 28-day case fatality rate among patients with definite or probable myocardial infarction who were hospitalized in the period from 1987 through 1994, with adjustment for year and age, was 10.6 percent (95 percent confidence interval, 8.7 to 13.0 percent) for women and 9.0 percent (95 percent confidence interval, 7.8 to 10.4 percent) for men. Overall, the decrease in the age-adjusted case fatality rate was 4.1 percent per year for men and 9.8 percent per year for women. This decline was statistically significant only among women, primarily because of the relatively large decline among white women (Table 2). There was no evidence of a decline in the case fatality rate among blacks hospitalized for myocardial infarction.

An estimate of the overall case fatality rate from CHD combines information on mortality at 28 days among patients hospitalized for myocardial infarction with information on deaths attributed to CHD that did not occur in conjunction with an event for which the patient was hospitalized. The overall case fatality rate declined among both men (by 3.9 percent per year) and women (by 6.1 percent per year). This decline was significant for whites but not for blacks.

DISCUSSION

We found that mortality due to CHD declined among 35-to-74-year-old residents of four geographically and ethnically diverse communities in the United States from 1987 to 1994; the decline was 28 percent for men and 31 percent for women. The decline was evident among both blacks and whites. Among men, most of the decline was observed between 1987 and 1991, with stable rates through 1994. The decrease in mortality due to CHD was accompanied by declining case fatality rates and declining rates of hospitalization for recurrent myocardial infarction. In contrast, the incidence of hospitalization for myocardial infarction was stable or increased slightly. These findings suggest that the decrease in mortality due to CHD between 1987 and 1994 in these communities may be due largely to improvements in the treatment of myocardial infarction and to secondary prevention (rather than to a decline in new events). The rates of both in-hospital and out-of-hospital death due to CHD declined; therefore, the percentage of deaths due to CHD that occurred outside the hospital changed little between 1987 and 1994. Future efforts to reduce

the burden of mortality from CHD in the community must address the prevention of out-of-hospital deaths — a goal that may require better primary prevention as well as more timely access to medical care.

The downward trend in mortality from CHD was consistent with that reported from analyses of U.S. vital statistics.[3] The overall decline in age-adjusted mortality from CHD in the study communities in the late 1980s and the early 1990s does not bear out the prediction, based on simulation studies, that the increase in the prevalence of CHD in the pool of patients at risk between 1980 and 1990 would cause age-adjusted mortality from CHD to rise in the 1990s.[18] We did not, however, determine mortality from CHD for persons over 74 years of age, a group in which the prevalence could be increasing because the population is living longer.

The significant improvement in survival after hospitalization for myocardial infarction (an increase of 28 to 56 percent) suggests an important contribution of medical care to recent trends in mortality from CHD. Similarly, the Minnesota Heart Survey reported that the risk of death within the 28 days after a myocardial infarction was 15 to 25 percent lower in 1990 than in 1985.[9]

Although the declines in mortality due to CHD and in case fatality rates are encouraging, the lack of change — or, for black women, the increase — in the incidence of acute myocardial infarction raises several issues. First, this trend represents a departure from previous reports: between 1985 and 1990, the incidence of myocardial infarction declined by approximately 1 percent annually in Minneapolis[9]; between 1975 and 1988, the incidence fell by 2 percent per year in Worcester, Massachusetts[8]; and between 1965 and 1979, the incidence declined by 1.4 percent per year in Rochester, Minnesota.[19] Although the Corpus Christi Heart Project did not report the percent change in incidence, this group concluded that there were nonsignificant declines in incidence among Mexican Americans and no appreciable change among non-Hispanic whites from 1989 to 1991.[20] Second, the difference in trends between blacks and whites suggests that current efforts to prevent CHD may be reaching blacks less effectively than whites. Further research is needed to confirm that the increase in the incidence of myocardial infarction among blacks is real and also to identify public health strategies that address this discrepancy.

The conclusion that medical care and secondary prevention have the most important roles in the observed trends in mortality from CHD is supported by the absence of a decline in the incidence of CHD and by improvements in the case fatality rate. These findings are consistent with the results of computer-simulation modeling, which suggested that 25 percent of the decline in CHD in the 1980s was attributable to primary prevention and more than 70 percent to the effects of reductions in risk factors or improvements in the treatment of patients with CHD.[18] Other simulation-based estimates suggest that primary prevention accounted for a greater proportion of the decline in CHD in the late 1960s and 1970s.[21-23] Although the incidence of myocardial infarction did not change in the communities in the ARIC study, primary prevention may have affected the severity of myocardial infarction and thereby lowered the case fatality rate. However, preliminary analysis of trends in the severity of myocardial infarction in the study (indicated by hemodynamic, cardiac-enzyme, and electrocardiographic variables) suggests no decline (unpublished data).

Continued community surveillance of trends in CHD is needed to evaluate the effects of new preventive and treatment measures such as the use of statin drugs to lower cholesterol,[24] since their use was not widespread in 1994. National vital statistics alone will not be adequate to evaluate the relative effect of these and other emerging efforts in prevention and treatment. Further evaluation of the reasons for the change in mortality due to CHD in the study communities awaits additional analyses of trends in the severity of disease and detailed investigations of changes in risk factors.

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APPENDIX

In addition to the authors, the following also participated in this study: University of North Carolina, Chapel Hill — P. Johnson, M. Knowles, C. Paton; Wake Forest University, Winston-Salem, N.C. — K. Burke, W. Cheeks, R. Cook, S. Cothern; University of Mississippi Medical Center, Jackson — B. Warren, D. Washington, M. Watson, N. Wilson; University of Minnesota, Minneapolis — G. Feitl, C. Hunkins, E. Justiniano, L. Kemmis; Johns Hopkins University, Baltimore — J. Chabot, C. Christman, D. Costa, P. Crowley; University of Texas Medical School, Houston — V. Stinson, P. Pfile, H. Pham, T. Trevino; Atherosclerosis Clinical Laboratory, Methodist Hospital, Houston — W. Alexander, D. Harper, C. Rhodes, S. Soyal; Ultrasound Reading Center, Bowman Gray School of Medicine, Winston-Salem, N.C. — A. Safrit, M. Wilder, L. Allred, C. Bell; Coordinating Center, University of North Carolina, Chapel Hill — P. DeSaix, S. Goode, T. Goodwin, S. Hutton.

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