

# CHANGES IN PREVALENCE OF NONFATAL CORONARY HEART DISEASE IN THE UNITED STATES FROM 1971–1994

**Objective:** To examine temporal trends in the prevalence of nonfatal coronary heart disease in the United States.

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**Design:** Four national cross-sectional health surveys: National Health and Nutrition Examination Survey (NHANES) I (1971–1975), NHANES II (1976–1980), NHANES III (1988–1994), and Hispanic HANES (HHANES) (1982–1984).

**Setting:** United States.

**Participants:** Persons aged 40–74 years.

**Main Outcome Measurements:** Prevalence of angina, self-reported myocardial infarction, and electrocardiographically defined myocardial infarction (ECG-MI).

**Results:** Generally, the age-adjusted prevalence of angina pectoris was higher among women than men, but the reverse was true for self-reported myocardial infarction and ECG-MI. Increases in the prevalence of angina pectoris occurred for Mexican-American men and women, and African-American women, but were not statistically significant for the latter. Age-adjusted rates of self-reported myocardial infarction increased among African-American men ( $P=.019$ ) and women ( $P=.005$ ) and Mexican-American men ( $P>.05$ ), but decreased among White men ( $P>.05$ ) and women ( $P>.05$ ). The prevalence of age-adjusted ECG-MI decreased among African-American men and women, White women, and to a lesser degree, White men; however, none of these decreases were statistically significant. Relative standard errors for ECG-MI prevalence in NHANES I and II among African Americans were large; therefore, prevalence trends need to be interpreted cautiously.

**Conclusions:** The decreases in ECG-MI could be due either to decreased incidence of coronary heart disease or myocardial infarction, or increases in the rates of timely cardiac interventions that minimize damage to the myocardium. (*Ethn Dis.* 2003;13:85–93)

**Key Words:** Angina Pectoris, Coronary Disease, Ethnic Groups, Health Surveys, Myocardial Infarction, Prevalence, United States

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## INTRODUCTION

Coronary heart disease continues to be an important cause of mortality in the United States, despite steady decreases since the 1960s.<sup>1</sup> An estimated 459,841 persons died of coronary heart disease in the United States in 1998, representing 19.7% of all deaths.<sup>2</sup> Data from the National Hospital Discharge Survey suggest that approximately 2,185,000 hospitalizations for coronary heart disease occurred in 1998.<sup>3</sup> Furthermore, the economic cost associated with coronary heart disease was estimated at \$327 billion in 2000.<sup>4</sup>

Due to the large burden of coronary heart disease, campaigns have been conducted to reduce the prevalence rates of smoking,<sup>5</sup> hyperlipidemia,<sup>6</sup> and hypertension.<sup>7</sup> These efforts have influenced the incidence and prevalence of coronary heart disease. Furthermore, the decades since the 1960s have seen the development of exciting medical technologies and pharmaceutical advances that have improved the survival rates of persons with coronary heart disease. These advances have affected primarily the prevalence of coronary heart disease, although changes in treatment may have influenced incidence of the disease to a lesser degree. The relative contributions of each of these major approaches to re-

ducing mortality rates of coronary heart disease have been extensively debated.<sup>8</sup>

Understanding trends in coronary heart disease prevalence is important for several reasons. First, prevalence rates provide information critical to defining the burden of a disease in a population, and further enables the ranking of the burden relative to that of other conditions. Second, prevalence rates may highlight populations at high risk of coronary heart disease and possible disparities. Third, prevalence estimates are crucial to estimating the costs associated with coronary heart disease. Fourth, resource allocation is strongly influenced by disease prevalence. Fifth, prevalence rates may contribute to policymakers' decision making and their positioning of research among other priorities. Sixth, prevalence rates may be used as a measure to evaluate population-based interventions.

Constant or increasing incidence rates of coronary heart disease, coupled with declining case-fatality rates, suggest that the prevalence of this condition should increase. However, declining incidence rates, coupled with declining case-fatality rates, suggest that prevalence could either be increasing, constant, or decreasing, depending on which predominates. We examined data from several national surveys in order to ascertain temporal trends of nonfatal coronary heart disease prevalence (angina pectoris, self-reported myocardial infarction, and electrocardiographically defined myocardial infarction [ECG-MI]) in the US population.

## METHODS

Since 1959, the National Center for Health Statistics has conducted periodic health surveys of the US population. We

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*“. . . prevalence estimates are crucial to estimating the costs associated with coronary heart disease.”*

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used data from the National Health and Nutrition Examination Survey (NHANES) I (1971–1975), NHANES II (1976–1980), Hispanic HANES (HHANES) (1982–1984), and NHANES III (1988–1994). Details about these surveys can be found elsewhere.<sup>9–14</sup> Generally, NHANES I, II, and III included representative samples of the non-institutionalized civilian US population using complex sampling designs. HHANES was specially designed to provide data for 3 major Hispanic groups in the United States: Mexican Americans, Cuban Americans, and Puerto Ricans.

### Angina Pectoris

Angina pectoris questionnaires based on the Rose questionnaire<sup>15</sup> were administered during all surveys, although the questions and wording varied over time (Appendix A). To develop a scoring algorithm that could be applied to all 4 surveys, we defined participants as having angina pectoris if they reported that they ever had any chest pain or discomfort, if they got the pain or discomfort while walking uphill or in a hurry or on level ground, if the pain caused them to stop or slow down; if the pain was relieved by standing still; if the pain was relieved within 10 minutes; and if the pain was located in the upper or middle sternum, the left anterior chest, or the left arm. We classified participants as having angina if they responded that they never walked uphill or in a hurry (a response category for HHANES and NHANES III), but met the other criteria.

### Self-Reported Myocardial Infarction

With the following questions, participants in all 4 surveys were asked whether a doctor had ever told them that they had suffered a heart attack:

NHANES I: Has a doctor ever told you that you have any of the following conditions; and if so, do you still have it? Heart attack. How many years ago did you first have it?

NHANES II: Has a doctor ever told you that you had a heart attack? How many years ago did you first have a heart attack?

NHANES III: Has a doctor ever told you that you had any of the following conditions, and if so, do you still have it? Heart attack. How many years ago did you first have a heart attack?

HHANES: Has a doctor ever told you that you had a heart attack? How many years ago did you first have a heart attack?

Persons who answered affirmatively to these questions were defined as having had a self-reported myocardial infarction.

### Electrocardiographically Defined Myocardial Infarction (ECG-MI)

Electrocardiograms were obtained from participants aged 25–74 years in NHANES I and II, and participants aged  $\geq 40$  years in NHANES III. Twelve-lead electrocardiograms were obtained with a Beckman Digicorder in NHANES I, a Marquette in NHANES II, and a Marquette MAC 12 in NHANES III. Detailed procedures used in obtaining and processing electrocardiograms have been described elsewhere.<sup>16</sup> Electrocardiograms from NHANES I required special handling and processing because the quality of the single-channel electrocardiogram data was lower than that of the other surveys. Electrocardiograms from 3 surveys were processed with the Dalhousi No-

vacode program.<sup>17</sup> Minnesota codes 1.1.1 through 1.1.7, and 1.2.1 through 1.2.7, together with codes 4.1, 4.2, 5.1, or 5.2, defined a probable myocardial infarction. Minnesota codes 1.2.1 through 1.2.7, without codes 4.1, 4.2, 5.1, or 5.2, and codes 1.2.8, 1.3.1 through 1.3.6, but together with 4.1, 4.2, 5.1, or 5.2, defined a possible myocardial infarction.

### Statistical Methods

We limited the analyses to participants aged 40–74 years because these were the only NHANES III participants who received an electrocardiogram. We present the coronary heart disease prevalence by age (40–64 years, and 65–74 years), sex, race or ethnicity, and race or ethnicity and sex. Due to small numbers, we do not present results for participants with a race designation of “other,” although these participants were included in calculating prevalence estimates for the age-specific, sex-specific, and total estimates. We standardized estimates of coronary heart disease prevalence to the 1980 US population aged 40–74 years by using 5-year intervals. Prevalence estimates were calculated using sampling weights incorporating the differential probabilities of selection, and since these estimates were adjusted for under-coverage and non-response, they should be representative of the US population. Tests for trend were conducted by regressing the time intervals between the surveys on the prevalence rates by using weighted least-squares linear regression. Comparisons of HHANES and NHANES III prevalence rates were made by using *t* tests. The standard error of the difference was calculated by taking the square root of the sum of the squared terms of the 2 standard errors. All prevalence estimates were calculated with the software SUDAAN, which takes into account the stratified multi-stage sampling design and produces valid estimates of the variance of the estimates.<sup>18</sup>

## RESULTS

### Angina Pectoris

Rates of angina pectoris were higher among older compared to younger participants (except for HHANES), and among women compared to men (Table 1). African-American women had the highest rate of angina pectoris during all 3 NHANESs. No clear trends are discernible for any group except African-American women, who showed a non-significant increase in the prevalence of angina pectoris from NHANES I through NHANES III (Table 1). Prevalence rates for angina pectoris for Mexican-American men and women were higher in NHANES III than in HHANES.

### Self-Reported Myocardial Infarction

In all surveys, rates of self-reported myocardial infarction were higher among older compared to younger respondents, and among men compared to women (Table 2). In NHANES I and NHANES II, White participants reported higher rates compared to African-American participants, but in NHANES III, African Americans reported a slightly higher rate compared to Whites. No clear trend in self-reported myocardial infarction was evident in either the overall or sex-specific rates of myocardial infarction. Among participants aged 40–64 years, the decreases in the prevalence of self-reported myocardial infarction were of borderline significance. A statistically nonsignificant decrease in prevalence occurred among Whites, while significant increases occurred among African-American men and women. In contrast, the data suggested that decreases in the prevalence of self-reported myocardial infarction had occurred among both White men and women, although neither trend was significant. Rates among Mexican-American men showed a non-significant increase, whereas the prevalence among women remained virtually

unchanged between HHANES and NHANES III.

### ECG-MI

The prevalence of ECG-MI was higher among older participants, and among men in the 3 NHANESs. Whites had slightly higher rates compared to African Americans in NHANES II and III (Table 3). The overall rate of ECG-MI appeared to decline during the study period, but, again, the trend was not statistically significant. Steady, though nonsignificant, decreases in the prevalence were observed for women, Whites, and African Americans from NHANES I through NHANES II and NHANES III. Furthermore, steady decreases were observed for White women and African-American men and women, but not for White men.

## DISCUSSION

National surveys paint a complex picture of changes in prevalence rates of nonfatal coronary heart disease that have occurred from NHANES I through NHANES III. The results suggest little consistent change in the prevalence of angina pectoris and self-reported myocardial infarction. Although the data suggest that decreases in ECG-MI—particularly among White women, African-American men, and African-American women—may have occurred, the tests for trends were not statistically significant.

Previously, angina pectoris prevalence rates among Whites, African Americans, and Mexican Americans aged 25–74 years using NHANES II and HHANES data were compared.<sup>19</sup> The changes in nonfatal coronary heart disease that we report occurred against a backdrop of declining rates of coronary heart disease mortality since at least 1980.<sup>20</sup> Thus, the decreases in ECG-MI and the decreases in self-reported MI among Whites that we report parallel the decreases in coronary heart disease

mortality rates. However, the increases in self-reported myocardial infarction among African Americans contrast with the decreases in rates of coronary heart disease mortality.

Data from the National Health Interview Survey (NHIS) suggest that, other than increasing among White women, the incidence of nonfatal coronary heart disease changed little during the 1980s in the United States.<sup>21</sup> Little is known about the incidence of total (fatal and nonfatal) coronary heart disease. Other information about trends in coronary heart disease incidence is derived from regional studies in the United States. Coronary heart disease incidence decreased among participants of the Framingham study between 1950 and 1989.<sup>22</sup> Additional data from Massachusetts suggest that incidence rates of acute myocardial infarction increased from 1975 to 1981, and then decreased through 1995.<sup>23,24</sup> In Rochester, Minnesota, the incidence of coronary heart disease decreased among men and increased among women from the late 1960s through 1982.<sup>25</sup> Data from the Minnesota Heart Health Program suggest that the incidence of coronary heart disease decreased during the 1980s.<sup>26</sup> Incident hospitalizations for myocardial infarction were either stable or increased between 1987 and 1994 among residents aged 35–74 years in 4 communities in the United States,<sup>27</sup> although the proportion of patients hospitalized with definitive evidence of a myocardial infarction decreased.<sup>26</sup> In addition, data from the Strong Heart Study suggest that the incidence of coronary heart disease increased between 1989–1991 and between 1993–1995.<sup>28–29</sup> Therefore, the data from these regional studies provide conflicting data concerning trends in the incidence of coronary heart disease.

The prevalence of nonfatal coronary heart disease—defined as the combination of self-reported myocardial infarction, angina pectoris, or coronary heart disease—in the United States determined with NHIS data changed little

**Table 1. Trends in self-reported angina pectoris in the United States population aged 40–74 years, by selected demographic characteristics**

	NHANES I (1971–1975)		NHANES II (1976–1980)		HHANES (1982–1984)		NHANES III (1988–1994)		<i>P</i> *
	<i>N</i>	% (SE)	<i>N</i>	% (SE)	<i>N</i>	% (SE)	<i>N</i>	% (SE)	
Total	4727	4.5 (0.4)	7261	7.1 (0.4)	—	—	8667	5.1 (0.3)	.942
Age									
40–64 years	3502	4.0 (0.5)	4694	6.7 (0.5)	1613	3.9 (0.5)	6165	4.5 (0.4)	.939
65–74 years	1225	5.9 (1.0)	2567	8.4 (0.7)	238	2.7 (1.0)	2502	6.7 (0.4)	.828
Sex									
Men	2241	4.2 (0.3)	3418	6.1 (0.5)	—	—	4153	4.5 (0.5)	.898
Women	2486	4.7 (0.7)	3843	8.1 (0.6)	—	—	4514	5.6 (0.5)	.901
Race or ethnicity									
White	4070	4.5 (0.4)	6367	7.1 (0.5)	—	—	3929	4.8 (0.4)	.909
African Americans	620	4.0 (0.7)	774	7.3 (1.1)	—	—	2302	6.6 (0.6)	.500
Mexican Americans	—	—	—	—	1851	3.8 (0.6)	2097	6.1 (0.5)	.008
Race or ethnicity and sex									
White men	1929	4.5 (0.4)	3010	6.2 (0.6)	—	—	1862	4.7 (0.6)	.898
African-American men	292	1.9 (0.5)	346	6.5 (1.3)	—	—	1090	3.9 (0.6)	.558
Mexican-American men	—	—	—	—	836	3.0 (0.7)	1060	5.5 (0.5)	.023
White women	2141	4.6 (0.6)	3357	8.1 (0.7)	—	—	2067	5.0 (0.5)	.865
African-American women	328	5.5 (1.4)	428	8.1 (1.7)	—	—	1212	8.7 (1.0)	.304
Mexican-American women	—	—	—	—	1015	4.6 (0.6)	1037	6.7 (0.8)	.049

\**P* values are those for linear trend for NHANES I, II, and III except for comparisons for estimates of all Mexican Americans and Mexican-American men and women of HHANES and NHANES III that were made with a 2-sample test for proportions.

during the 1980s.<sup>21</sup> Prevalence increased among White women, decreased among White men, and changed less distinctly among African-American men and women. The findings for White men from our study are consistent with the NHIS data. For White women, however, our results suggest a decrease in self-reported myocardial infarction, which was corroborated by a similar trend in ECG-MI. Questions about coronary heart disease differed markedly between NHIS and NHANES.

Data about regional trends in coronary heart disease prevalence are scarce. In the Minneapolis-St. Paul area, coronary heart disease rates (defined as in-hospital myocardial infarction [fatal or nonfatal], out-of-hospital myocardial infarction, sudden cardiac death, and fatal out-of-hospital coronary heart disease) decreased during the 1980s.<sup>25</sup> Increases in the prevalence of Q wave and non-Q wave myocardial infarction occurred from 1970 to 1980 in the same area.<sup>30</sup> From 1980–1991, total coronary disease rates, defined as hospital discharges for coronary heart disease and out-of-hos-

pital cardiac death, changed little in 2 southeastern New England communities.<sup>31</sup> When the overall rate was disaggregated, nonfatal hospitalizations increased, whereas in-hospital and out-of-hospital mortality decreased. Again, local studies show differences in the trends of coronary heart disease prevalence.

From the time period of NHANES I through that of NHANES III, trends in coronary heart disease risk factors have affected trends in this disease. The prevalence rates of smoking,<sup>32,33</sup> hypertension,<sup>34</sup> and hypercholesterolemia<sup>35</sup> have declined during this time. Because these factors have been linked to the incidence of coronary heart disease, changes in these factors could have reduced the incidence and prevalence. Further, changes in these factors are also associated with increased survival after developing the disease; therefore, increases in the prevalence of nonfatal coronary heart disease could also be expected. While physical activity levels have remained largely stationary,<sup>36,37</sup> the prevalence of obesity has increased significantly between NHANES II and III

and beyond.<sup>38,39</sup> Although it is unclear whether these increases have affected the incidence or prevalence of coronary heart disease so far, the increasing prevalence of obesity will likely have an adverse effect on future rates of coronary heart disease incidence and mortality. In response to the increase in prevalence rates of obesity, the prevalence of diabetes mellitus has also increased significantly.<sup>40–42</sup> Because diabetes mellitus is a strong risk factor for coronary heart disease, an increase in its prevalence would be expected to inflate the rates of coronary heart disease. Thus far, such data have not been published.

In addition to changes in the prevalence rates of risk factors for coronary heart disease, important technological changes have occurred in the treatment of the disease. The introduction of cardiac catheterization heralded a new era in interventional cardiology. The use of cardiac catheterizations, thrombolytic agents, percutaneous transluminal coronary angioplasties, and coronary artery bypass graft surgery has increased.<sup>43</sup> These interventions have been shown to



**Table 2. Trends in self-reported myocardial infarction in the United States population aged 40–74 years, by selected demographic characteristics**

	NHANES I (1971–1975)		NHANES II (1976–1980)		HHANES (1982–1984)		NHANES III (1988–1994)		P*
	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	
Total	7490	6.3 (0.4)	9797	5.6 (0.3)	—	—	8623	5.7 (0.4)	.628
Age									
40–64 years	4028	4.9 (0.4)	6165	4.4 (0.3)	1629	2.9 (0.4)	6109	3.8 (0.30)	.092
65–74 years	3462	11.0 (0.8)	3632	9.9 (0.6)	262	7.6 (1.8)	2514	11.0 (0.9)	.878
Sex									
Men	3348	9.0 (0.7)	4452	8.2 (0.4)	849	5.4 (1.1)	4140	8.3 (0.7)	.688
Women	4142	4.0 (0.5)	5345	3.4 (0.4)	1042	3.1 (0.6)	4483	3.3 (0.4)	.546
Race or ethnicity									
White	6146	6.6 (0.4)	8559	5.8 (0.3)	—	—	3934	5.6 (0.4)	.423
African Americans	1279	3.5 (0.8)	1079	4.3 (0.6)	—	—	2302	6.1 (0.5)	.014
Mexican Americans	—	—	—	—	1891	4.2 (0.6)	2048	4.7 (0.6)	.596
Race or ethnicity and sex									
White men	2756	9.4 (0.7)	3916	8.7 (0.5)	—	—	1867	8.4 (0.7)	.419
African-American men	556	5.0 (1.5)	456	5.5 (0.9)	—	—	1093	7.0 (0.9)	.020
Mexican-American men	—	—	—	—	849	5.4 (1.1)	1039	6.6 (0.9)	.427
White women	3390	4.1 (0.5)	4643	3.4 (0.3)	—	—	2067	3.1 (0.4)	.314
African-American women	723	2.5 (0.5)	623	3.3 (0.6)	—	—	1209	5.4 (0.7)	.004
Mexican-American women	—	—	—	—	1042	3.1 (0.6)	1009	3.0 (0.6)	.861

\*P values are those for linear trend for NHANES I, II, and III except for comparisons for estimates of all Mexican Americans and Mexican-American men and women of HHANES and NHANES III that were made with a 2-sample test for proportions.

affect survival favorably and, thus, would have contributed to increasing the prevalence of coronary heart disease. Furthermore, changes in the treatment

of myocardial infarction, such as the use of aspirin, angiotensin-converting enzyme inhibitors, beta-blockers, lipid-lowering medication, heparin, and other

medical treatment options have also contributed to extending the life expectancy of these patients.<sup>44–50</sup>

Perhaps a consequence of the ever-

**Table 3. Trends in possible or probable myocardial infarction by electrocardiograph in the United States population aged 40–74 years, by selected demographic characteristics**

	NHANES I (1971–1975)		NHANES II (1976–1980)		HHANES (1982–1984)		NHANES III (1988–1994)		P*
	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	
Total	4275	3.6 (0.3)	6492	3.4 (0.3)	1574	5.7 (0.7)	7003	2.4 (0.2)	.098
Age									
40–64 years	3186	2.4 (0.4)	4238	2.9 (0.4)	1362	4.0 (0.6)	5125	1.3 (0.2)	.297
65–74 years	1089	7.6 (0.8)	2254	5.2 (0.6)	212	10.1 (2.1)	1878	5.5 (0.6)	.647
Sex									
Men	2010	4.8 (0.5)	3068	5.0 (0.5)	—	—	3407	3.4 (0.4)	.221
Women	2265	2.6 (0.4)	3424	2.0 (0.3)	—	—	3596	1.5 (0.3)	.157
Race or ethnicity									
White	3735	3.6 (0.4)	5701	3.5 (0.3)	—	—	3128	2.5 (0.3)	.133
African Americans	503	3.8 (0.9)	679	3.1 (0.6)	—	—	1777	2.2 (0.4)	.079
Mexican Americans	—	—	—	—	1574	5.7 (0.7)	1801	2.1 (0.4)	<.001
Race or ethnicity and sex									
White men	1766	4.7 (0.5)	2705	5.1 (0.5)	—	—	1516	3.6 (0.5)	.322
African-American men	224	5.0 (2.1)	305	4.4 (1.2)	—	—	848	3.5 (0.7)	.059
Mexican-American men	—	—	—	—	697	7.6 (1.4)	923	2.3 (0.5)	.002
White women	1969	2.6 (0.4)	2996	2.0 (0.3)	—	—	1612	1.5 (0.3)	.206
African-American women	279	3.1 (1.2)	374	2.1 (0.8)	—	—	929	1.2 (0.4)	.152
Mexican-American women	—	—	—	—	877	3.9 (0.5)	878	1.9 (0.6)	.006

\*P values are those for linear trend for NHANES I, II, and III except for comparisons for estimates of all Mexican Americans and Mexican-American men and women of HHANES and NHANES III that were made with a 2-sample test for proportions.

*Furthermore, changes in the treatment of myocardial infarction, such as the use of aspirin, angiotensin-converting enzyme inhibitors, beta-blockers, lipid-lowering medication, heparin, and other medical treatment options have also contributed to extending the life expectancy of these patients.*<sup>44-50</sup>

increasing number of cardiac procedures performed is that interventions undertaken early in the course of acute coronary heart disease events may limit or negate damage to the myocardium. Thus, electrocardiograms may reveal no evidence of myocardial damage. For example, the proportion of myocardial infarction with Q-waves declined from 52% in 1986-1988 to 35% during 1995-1997.<sup>48</sup> Unfortunately, NHANES III did not include questions about the use of thrombolytic therapy, coronary artery bypass surgery, or percutaneous transluminal coronary angioplasty.

These data should be interpreted with several caveats in mind. Wording of the angina pectoris questionnaires was not consistent for all surveys, and this inconsistency may have affected angina pectoris prevalence estimates. Furthermore, the questionnaires were developed for use in White populations and their performance in populations of different races or ethnicities is uncertain. Nevertheless, the instrument has been used in African-American and Hispanic populations.<sup>51-54</sup> In addition, the use of the angina pectoris questionnaire in women has been questioned.<sup>55,56</sup>

Generally, the positive predictive value of self-reports of myocardial infarction or coronary heart disease range from about 60% to 80%, and sensitivity is approximately 60%.<sup>57-60</sup> The wording of the questions concerning self-reported myocardial infarction varied slightly. Notably, NHANES I and III respondents were asked if they had ever been told by a doctor that they had suffered a heart attack, and whether they still had the condition. In contrast, NHANES II and HHANES respondents were only asked if they had ever been told by a doctor that they had suffered a heart attack. Whether and how these word variations might have affected the trends in prevalence rates of self-reported myocardial infarction is unknown. In addition, the proportion of persons with silent myocardial ischemia or infarction may be substantial.

The electrocardiographic data from NHANES I was collected at a time when procedures for performing electrocardiograms and processing them were still evolving to those used in later surveys. Whether the special processing affected the prevalence estimates of ECG-defined myocardial infarction is unclear.

Our efforts demonstrate the difficulty in generating national data about temporal trends in the prevalence of coronary heart disease in the United States. Earlier, we explained why such estimates are useful, even necessary. The 3 measures of nonfatal coronary heart disease prevalence in our study provide inconsistent evidence about the direction of the coronary heart disease trends. The various clinical manifestations of this condition complicate efforts to measure trends in the incidence and prevalence of the disease. Not unexpectedly, definitions of coronary heart disease have varied across studies. A comprehensive definition of prevalence would require inclusion of both fatal and nonfatal coronary heart disease, as well as diagnosed and silent coronary heart disease. Despite these considerations, our results provide unique infor-

mation about trends in nonfatal coronary heart disease in the US population.

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*Design and concept of study:* Ford, Giles  
*Data analysis and interpretation:* Ford, Giles  
*Manuscript draft:* Ford, Giles  
*Statistical expertise:* Ford, Giles  
*Supervision:* Ford

## APPENDIX A

National Health and Nutrition Examination Survey I angina pectoris questionnaire:

Have you ever had . . .

Trouble with any pain or discomfort in your chest?

Trouble with any pressure or heavy sensation in your chest?

Was the problem that of chest pains, chest discomfort, pressure or heaviness?

Heaviness

Burning sensation

Tightness

Stabbing pain

Pressure

Sharp pain

Shooting pains

Have you had it more than 3 times?

Have you been bothered by this within the past 12 months?

How old were you when you first had it?

Do you get it if you walk at an ordinary pace on level ground?

Do you get it if you walk uphill or hurry?

What do you do if you get it while walking?

Stop

Slow down

Continue at same pace

Take medicine

If you do stop or slow down, is it relieved or not?

How soon?

When you get pain or discomfort, where is it located?

Upper middle chest

Lower middle chest

Left side of chest

Left arm

Right side of chest

Other

Do any of these things tend to bring it on?

Excitement or emotion

Stooping over

Eating a heavy meal

Coughing spells

Cold wind

Exertion

National Health and Nutrition Examination Survey II angina pectoris questionnaire:

Have you ever had shortness of breath either when hurrying on the level or walking up a slight hill?

Have you ever had any trouble with pain, discomfort, or pressure in your chest when you walk fast or uphill?

Would you describe this pain as any of the following?

Heaviness

Burning sensation

Tightness

Stabbing pain

Pressure

Sharp pain

Shooting pains

Have you had the pain or discomfort more than 3 times?

Have you been bothered by the pain or discomfort within the past 12 months?

How old were you when you first had the pain or discomfort?

Do you get the pain or discomfort if you walk at an ordinary pace on level ground?

If you get the pain or discomfort while walking do you—

Stop?

Slow down?

Continue at the same pace?

Take medicine?

If you do stop or slow down, is the pain or discomfort relieved or not?

How soon is the pain relieved?

When you get pain or discomfort where is it located? Is it in the—

Upper middle chest?

Lower middle chest?

Left side of chest?

Left arm?

Right side of chest?

Some other place?

Do any of the following things tend to bring the pain or discomfort on?

Excitement or emotion

Stooping over

Eating a heavy meal

Coughing spells

Cold wind

Exertion

National Health and Nutrition Examination Survey III angina pectoris questionnaire:

Have you ever had any pain or discomfort in your chest?

Do you get it when you walk uphill or hurry?

Do you get it when you walk at an ordinary pace on level ground?

What do you do if you get it while you are walking? Do you stop or slow down, or continue at the same pace?

If you stand still, what happens to it? Is the pain or discomfort relieved or not relieved?

How soon is the pain relieved?



Where is the pain or discomfort located?

Hispanic Health and Nutrition Examination Survey angina pectoris questionnaire:

Have you ever had any pain or discomfort in your chest?

Have you ever had any pressure or heaviness in your chest?

Do you get it when you walk uphill or hurry?

Do you get it when you walk at an ordinary pace on the level?

What do you do if you get the (pain or discomfort/pressure or heaviness) while you are walking?

Do you stop, slow down, continue at the same pace, or take medicine?

Stop or slow down

Continue at same pace

Take medicine

If you stand still, what happens to the (pain or discomfort/pressure or heaviness)? Is it relieved or not?

Relieved

Not relieved

How soon is it relieved?

Where is the (pain or discomfort/pressure or heaviness) located? (Location 1–8).

Did you see a doctor because of your (pain or discomfort/pressure or heaviness)?

What did the doctor say it was?

Coronary heart disease

Other cardiovascular disease

Respiratory condition

Chest pain, non-cardiovascular

Stress, tension, or nervous condition