

Race and Sex Differences in the Incidence and Prognostic Significance of Silent Myocardial Infarction in the Atherosclerosis Risk in Communities (ARIC) Study

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Background—Race and sex differences in silent myocardial infarction (SMI) are not well established.

Methods and Results—The analysis included 9498 participants from the Atherosclerosis Risk in Communities (ARIC) study who were free of cardiovascular disease at baseline (visit 1, 1987–1989). Incident SMI was defined as ECG evidence of MI without clinically documented MI (CMI) after the baseline until ARIC visit 4 (1996–1998). Coronary heart disease and all-cause deaths were ascertained starting from ARIC visit 4 until 2010. During a median follow-up of 8.9 years, 317 participants (3.3%) developed SMI and 386 (4.1%) developed CMI. The incidence rates of both SMI and CMI were higher in men (5.08 and 7.96 per 1000-person years, respectively) than in women (2.93 and 2.25 per 1000-person years, respectively; $P<0.0001$ for both). Blacks had a nonsignificantly higher rate of SMI than whites (4.45 versus 3.69 per 1000-person years; $P=0.217$), but whites had higher rate of CMI than blacks (5.04 versus 3.24 per 1000-person years; $P=0.002$). SMI and CMI (compared with no MI) were associated with increased risk of coronary heart disease death (hazard ratio, 3.06 [95% confidence interval, 1.88–4.99] and 4.74 [95% confidence interval, 3.26–6.90], respectively) and all-cause mortality (hazard ratio, 1.34 [95% confidence interval, 1.09–1.65] and 1.55 [95% confidence interval, 1.30–1.85], respectively). However, SMI and CMI were associated with increased mortality among both men and women, with potentially greater increased risk among women (interaction $P=0.089$ and 0.051, respectively). No significant interactions by race were detected.

Conclusions—SMI represents >45% of incident MIs and is associated with poor prognosis. Race and sex differences in the incidence and prognostic significance of SMI exist that may warrant considering SMI in personalized assessments of coronary heart disease risk. (*Circulation*. 2016;133:2141–2148 DOI: 10.1161/CIRCULATIONAHA.115.021177.)

Key Words: continental population groups ■ coronary heart disease ■ myocardial infarction ■ sex

Approximately 635 000 new cases of coronary heart disease (CHD) occur annually in the United States, with an additional 155 000 incidentally discovered asymptomatic silent myocardial infarctions (SMIs).¹ SMI, defined as the presence of pathological Q waves in the absence of a history of typical cardiac symptoms, is one of the important cardiac abnormalities that can be reasonably detected through ECG screening.^{2,3}

Clinical Perspective on p 2148

Given that SMI is characterized by no or mild symptoms, patients with SMI are deprived medical treatments that could prevent subsequent adverse outcomes, including a second MI or even death.⁴ This underscores the importance of detecting

SMI in clinical practice. In clinical trials evaluating interventions to prevent or treat CHD, detection of unrecognized MI as a clinical end point has the potential to increase statistical power, to decrease sample sizes, and to reduce length of follow-up, cost, and potential harm from exposure.⁴

The reported incidence of SMI ranges from 22% to 60% of the total incidence of MI, and the prognosis of these SMIs has been shown to be similar to or worse than the prognosis for clinically recognized MI (CMI).^{4–27} However, the current understanding of the epidemiology of SMI is based primarily on studies in white populations of European ancestry^{8,11–15,18} or on studies with limited representation of both sexes.^{9,10,16,18,21,23} The lack of race and sex diversity in these studies is occasionally complicated by small sample size.^{7,28}

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The aim of this study was to examine the race and sex differences in the incidence and prognostic significance of SMI versus MI with CMI in the Atherosclerosis Risk in Communities (ARIC) study, a community-based, predominantly biracial cohort study.

Methods

Study Population

The ARIC study was designed to investigate the causes of atherosclerosis and its clinical outcomes, as well as variations in cardiovascular risk factors, medical care, and disease by race and sex.²⁹ From 1987 to 1989 (ARIC study baseline), 15 792 adults (55.2% women; age, 45–64 years) from 4 US communities (Washington County, Maryland; suburbs of Minneapolis, MN; Jackson, MS; and Forsyth County, North Carolina) were enrolled and underwent a phone interview and clinic visit. Additional examinations were conducted in 1990 to 1992 (visit 2), 1993 to 1995 (visit 3), 1996 to 1998 (visit 4), and 2011 to 2013 (visit 5). Participants were mostly white in the Washington County and Minneapolis sites, exclusively black in Jackson, and a mix of both in Forsyth County. The study was approved by the institutional review board at each study site. All participants provided written informed consent.

For the purpose of this analysis, we included all ARIC participants with good-quality and complete ECG data at visits 1 through 4 and outcome events after visit 4. We excluded the following participants: 47 with reported race other than black or white; 136 with poor-quality ECGs; 3775 with missing ECGs in any of the ARIC first 4 visits (including 871 who died before visit 4); 429 with an ECG diagnosis of bundle-branch block, external pacemaker, or Wolff-Parkinson-White pattern; and 201 with missing ≥ 1 baseline cardiovascular disease risk factors. We also excluded 1706 participants with a history of cardiovascular disease at baseline that was defined as the presence of ECG evidence of MI or a self-reported history of physician-diagnosed MI, coronary artery bypass surgery, coronary angioplasty, heart failure, or stroke. After all exclusions (n=6294), 9498 subjects remained and were included in the analysis.

Silent MI

Incident SMI was defined as ECG evidence of new MI at ARIC visit 2, 3, or 4 that was not present at the baseline visit (visit 1) in the absence of documented CMI. Participants with both SMI and CMI between ARIC visits 1 and 4 were considered to have CMI. Identical electrocardiographs (MAC PC, Marquette Electronics Inc, Milwaukee, WI) were used at all clinical sites, and resting 10-second standard simultaneous 12-lead ECGs were recorded in all participants using strictly standardized procedures. All ECGs were processed in a central ECG laboratory (initially at Dalhousie University, Halifax, NS, Canada, and later at the Epidemiological Cardiology Research Center, Wake Forest School of Medicine, Winston-Salem, NC), where all ECGs were visually inspected for technical errors and quality. ECG evidence of MI was defined by the new appearance of Minnesota Code (MC) ECG classifications as a major Q/QS wave abnormality (MC 1.1 or MC 1.2) or minor Q/QS wave abnormality (MC 1.3) plus major ST-T abnormality (MC 4.1, MC 4.2, MC 5.1, or MC 5.2).^{30,31} Traditional serial change comparisons³⁰ were not used.

CHD Death and All-Cause Mortality

CHD death and all-cause mortality were ascertained after ARIC visit 4 (1996–1998) through December 31, 2010, from death certificates. Deaths and hospitalization events were ascertained in each clinical center during an annual follow-up phone interview or through review of community hospital discharge indexes. Incident CHD events included definite or probable hospitalized MI (CMI in this analysis) or definite CHD death. All CHD event classifications and specific criteria, including the adjudication process, have been described previously.^{32–34} CMI was based on physician review and adjudication of chest pain, cardiac biomarkers/enzymes from hospitalizations, ECG evidence including a new pathological Q wave, CHD history, the underlying cause of death from death certificates, and other associated information. All eligible hospitalized events were classified as definite, probable, suspect, or no MI. Definite MI and probable MI were combined to define CMI in this analysis. The definite hospitalized CMI met ≥ 1 of the following criteria: evolving diagnostic ECG pattern, diagnostic ECG pattern and abnormal enzymes, or cardiac pain and abnormal enzymes plus

Table 1. Baseline (1987–1989) Participant Characteristics Stratified by Incident MI During Follow-Up (1996–1998)

	No MI (n=8795)	SMI (n=317)	CMI (n=386)	P Value*	P Value†
Age, y	54±5.6	55±5.9	55±5.6	0.289	<0.001
Women, n (%)	5154 (59)	139 (44)	107 (28)	<0.001	<0.001
Blacks, n (%)	1802 (20)	74 (23)	54 (14)	0.001	0.003
Education level of high school or below, n (%)	4483 (51)	161 (51)	227 (59)	0.033	0.011
Current smoker, n (%)	1814 (21)	80 (25)	120 (31)	0.004	<0.001
Body mass index, kg/m ²	27±5.0	29±5.7	28±4.3	0.063	<0.001
Systolic blood pressure, mm Hg	118±17	125±19	125±19	0.783	<0.001
Hypertension, n (%)	2347 (27)	128 (41)	152 (39)	0.783	<0.001
Antihypertensive medication, n (%)	1966 (22)	109 (34)	116 (30)	0.221	<0.001
Diabetes mellitus, n (%)	644 (7.4)	53 (17)	64 (17)	0.970	<0.001
Ratio of total to HDL cholesterol	4.4±1.6	4.8±1.7	5.7±1.6	<0.001	<0.001
Cholesterol-lowering medication, n (%)	202 (2.3)	7 (2.2)	12 (3.1)	0.463	0.578
Aspirin use, n (%)	4016 (46)	144 (46)	166 (43)	0.531	0.579
Family history of coronary heart disease, n (%)	3462 (39)	138 (44)	199 (52)	0.034	<0.001
Serum creatinine, mg/dL	1.1±0.3	1.1±0.2	1.2±0.2	0.130	<0.001

Values are mean±SD when appropriate. CMI indicates clinically manifest myocardial infarction; HDL, high-density lipoprotein; MI, myocardial infarction; and SMI, silent myocardial infarction.

*P value for comparison between SMI and CMI with the unpaired Student *t* test and χ^2 for continuous and categorical variables, respectively.

†P value for comparison among the 4 groups using ANOVA and χ^2 for continuous and categorical variables, respectively.

Table 2. Incidence of SMI and CMI by Sex and Race: ARIC 1987–1989 to 1996–1998

	SMI		CMI	
	Events, n (%)	Incidence per 1000 person-y	Events, n (%)	Incidence per 1000 person-y
All population (n=9498)	317 (3.3)	3.84 (2.84–4.84)	386 (4.1)	4.68 (3.51–5.84)
Men (n=4098)	178 (4.3)	5.08 (3.34–6.82)	279 (6.8)	7.96 (5.64–10.3)
Women (n=5400)	139 (2.6)	2.93 (1.77–4.09)	107 (2.0)	2.25 (1.18–3.33)
Whites (n=7568)	243 (3.2)	3.69 (2.59–4.79)	332 (4.4)	5.04 (3.69–6.39)
Blacks (n=1930)	74 (3.8)	4.45 (2.05–6.84)	54 (2.8)	3.24 (1.13–5.36)

ARIC indicates Atherosclerosis Risk in Communities; CMI, clinically manifest myocardial infarction; and SMI, silent myocardial infarction.

evolving ST-T pattern or equivocal ECG pattern. The probable hospitalized MI met ≥ 1 of the following criteria in the absence of sufficient evidence for definite hospitalized MI: cardiac pain and abnormal enzymes, cardiac pain and equivocal enzymes and either evolving ST-T pattern or diagnostic ECG pattern, or abnormal enzymes and evolving ST-T pattern. Criteria for each of these diagnostic elements in the algorithm remained constant over the study period and are described in detail in the ARIC study surveillance manual.^{31,33,34}

Covariates

Baseline age, sex, race, education level, income, and smoking status were determined by self-report. Body mass index at baseline was calculated as weight in kilograms divided by height in meters squared. Blood samples were obtained after an 8-hour fasting period. Baseline diabetes mellitus was defined as a fasting glucose level ≥ 126 mg/dL (or nonfasting glucose ≥ 200 mg/dL), a self-reported physician diagnosis of diabetes mellitus, or the use of diabetes medications. Baseline hypertension was defined as systolic blood pressure ≥ 140 mm Hg, diastolic blood pressure ≥ 90 mm Hg, or the use of blood pressure-lowering medications. At each study visit, medication history was obtained by self-report of medication intake during last 2 weeks and by a review of medications brought by the participants to their visits. Each medication was coded by trained and certified interviewers with the use of a computerized medication classification system. Prevalent stroke and peripheral arterial disease were identified by self-reported history of a previous physician diagnosis. Prevalent heart failure was identified by the Gothenburg criteria or self-reported history of heart failure medication use in the past 2 weeks.

Statistical Methods

Frequency distributions of the variables used in analyses were first inspected to rule out anomalies and outliers. Descriptive statistics were used to determine mean values, standard deviations, and percentile distributions for continuous variables, as well as frequencies and percentages for categorical variables.

During the period from visit 1 to 4, incidence rates of SMI and CMI were calculated per 1000 person-years, compared in all ARIC participants, and stratified by age, sex, and race/ethnicity.

Cox proportional hazards analysis was used to examine the associations of SMI and CMI (versus no MI) occurring from visit 1 to 4 with CHD death and all-cause mortality occurring after visit 4. The follow-up time included the time elapsed between the identification of SMI or CMI plus the time from visit 4 to the event. Non-CHD deaths were treated as censored. Models were incrementally adjusted as follows: Model 1 was adjusted for baseline demographics (age, sex, and race), and model 2 was adjusted for variables in model 1 plus study field center, body mass index, income, education, smoking status, systolic blood pressure, blood pressure-lowering medications, diabetes mellitus, ratio of total cholesterol to high-density lipoprotein cholesterol, use of cholesterol-lowering medications, use of aspirin, family history of CHD, and serum creatinine (all variables measured at baseline). Interactions by sex and race were examined in model 2. We examined the assumption of proportional hazards by computation of Schoenfeld residuals and inspection of log (–log [survival function]) curves, and they were met.

All analyses were performed with SAS version 9.3 (SAS Institute Inc, Cary, NC). A 2-sided value of $P < 0.05$ was considered significant. However, because the interaction tests were used only

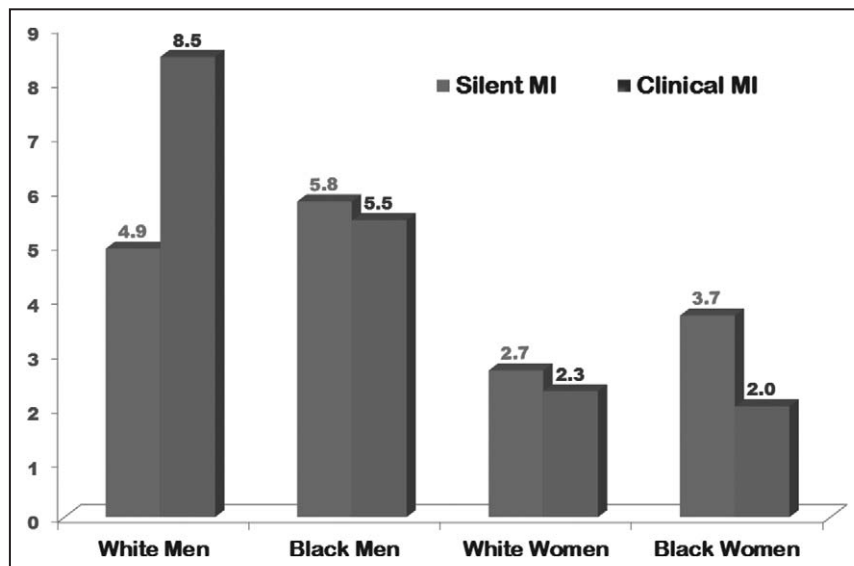


Figure 1. Sex-race specific incidence rates (per 1000 person-years) of silent myocardial infarction (SMIs) and clinical MIs.

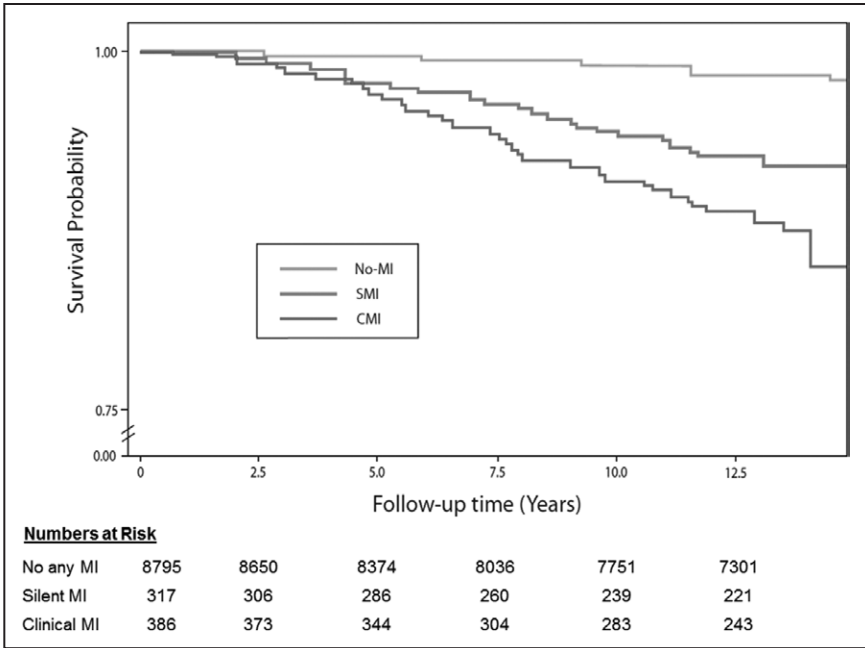


Figure 2. Coronary heart disease survival probability curves by myocardial infarction (MI) status. CMI indicates clinical myocardial infarction; and SMI, silent myocardial infarction.

for screening for effect modification (interactions) by sex and race and not testing a hypothesized effect modification, we used a more relaxed *P* value of 0.10 to define significance to detect interaction.³⁵

Results

This analysis included 9498 participants (age at baseline, 54.0±5.7 years; 56.9% women; and 20.3% black). From baseline through the fourth ARIC visit, 317 participants developed SMI, and 386 developed CMI. Table 1 shows the baseline characteristics of the study participants stratified by MI status.

Table 2 shows the incidence rates (per 1000 person-years) of SMI and CMI, overall and stratified by sex and race. Overall, the incidence rate of CMI was slightly higher

than the incidence rate of SMI. However, sex and race differences in the incidence of SMI and CMI were observed. The incidence rates of both SMI and CMI were higher in men compared with women (*P*<0.0001). On the other hand, blacks had a nonsignificantly higher rate of SMI than whites (*P*=0.217), but whites had a higher rate of CMI than blacks (*P*=0.002). Figure 1 shows the incidence rates of SMI and CMI in white men, black men, white women, and black women. As shown, the incidence rate of SMI was higher than the rate of CMI in black women, which is the opposite of what is observed in white men, in whom CMI was more common than SMI. On the other hand, the incidence rates of SMI were comparable to those of CMI in white women and black men.

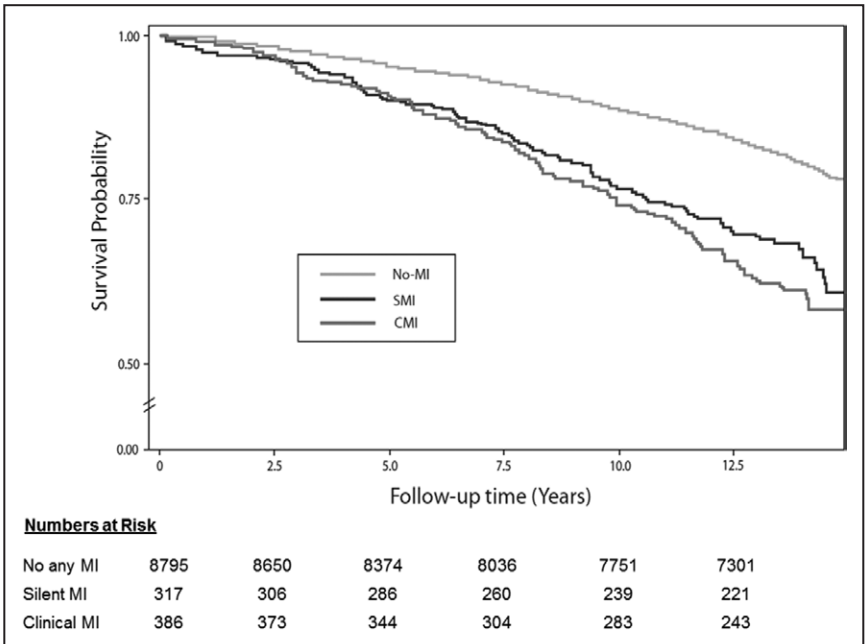


Figure 3. All-cause mortality survival probability curves by myocardial infarction (MI) status. CMI indicates clinical myocardial infarction; and SMI, silent myocardial infarction.

During a median follow-up of 13.2 years follow-up, 1833 cases of all-cause mortality were detected, of which 189 were CHD deaths. Figures 2 and 3 show the event-free survival curves by MI status (CHD death and all-cause mortality, respectively; no MI, SMI, and CMI).

In multivariable-adjusted Cox proportional hazards analysis, both SMI and CMI (compared with no MI) were associated with increased risk of CHD death (Table 3) and all-cause mortality (Table 4). However, SMI and CMI were associated with increased risk of mortality among both men and women, with potentially greater increased risk among women (interaction $P=0.089$ and 0.051 , respectively). No significant interaction by race was detected.

Discussion

In this analysis from the ARIC study, one of the largest community-based biracial cohort studies in the United States, we examined the sex and racial differences in the incidence and prognostic significance of silent versus CMI. The 3 key findings are the following: (1) SMI is common ($\approx 45\%$ of the MIs are silent); (2) both SMI and CMI are associated with poor

prognosis, with CMI showing slightly stronger association with risk of death than SMI; and (3) there are race and sex differences in the incidence and prognostic significance of SMI. These findings highlight the importance of detection of SMI and the potential impact of such detection on personalized prevention of CHD that takes into account race and sex. This is further underscored by the known sex and race disparity in CHD incidence and prognosis³⁶ and the fact that those with SMI are deprived medical attention compared with those with CMI.

Several previous studies have examined the prevalence, incidence, and prognostic significance of SMI.^{4–26} In literature reviews by Pride et al⁴ and Sheifer et al,³⁷ SMI constituted up to 44% of the total MIs and carried a prognosis that was as poor as that for CMIs. The prevalence and incidence of SMI differed, however, from 1 study to another. In the Cardiovascular Health Study (CHS), which is a predominantly white population of elderly ≥ 65 years of age, SMI accounted for 22% of the prevalent MIs.¹⁹ In a similar cohort of elderly patients > 75 years of age, the Bronx Aging Study, SMIs represented 44% of the total MIs.¹⁷ On the other hand, in the Heart and

Table 3. Risk of CHD Death Associated With SMI and CMI by Sex and Race

	Events/1000 person-y	HR (95% CI)		Interaction P Value \ddagger
		Model 1*	Model 2†	
All participants				N/A
No MI (n=8795)	0.7	1 (Referent)	1 (Referent)	
SMI (n=317)	3.2	4.10 (2.57–6.53)	3.06 (1.88–4.99)	
CMI (n=386)	5.5	6.85 (4.78–9.79)	4.74 (3.26–6.90)	
Men				
No MI (n=3641)	1.0	1 (Referent)	1 (Referent)	0.089
SMI (n=178)	3.6	3.23 (1.79–5.81)	2.77 (1.51–5.10)	
CMI (n=279)	5.5	5.49 (3.61–8.34)	4.39 (2.83–6.63)	
Women				
No MI (n=5154)	0.4	1 (Referent)	1 (Referent)	
SMI (n=139)	2.8	6.92 (3.26–14.7)	3.79 (1.65–8.73)	
CMI (n=107)	5.5	12.7 (6.66–24.0)	5.67 (2.78–11.6)	
White				
No MI (n=6993)	0.5	1 (Referent)	1 (Referent)	0.204
SMI (n=243)	2.6	4.01 (2.23–7.24)	3.30 (1.82–6.01)	
CMI (n=332)	4.6	6.60 (4.31–10.1)	4.52 (2.92–6.99)	
Black				
No MI (n=1802)	1.1	1 (Referent)	1 (Referent)	
SMI (n=74)	5.4	4.15 (1.93–8.89)	2.62 (1.06–6.48)	
CMI (n=54)	11.5	7.22 (3.75–13.9)	5.57 (2.60–11.9)	

CHD indicates coronary heart disease; CI, confidence interval; CMI, clinically manifest myocardial infarction; HR, hazard ratio; MI, myocardial infarction; and SMI, silent myocardial infarction.

*Model 1 adjusted for age, sex, and race.

†Model 2 adjusted for variables in model 1 plus study field center, body mass index, education, smoking status, systolic blood pressure, blood pressure-lowering medications, diabetes mellitus, ratio of total cholesterol to high-density lipoprotein, use of cholesterol-lowering medications, use of aspirin, family history of CHD, and serum creatinine (all at baseline).

‡Interactions tested in model 2.

Table 4. Risk of All-Cause Mortality Associated With Different Patterns of MI

	Events/1000 person-y	HR (95% CI)		Interaction <i>P</i> Value†‡
		Model 1*	Model 2†	
All participants				N/A
No MI (n=8795)	8.4	1 (Referent)	1 (Referent)	
SMI (n=317)	15.9	1.63 (1.33–1.99)	1.34 (1.09–1.65)	
CMI (n=386)	18.7	1.85 (1.56–2.20)	1.55 (1.30–1.85)	
Men				0.051
No MI (n=3641)	11.0	1 (Referent)	1 (Referent)	
SMI (n=178)	17.3	1.43 (1.11–1.85)	1.23 (0.94–1.60)	
CMI (n=279)	18.7	1.65 (1.34–2.02)	1.45 (1.18–1.78)	
Women				
No MI (n=5154)	6.6	1 (Referent)	1 (Referent)	
SMI (n=139)	14.0	2.05 (1.49–2.81)	1.58 (1.13–2.20)	
CMI (n=107)	18.9	2.59 (1.89–3.56)	1.83 (1.32–2.54)	
White				0.178
No MI (n=6993)	8.0	1 (Referent)	1 (Referent)	
SMI (n=243)	14.6	1.50 (1.18–1.90)	1.31 (1.03–1.67)	
CMI (n=332)	18.1	1.80 (1.49–2.17)	1.48 (1.22–1.79)	
Black				
No MI (n=1802)	9.8	1 (Referent)	1 (Referent)	
SMI (n=74)	20.1	2.03 (1.40–2.96)	1.45 (0.96–2.21)	
CMI (n=54)	23.0	2.14 (1.41–3.26)	1.97 (1.27–3.05)	

CI indicates confidence interval; CMI, clinically manifest myocardial infarction; HR, hazard ratio; MI, myocardial infarction; and SMI, silent myocardial infarction.

*Model 1 adjusted for age, sex, and race.

†Model 2 adjusted for variables in model 1 plus study field center, body mass index, education, smoking status, systolic blood pressure, blood pressure-lowering medications, diabetes mellitus, ratio of total cholesterol/high density lipoprotein, use of cholesterol-lowering medications, use of aspirin, family history of CHD, and serum creatinine (all at baseline).

‡Interactions tested in model 2.

Estrogen/Progestin Replacement Study Trial, which included only women, SMI constituted only 4% of the total MI,³⁸ which is much lower than in the Reykjavik Study in Women, in which SMIs represented 33% of the total MIs.¹⁰ Similarly, different studies showed different prognoses of SMI, with some reporting similar or poorer prognosis^{17,26} and others showing better prognosis with SMI compared with CMI.^{7,39}

Differences in the incidence and prognostic significance among various studies could be explained by differences in the population studied (eg, distribution of age, race, and sex) and the method by which SMI is detected (eg, Q wave in the ECG, myocardial scar in the cardiac magnetic resonance imaging, or areas of akinesia in the echocardiography). Even within studies that used ECG to define SMI there are differences: Some used serial Q/ST/T changes,²⁶ and others used MI at each point of time as in our study. Regardless of these differences, the overall incidence and prognostic significance of SMI in these studies generally agree with our results. However, none of these studies had the large sample size or the ethnically diverse community-based population with good representation of both sexes that our study has. Hence, the race and

sex differences in the incidence and prognostic significance of SMI were not appropriately examined in previous studies. Therefore, our results expand on the previous studies and extend our previous ARIC report on SMI that examined the incidence but not the prognostic significance of these MIs.⁴⁰

Our observations of race and sex differences in the incidence and prognostic significance of SMI add to the accumulating evidence of sex and racial differences in cardiovascular disease outcomes and the potential differences in the impact of risk factors among sexes and races. Because we adjusted for several potential confounders, it is less likely that our observed sex and racial differences were confounded by differences in MI-associated morbidities. Future investigation should assess whether genetic background, emerging risk factors, access to health care, awareness, and adherence to medications contribute to sex and racial differences.

Our results should be read in the context of certain limitations. Our analyses included only whites and blacks; hence, our results may not be generalizable to other races/ethnicities. Although we adjusted for several potential confounders in the models examining the association between SMI and CMI with

outcomes, residual confounding remains a possibility as in all similar studies. Q waves often disappear after MI; thus, the incidence of SMI in our study might be underestimated given the time between visits. In addition, the increasing sensitivity of troponin in the past decade probably has yielded more CMI and subsequently less SMI in the later stages of ARIC compared with earlier stages. Although this should not affect the race and sex differences, it may affect the trend of SMI over time. In addition, there were no significant changes in the sensitivity of troponin before 1998, the date our ascertainment of SMI ended. Despite these limitations, our study was able to document the race and sex differences in the incidence and prognostic significance of SMI and to compare the results with CMI in a large, well-designed, prospective cohort study with long-term follow-up, the ARIC study. Other strengths include standardized ECG procedures and carefully documented outcomes events ascertained by an independent adjudication committee.

Conclusions

In the ARIC study, we showed that SMI is as common as CMI, that 45% of the MIs are silent, and that both SMI and CMI are associated with poor outcomes. However, there are race and sex differences in the incidence and prognostic significance of SMI. Thus, an accidental ECG finding of MI in individuals without a history of MI may warrant enhanced CHD prevention efforts that take into account sex and race differences.

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Disclosures

None.

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CLINICAL PERSPECTIVE

This report from the Atherosclerosis Risk in Communities (ARIC) study, one of the largest community-based biracial cohort studies in the United States, shows that the presence of asymptomatic or silent myocardial infarction on screening ECGs is a common finding; $\approx 45\%$ of the total number of myocardial infarctions in the study were silent. These silent myocardial infarctions were associated with increased risk of death in a magnitude that is relatively comparable to that of myocardial infarctions with clinical manifestations. However, race and sex differences in the incidence and prognostic significance of silent myocardial infarction were observed in this study. These findings highlight the importance of detecting silent myocardial infarctions and the potential impact of such detection on personalized prevention of coronary heart disease that takes into account race and sex.