ORIGINAL RESEARCH

Trends in Acute Myocardial Infarction by Race and Ethnicity

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Background—Trends in acute myocardial infarction (AMI) incidence rates for diverse races/ethnicities are largely unknown, presenting barriers to understanding the role of race/ethnicity in AMI occurrence.

Methods and Results—We identified AMI hospitalizations for Kaiser Permanente Southern California members, aged ≥35 years, during 2000 to 2014 using discharge diagnostic codes. We excluded hospitalizations with missing race/ethnicity information. We calculated annual incidence rates (age and sex standardized to the 2010 US census population) for AMI, ST-segment–elevation myocardial infarction, and non–ST-segment–elevation myocardial infarction by race/ethnicity (Hispanic and non-Hispanic racial groups: Asian or Pacific Islander, black, and white). Using Poisson regression, we estimated annual percentage change in AMI, non–ST-segment–elevation myocardial infarction, and ST-segment–elevation myocardial infarction incidence by race/ethnicity and AMI incidence rate ratios between race/ethnicity pairs, adjusting for age and sex. We included 18 630 776 person-years of observation and identified 44 142 AMI hospitalizations. During 2000 to 2014, declines in AMI, non–ST-segment–elevation myocardial infarction, and ST-segment–elevation myocardial infarction were 48.7%, 34.2%, and 69.8%, respectively. Age- and sex-standardized AMI hospitalization rates/100 000 person-years declined for Hispanics (from 307 to 162), Asians or Pacific Islanders (from 271 to 158), blacks (from 347 to 199), and whites (from 376 to 189). Annual percentage changes ranged from −2.99% to −4.75%, except for blacks, whose annual percentage change was −5.32% during 2000 to 2009 and −1.03% during 2010 to 2014.

Conclusions—During 2000 to 2014, AMI, non–ST-segment–elevation myocardial infarction, and ST-segment–elevation myocardial infarction hospitalization incidence rates declined substantially for each race/ethnic group. Despite narrowing rates among races/ethnicities, differences persist. Understanding these differences can help identify unmet needs in AMI prevention and management to guide targeted interventions. **(*J Am Heart Assoc*. 2020;9:e013542. DOI: 10.1161/JAHA.119.013542.)**

Key Words: acute myocardial infarction • cardiovascular disease • incidence rates • race/ethnicity • trends

Acute myocardial infarction (AMI) is a common and potentially fatal presentation of cardiovascular disease (CVD). In the United States, an estimated 605 000 incident AMIs and 200 000 recurrent AMIs occur each year.[1] Studies of community-based cohorts and Medicare beneficiaries from the 1970s through 2010 observed >20% declines in AMI hospitalizations, but reported smaller declines for blacks, compared with whites.[2,3] Most studies have focused on differences between blacks and whites, leaving gaps in our understanding of AMI trends for other races/ethnicities.

Population sizes for some races/ethnicities, including Asians and Hispanics, are growing rapidly in the United States; whereas the non-Hispanic white population is projected to decrease by 16 million during 2014 to 2060.[4] The US Census Bureau estimated that >50% of the US population will belong to a race/ethnic minority group by 2044.[4] Limited

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Accompanying Tables S1 through S8 and Figure S1 are available at https://www.ahajournals.org/doi/suppl/10.1161/JAHA.119.013542

Preliminary findings were previously presented at the Epidemic Intelligence Service Conference, April 24 to 27, 2017, in Atlanta, GA; and at the Council of State and Territorial Epidemiologists Conference, June 4 to 8, 2017, in Boise, ID.

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Received June 10, 2019; accepted January 17, 2020.

Clinical Perspective

What Is New?

- Declines in acute myocardial infarction, non–ST-segment–elevation myocardial infarction, and ST-segment–elevation myocardial infarction hospitalization incidence rates were observed across all race/ethnic groups during 2000 to 2014; however, declines plateaued among blacks, but not other race/ethnic groups, beginning in 2010.
- Acute myocardial infarction, non–ST-segment–elevation myocardial infarction, and ST-segment–elevation myocardial infarction incidence rates for Hispanics and Asians or Pacific Islanders were lower than rates for whites during the study period, but by 2014 Asians or Pacific Islanders were no longer the group with the lowest incidence of acute myocardial infarction and ST-segment–elevation myocardial infarction.

What Are the Clinical Implications?

- Improvements in the prevention and treatment of cardiovascular risk factors likely had a considerable influence on the declining incidence of acute myocardial infarction in this population; however, despite narrowing rates between race/ethnic groups, differences persisted, suggesting that further efforts are needed to identify inequities in unmet needs in primary prevention.

knowledge of trends in AMI incidence for Asians or Pacific Islanders (APIs) and Hispanics presents challenges to understanding the contribution of race/ethnicity in the cause of AMI occurrence and the need for planning culturally appropriate strategies for AMI prevention and management (eg, inclusion of some aspect of a group's cultural values in the strategy). We examined trends in incidence of AMI hospitalizations by race/ethnicity during 2000 to 2014 for the membership of Kaiser Permanente Southern California (KPSC), a large, integrated healthcare delivery system.

Methods

Anonymized data that support the findings of this study are made available from the corresponding author on reasonable request from qualified researchers with documented evidence of training in human subjects protections.

Study Population

KPSC currently exceeds 4.6 million members and represents a unique setting to observe AMI trends across race/ethnic groups. KPSC members are representative of the insured population within the service area, comprising 10 southern California counties.[5] KPSC members' receipt of outpatient, inpatient, laboratory, and pharmacy services is tracked in the electronic health record system. Services performed outside of KPSC hospitals and medical offices are tracked through billing claims submitted to KPSC. In this study, we included people aged ≥35 years with ≥4 years of continuous membership and race/ethnicity information available.

Member Demographics

Age, sex, race/ethnicity, and health plan enrollment status were obtained from electronic membership records. Races/ethnicities were categorized into mutually exclusive groups, including Hispanic (regardless of race) and the following non-Hispanic racial groups: API, black, white, and a group consisting of Native American/Alaskan Native, multiple, or other (multiple/other) races.

Identification of AMI Hospitalizations

We identified hospitalizations during January 1, 1996, to December 31, 2014, with a principal discharge diagnosis of AMI using previously validated *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) codes 410.xx (excluding 410.x2) from hospital discharge records and inpatient claims.[6,7] An incident AMI hospitalization was defined as the first documented hospitalization during 2000 to 2014 for people with no history of AMI hospitalization during the previous 4 years. Each person identified to have an incident AMI hospitalization had at least 4 years of observation before the incident AMI hospitalization. Similarly, *ICD-9-CM* codes were used to identify the incidence of ST-segment–elevation myocardial infarction (STEMI) hospitalizations (410.0–410.6 and 410.8) and non–ST-segment–elevation myocardial infarction (NSTEMI) hospitalizations (410.7 and 410.9). In AMI analyses, myocardial infarction could be STEMI or NSTEMI. STEMI or NSTEMI analyses included the first event of the corresponding type.

Statistical Analysis

Demographic characteristics of people hospitalized with incident AMI were summarized overall and by race/ethnic groups (Table 1). To improve visibility of Table 1, demographic characteristics were summarized in three 5-year periods: 2000 to 2004, 2005 to 2009, and 2010 to 2014.

For each year during 2000 to 2014, we calculated age- and sex-standardized incidence rates/100 000 person-years separately for AMI, NSTEMI, and STEMI by race/ethnicity using direct adjustment to the 2010 US Census Bureau population distribution. Numerators were the number of incident AMI, NSTEMI, or STEMI hospitalizations within the year.

Table 1. Characteristics of People Hospitalized for AMI by Race/Ethnicity and Year, Kaiser Permanente Southern California, 2000 to 2014

Characteristics	Overall	Hispanic*	Asian or Pacific Islander*	Black*	White*	Multiple/Other*
Years 2000–2004						
N (%)	15 159 (100.0)	2526 (16.7)	870 (5.7)	1811 (11.9)	9882 (65.2)	70 (0.5)
Age, mean±SD, y	68.6±12.6	64.3±12.5	65.2±11.9	66.5±12.0	70.4±12.3	64.0±13.4
Age group, y, %						
35–54	16.0	25.0	23.1	18.9	12.5	25.7
55–74	49.8	53.4	55.2	54.7	47.5	52.9
≥75	34.2	21.5	21.7	26.3	40.0	21.4
Sex, %						
Women	36.7	31.3	27.9	44.5	37.4	30.0
Men	63.3	68.7	72.1	55.5	62.6	70.0
Years 2005–2009						
N (%)	14 527 (100.0)	2959 (20.4)	1021 (7.0)	1597 (11.0)	8844 (60.9)	106 (0.7)
Age, mean±SD, y	69.0±12.8	65.4±12.7	66.3±12.0	67.8±12.6	70.7±12.6	68.0±12.7
Age group, y, %						
35–54	15.4	22.7	17.4	16.8	12.4	17.9
55–74	49.3	51.7	58.3	51.7	47.1	48.1
≥75	35.3	25.6	24.3	31.4	40.5	34.0
Sex, %						
Women	37.0	33.7	27.9	48.7	37.1	32.1
Men	63.0	66.3	72.1	51.3	62.9	67.9
Years 2010–2014						
N (%)	14 456 (100.0)	3339 (23.1)	1211 (8.4)	1696 (11.7)	8097 (56.0)	113 (0.8)
Age, mean±SD, y	70.0±13.0	66.3±13.2	67.1±12.7	68.9±12.7	72.3±12.5	65.2±13.2
Age group, y, %						
35–54	13.8	21.6	18.3	14.6	9.5	23.0
55–74	48.0	49.8	52.9	51.1	45.9	47.8
≥75	38.2	28.6	28.7	34.3	44.5	29.2
Sex, %						
Women	38.5	36.1	30.5	50.1	38.3	33.6
Men	61.5	63.9	69.5	49.9	61.7	66.4

Percentages might not add up to 100% because of rounding to the nearest tenth of a percentage. AMI indicates acute myocardial infarction.
*People were categorized as Hispanic (regardless of race) or as one of the following non-Hispanic race groups: Asian or Pacific Islander, black, white, or multiple/other.

Denominators for each year were the total number of person-years for all KPSC members, including people without an AMI. Denominators excluded person-time from those missing race/ethnicity information among people who were aged ≥35 years with ≥4 years of membership. Within each race/ethnic group, we calculated AMI incidence stratified by age group (35–54, 55–74, and ≥75 years) and sex. Poisson distribution was used to estimate SEs and 95% CIs. We used Poisson regression to estimate the annual percentage changes (APCs) during 2000 to 2014 for AMI, STEMI, and NSTEMI incidence rates by race/ethnicity, adjusting for age and sex. We assessed trends for race/ethnic groups by including interaction terms between year and race/ethnicity in the Poisson regression models. Linear trends were modeled for all races/ethnicities, unless there was evidence for nonlinearity. We investigated nonlinearity by fitting generalized additive models and testing the smoothing effect of year, adjusting for age and sex. If nonlinear trends were identified, we modeled trends using linear spline regression, which allowed testing the change of APCs from one period to

another.[8] We also calculated APCs stratified by age group and sex. To determine if differences existed in the percentage declines between race/ethnic groups, we compared the 95% CIs of the APCs. We also estimated the incidence rate ratios to compare the incidence rates for each race/ethnicity pair in 2000 and again in 2014 using Poisson regression.

Sensitivity analyses were conducted to assess whether AMI hospitalization trends differed using 1, 2, and 8 years of time in membership requirements, compared with a 4-year requirement. All analyses were conducted using SAS, version 9.3 (SAS Institute, Cary, NC). The study protocol was reviewed and approved by the KPSC Institutional Review Board, and a waiver for written informed consent was obtained. KPSC ensured compliance with Health Insurance Portability and Accountability Act regulations.

Results

We included 18 630 776 person-years of observation in the study, with the following race/ethnicity distribution: 5 720 814 (30.7%) person-years for Hispanics, 1 835 454 (9.9%) person-years for APIs, 2 212 507 (11.9%) person-years for blacks, 8 596 768 (46.1%) person-years for whites, and 265 233 (1.4%) person-years for multiple/other race (Table S1). We identified 45 331 AMI hospitalizations. We excluded 1189 (2.6%) hospitalizations missing race/ethnicity information. Among the remaining 44 142 people with hospitalizations, mean age at AMI was 69.2 years, with an SD of 12.8 years; 27 633 (62.6%) were men; 8824 (20.0%) were Hispanic, 3102 (7.0%) were API, 5104 (11.6%) were black, 26 823 (60.8%) were white, and 289 (0.7%) were of multiple/other race. Table 1 and Tables S2 and S3 show demographic characteristics of people with incident AMI hospitalization by race/ethnicity or type of AMI (NSTEMI or STEMI), respectively.

AMI, NSTEMI, and STEMI Incidence Rates Standardized for Age and Sex

During 2000 to 2014, standardized AMI hospitalization incidence rates/100 000 person-years declined for Hispanics (from 307 to 162), APIs (271 to 158), blacks (347 to 199), whites (376 to 189), and multiple/other races (232 to 99) (Figure 1 and Table S4). AMI rates, in descending order, were

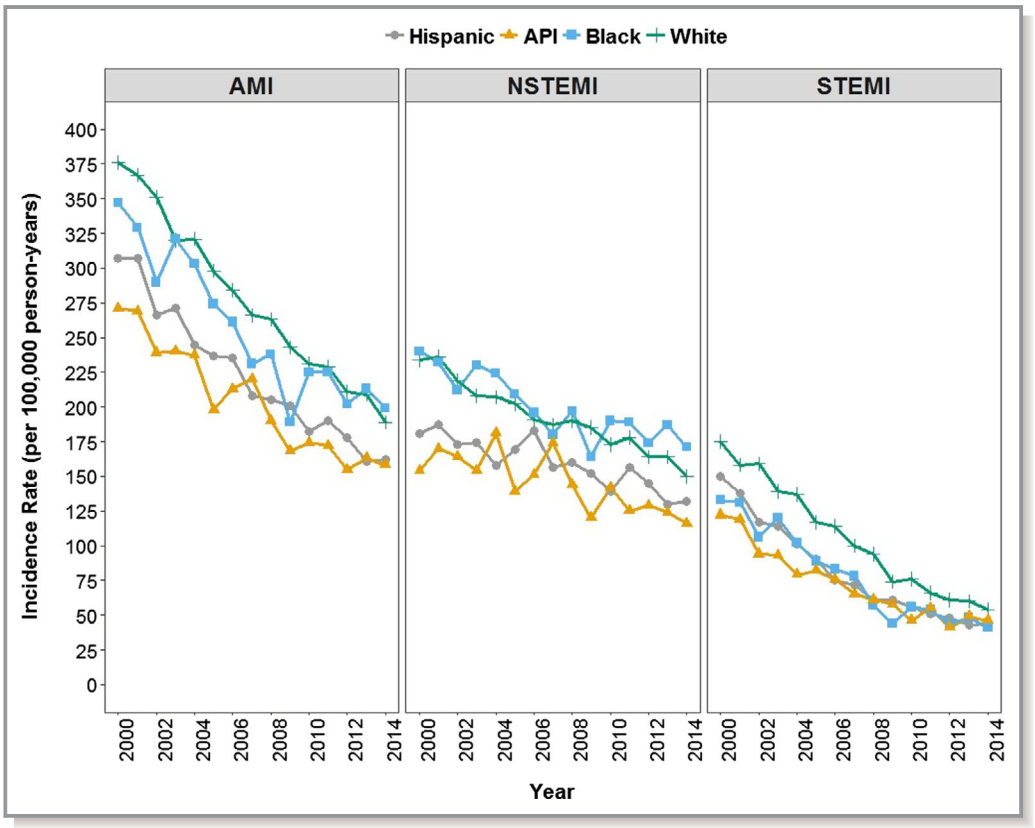

Figure 1. Overall incidence for acute myocardial infarction (AMI), non–ST-segment–elevation myocardial infarction (NSTEMI), and ST-segment–elevation myocardial infarction (STEMI) hospitalizations per 100 000 person-years by race/ethnicity, standardized by age and sex, Kaiser Permanente Southern California, 2000 to 2014. Race/ethnic groups include Hispanic (regardless of race) and the following non-Hispanic racial groups: Asian or Pacific Islander (API), black, and white.

highest for whites, blacks, Hispanics, and APIs. Among women, black women had the highest AMI rates among women aged 35 to 74 years, and black and white women aged ≥75 years had similar rates (Figure 2 and Table S5). In contrast, white men had the highest AMI rates across all age groups among men (Figure 2 and Table S6). NSTEMI incidence rates declined for Hispanics (from 181 to 132), APIs (154 to 116), blacks (240 to 171), whites (234 to 150), and multiple/other races (108 to 99) (Figure 1 and Table S7). NSTEMI rates were similar for blacks and whites (although rates for blacks became consistently higher than rates for whites after 2009), and these rates were followed by rates for Hispanics and then APIs. STEMIs also declined for Hispanics (from 150 to 44), APIs (122 to 46), blacks (133 to 41), whites (175 to 54), and multiple/other races (146 to 12) (Figure 1 and Table S8). Whites had the highest STEMI rates throughout the study period. In 2008, AMI incidence rates for Hispanics, APIs, and blacks converged. Incidence rates for people of multiple/other races were variable because their numbers were limited; they are not included in Figures 1 and 2 to increase visibility. These numbers are provided in Tables S4 through S8.

Trends in AMI, NSTEMI, and STEMI Incidence Rates

During 2000 to 2014, we observed a 48.7% (from 349 to 179) decrease in AMI incidence rates, standardized for age and sex, and an incidence decline for each race/ethnic group (Figure 1 and Table S4). Using Poisson regression, we estimated that during 2000 to 2014, the APC (95% CI) was −4.51% (−4.97% to −4.04%) for Hispanics, −4.11% (−4.90% to −3.32%) for APIs, −4.75% (−5.02% to −4.49%) for whites, and −2.99% (−5.65% to −0.26%) for multiple/other races (Table 2). The APCs across race/ethnic groups were similar, except for blacks. We identified nonlinear declines in AMI incidence among blacks, as indicated by generalized additive models (data not displayed). A linear spline model with one knot at year 2009 was fitted for blacks, and the APC (95% CI) was −5.31% (−6.31% to −4.30%) during 2000 to 2009; during 2010 to 2014, APC (95% CI) was −1.05% (−3.09% to 1.02%).

During 2000 to 2014, the relative decline in people hospitalized with NSTEMI was 34.2% (from 219 to 144), and the relative decline in people hospitalized with STEMI was

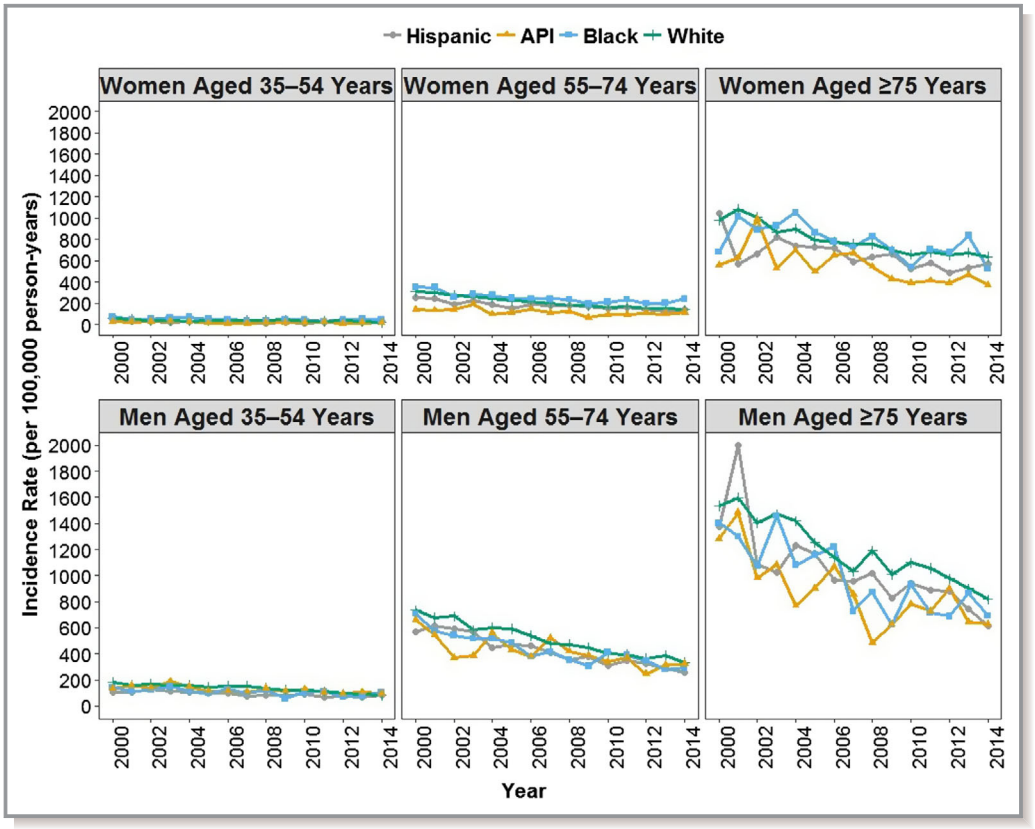

Figure 2. Overall acute myocardial infarction hospitalizations per 100 000 person-years by race/ethnicity, age, and sex, Kaiser Permanente Southern California, 2000 to 2014. Race/ethnic groups include Hispanic (regardless of race) and the following non-Hispanic racial groups: Asian or Pacific Islander (API), black, and white.

Table 2. APC in Hospitalizations for AMI, NSTEMI, and STEMI, Adjusted by Age and Sex, by Race/Ethnicity, Kaiser Permanente Southern California, 2000 to 2014

Event Type	Hispanic*	Asian or Pacific Islander*	Black 2000–2009*†	Black 2010–2014*†	White*	Multiple/Other*
AMI	−4.51 (−4.97 to −4.04)	−4.11 (−4.90 to −3.32)	−5.31 (−6.31 to −4.30)	−1.05 (−3.09 to 1.02)	−4.75 (−5.02 to −4.49)	−2.99 (−5.65 to −0.26)
NSTEMI	−2.23 (−2.80 to −1.65)	−2.54 (−3.50 to −1.58)	−2.28 (−2.98 to −1.57)	−2.28 (−2.98 to −1.57)	−2.88 (−3.20 to −2.56)	−1.16 (−4.59 to −2.40)
STEMI	−8.60 (−9.34 to −7.86)	−7.42 (−8.70 to −6.12)	−8.84 (−9.90 to −7.77)	−8.84 (−9.90 to −7.77)	−8.53 (−8.95 to −8.10)	−8.41 (−12.55 to −4.08)

AMI indicates acute myocardial infarction; APC, annual percentage change; NSTEMI, non-STEMI; STEMI, ST-segment–elevation myocardial infarction.

*People were categorized as Hispanic (regardless of race) or as one of the following non-Hispanic race groups: Asian or Pacific Islander, black, white, or multiple/other.

†A linear spline model with one knot at year 2009 was fitted for the black people to account for nonlinearity in the decline in AMI incidence. This allowed for different estimations of the APC for 2000 to 2009 and 2010 to 2014. No statistically significant evidence of nonlinearity in the decline of hospitalized NSTEMI and STEMI incidence rates was observed.

69.8% (159 to 48) (Figure 1 and Table S7 and S8). APCs (95% CIs) in NSTEMI incidence rates were −2.23% (−2.80% to −1.65%) for Hispanics, −2.54% (−3.50% to −1.58%) for APIs, −2.28% (−2.98% to −1.57%) for blacks, −2.88% (−3.20% to −2.56%) for whites, and −1.16% (−4.59% to 2.40%) for multiple/other races (Table 2). APCs (95% CIs) in STEMIs during this period were −8.60 (−9.34% to −7.86%) for Hispanics, −7.42% (−8.70% to −6.12%) for APIs, −8.84% (−9.90% to −7.77%) for blacks, −8.53% (−8.95% to −8.10%) for whites, and −8.41% (−12.55% to −4.08%) for multiple/other races (Table 2).

In sensitivity analyses, using 1, 2, or 8 years of time in membership did not change trends in AMI incidence, compared with a 4-year membership requirement, although estimated rates were different (Figure S1).

Race/Ethnic Group Incidence Rate Ratios in 2000 and 2014

AMI incidence rates were significantly lower for blacks, APIs, and Hispanics than for whites in 2000 ($P<0.001$; Figure 3). In 2014, rates for APIs and Hispanics were still lower than rates for whites ($P<0.0001$); however, rates between blacks and whites were similar ($P=0.93$). AMI incidence rates for APIs and Hispanics were lower than AMI rates for blacks in 2000 and 2014 ($P<0.0001$). Compared with APIs, Hispanics had higher AMI incidence rates in 2000 ($P=0.008$), although AMI incidence rates were similar for both groups in 2014 ($P=0.14$).

Discussion

Among people aged ≥35 years, we observed considerable declines in the incidence of AMI hospitalizations during a 15-year period (2000–2014) across all race/ethnic groups in a large, diverse, community-based population. The decline of STEMI was approximately twice the decline of NSTEMI. Declines for most race/ethnic groups were similar, except for blacks, who experienced a steep decline in AMI rates during 2000 to 2009 that slowed during 2010 to 2014. Results indicate that although AMI incidence rates narrowed between races/ethnicities, particularly between black and white and between API and Hispanic groups, differences by race/ethnicity persist.

These results extend previous reports of substantial decreases in rates of AMI hospitalizations in the United States during the past 2 decades, which typically reported AMI declines of 24% to 30% corresponding to the first half of our study period (≈2000–2007).[3,7,9–18] We observed a relative decline in AMI of 48.7% over a study period that is nearly twice as long (2000–2014). In Kaiser Permanente Northern California, STEMI rates decreased steeply from 1999

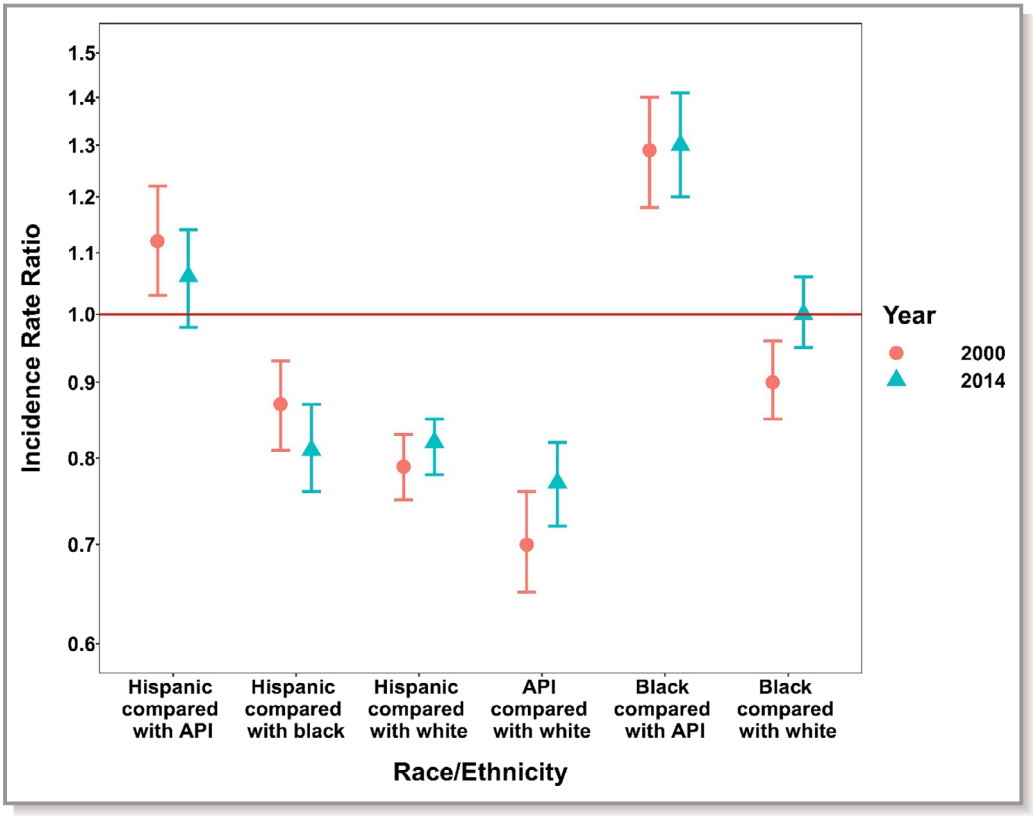

Figure 3. Incidence rate ratios for acute myocardial infarction for race/ethnicity pairs in 2000 and 2014, Kaiser Permanente Southern California. People were categorized as Hispanic (regardless of race) or as one of the following non-Hispanic racial groups: Asian or Pacific Islander (API), black, or white.

to 2008, whereas NSTEMI rates increased from 1999 to 2004 and then decreased thereafter, which is consistent with our observation of steeper declines in STEMI compared with NSTEMI. A follow-up study in Kaiser Permanente Northern California from 2008 to 2014 demonstrated that AMI rates continued to decrease, although declines were driven by NSTEMI rather than STEMI.[18] In our study, we did not find statistically significant evidence of nonlinearity for the APCs in NSTEMI or STEMI rates over the study period. However, although the APCs are consistent across years, the magnitude of the rate decreases becomes smaller over time.

Declines in AMI rates have been attributed to improvements in CVD awareness, treatment, and risk factor management.[7] Although not analyzed in our study, efforts to improve and standardize long-term and preventive care at KPSC likely contributed to declines in incident AMI hospitalizations.[19] KPSC has prioritized hypertension control and increased the use of statins for primary prevention.[20,21]

Our study provides evidence to expand the limited literature assessing AMI hospitalization incidence rates for Hispanics and APIs in the United States. During 2000 to 2014, we observed similar declines in AMI, NSTEMI, and STEMI hospitalization incidence rates for Hispanics, APIs, and whites, indicating that these groups might have experienced similar benefits from improvements in CVD awareness and care. Our results also reveal that AMI, NSTEMI, and STEMI incidence rates for Hispanics and APIs were lower than rates for whites during the study period. Although not directly comparable to our more contemporary study, results from the Corpus Christi Heart Project reported that Mexican people who resided in one Texas community had higher AMI incidence rates than their white counterparts during 1988 to 1992.[22] For APIs, CVD incidence data are severely lacking in the United States; however, studies report that compared with other races/ethnicities, APIs have lower prevalence of coronary heart disease and stroke and a higher prevalence of ideal cardiovascular health metrics.[1] Although we observed AMI rates for APIs as the lowest among all race/ethnic groups in 2000, AMI rates for APIs and Hispanics converged by the end of the study period. In addition, NSTEMI rates also converged for APIs, Hispanics, and blacks. Our results provide new data indicating that by 2014, APIs in our study population were no longer the group with the lowest incidence of AMI and STEMI. However, our API and Hispanic categories aggregate multiple race/ethnic groups and might not reflect the experience of more granular groups (eg, Asian Indians, Filipinos, and Puerto Ricans) whose CVD prevalence has been reported to vary.[23,24]

Although incident AMI hospitalization rates remain lower for APIs and Hispanics, compared with whites, the absolute burden (number of people hospitalized) of AMI hospitalization incidence for Hispanics and APIs increased over the study period. In contrast, the absolute burden of AMI hospitalizations for whites declined. The absolute burden for APIs and Hispanics increased, despite decreasing incidence rates. This observation is likely attributable to the rapid growth in population size for the underlying API and Hispanic populations and the slower growth for the white population, outweighing lower incidence rates for APIs and Hispanics, compared with whites. The AMI burden for APIs and Hispanics will likely continue to grow according to population size increases.

Studies of Medicare beneficiaries,[15,16] the ARIC (Atherosclerosis Risk in Communities) study,[12] and an analysis of an all-payer administrative database of hospitalizations in the United States[11] examined race/ethnic differences in incidence and recurrent AMI hospitalization rates and observed smaller declines for blacks than whites. In our study, we observed similar annual declines in incidence rates during 2000 to 2009 for blacks and whites. However, the decline for blacks plateaued during 2010 to 2014, whereas the decline for whites during 2010 to 2014 continued according to the trajectory observed during 2000 to 2009.

Although slower declines in AMI hospitalizations among blacks might be attributable to less effective improvements in primary prevention of CVD for blacks than in primary prevention for whites, alternative explanations raise the possibility that slower declines might represent improvements in access and quality of care for blacks. This might occur if more blacks with AMIs survive long enough to be hospitalized.[15] Hospitalized AMIs do not capture nonhospitalized AMIs, including out-of-hospital deaths. Blacks have a higher burden of CVD and its risk factors,[25] more barriers to symptom recognition,[26] and reduced access to heart disease treatment and health care compared with whites.[25,27] Therefore, blacks might be less likely than whites to be hospitalized for AMI and more likely to experience out-of-hospital AMI deaths. Reports of higher hospitalization rates and nonhospitalized first AMI or fatal coronary heart disease for blacks, compared with whites, support this hypothesis.[28,29]

Among Medicare enrollees in Kaiser Permanente health plans in the western United States, differences in control of cardiovascular and diabetes mellitus risk factors between blacks and whites have decreased, with control becoming similar by 2011.[30] Moreover, in our study, the higher rates of AMI incidence for whites compared with blacks were driven by STEMIs, which are more severe and deadlier than NSTEMIs. Although NSTEMI rates were similar for blacks and whites in 2000, NSTEMI rates were higher for blacks than whites starting in 2010. These observations are consistent with the possibility that blacks experienced a shift from out-of-hospital STEMI deaths to hospitalized STEMIs and a shift from STEMIs to NSTEMIs. Therefore, a plateauing decline in hospitalized AMIs during later study years for blacks might reflect reductions in healthcare access barriers and disease severity, increases in cardioprotective medications, or improved treatment of CVD risk factors for blacks.

Our findings require considerations. All people in our study had healthcare coverage through membership in an integrated, managed healthcare organization and might be healthier than the general population. In addition, the study population might have had better access to care than the general population and further benefited from increasingly standardized approaches to CVD prevention and management (eg, improved hypertension control).[19,20] Our results might not be generalizable to populations with less access to care; however, our study provides a unique opportunity to increase knowledge about the contribution of race/ethnicity to AMI cause in a setting where all people have healthcare coverage. Although people from all race/ethnic groups in this study have the same theoretical access to healthcare coverage because they are all insured with KPSC, we demonstrate that differences in AMI incidence rates persist. These differences might reflect genetic and other biological predispositions for AMI risk or barriers to healthcare use experienced by different race/ethnic groups.[15,31]

Our study is limited by not capturing out-of-hospital fatal AMIs, which might indicate more severe disease or barriers to accessing care quickly. Other studies have observed greater declines in out-of-hospital fatal AMI than hospitalized AMI.[9] Thus, declines in combined fatal out-of-hospital AMI and hospitalized AMI are likely to be steeper than the decline in hospitalized AMI alone. We did not account for secular changes in diagnostic sensitivity that might arise from increasing use of biomarkers (eg, serum troponin). Trends might be more dramatic than observed in this study because incidence during earlier years might be biased downward. Moreover, we could not assess AMI history before KPSC membership, which might have led to misclassification of some recurrent AMIs as first AMIs. However, because we included a 4-year time in membership requirement, we were able to use a look-back period of 4 years to reduce potential misclassification. Results from sensitivity analyses illustrated that varying the length of continuous membership time (1, 2, 4, and 8 years) did not change the trend of hospitalized AMI incidence rates during the study period. Moreover, most recurrent AMIs occur within the first year, with risk of recurrent AMI decreasing sharply after the second year.[32]

In summary, we observed substantial declines in incidence of hospitalized AMI across all race/ethnic groups during 2000 to 2014 (declines plateaued among blacks beginning in 2010) among a community-based southern California population,

likely caused in part by ongoing efforts to improve primary prevention and chronic disease care. Our results provide valuable insights into how AMI risk differs by race/ethnicity and can guide long-term goals of KPSC and other healthcare communities to reduce AMI rates, potentially through identifying unmet needs in primary prevention for targeted interventions. Determining AMI risk for diverse populations will become increasingly important as the distribution of race/ethnicity shifts with the growth of race/ethnic minority populations.

Acknowledgments

The authors thank the patients of Kaiser Permanente for helping to improve care through the use of information collected through our electronic health record systems. The authors thank Byron Robinson, PhD, for helpful insights and comments that greatly improved the article. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Sources of Funding

This work was supported by the Southern California Permanente Medical Group.

Disclosures

Dr Chi completed this work while employed at the Centers for Disease Control and Prevention and Kaiser Permanente Southern California. She is currently employed by Genentech, Inc. Dr Reading completed this work while employed at Kaiser Permanente Southern California. She is currently employed by Amgen, Inc. Dr Reynolds has received research funding through her institution from Amgen, Inc, and Regeneron Pharmaceuticals, Inc. The remaining authors have no disclosures to report.

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SUPPLEMENTAL MATERIAL

Table S1. Person-Years Contributed by Each Race/Ethnic Group by Year, Kaiser Permanente Southern California, 2000–2014.

		Hispanic		Asian or Pacific Islander		Black		White		Multiple or Other	
Year	Overall Person-years	Person-years	%	Person-years	%	Person-years	%	Person-years	%	Person-years	%
2000	933,256	224,126	24	75,671	8	128,240	14	495,152	53	10,067	1
2001	986,136	249,245	25	81,805	8	132,378	13	511,679	52	11,029	1
2002	1,041,102	275,438	26	88,452	8	136,591	13	528,423	51	12,198	1
2003	1,078,067	294,148	27	93,585	9	139,168	13	538,008	50	13,157	1
2004	1,107,510	310,661	28	98,447	9	141,100	13	543,281	49	14,021	1
2005	1,158,747	337,893	29	105,156	9	144,147	12	556,274	48	15,276	1
2006	1,210,185	365,433	30	112,790	9	147,349	12	567,907	47	16,706	1
2007	1,243,319	384,901	31	119,090	10	148,859	12	572,497	46	17,971	1
2008	1,279,658	405,411	32	125,993	10	150,793	12	578,533	45	18,928	1
2009	1,313,135	422,749	32	133,500	10	151,984	12	585,059	45	19,844	2
2010	1,360,965	443,671	33	142,723	10	154,331	11	599,043	44	21,197	2
2011	1,413,077	467,385	33	152,513	11	156,502	11	614,167	43	22,510	2
2012	1,461,685	491,191	34	161,471	11	159,049	11	626,414	43	23,560	2
2013	1,495,212	510,262	34	168,216	11	159,606	11	633,182	42	23,946	2
2014	1,548,722	538,299	35	176,042	11	162,409	10	647,150	42	24,823	2
Total	18,630,776	5,720,813	31	1,835,454	10	2,212,506	12	8,596,769	46	265,233	1

Table S2. Characteristics of Persons Hospitalized for Non-ST-Segment Elevation Myocardial Infarction by Race/Ethnicity and Year, Kaiser Permanente Southern California, 2000–2014.*

Characteristics	Overall	Hispanic†	Asian or Pacific Islander†	Black†	White†	Multiple/ Other†
Years 2000–2004						
N (%)	9792 (100.0%)	1512 (15.4%)	557 (5.7%)	1269 (13.0%)	6417 (65.5%)	37 (0.4%)
Age (yrs), mean ± SD	69.8 ± 12.5	65.4 ± 12.7	66.6 ± 12.0	67.1 ± 12.0	71.6 ± 12.1	64.4 ± 13.4
Age group (%)						
35–54	1266 (12.9%)	319 (21.1%)	101 (18.1%)	206 (16.2%)	631 (9.8%)	9 (24.3%)
55–74	4662 (47.6%)	812 (53.7%)	311 (55.8%)	682 (53.7%)	2837 (44.2%)	20 (54.1%)
≥75	3864 (39.5%)	381 (25.2%)	145 (26%)	381 (30%)	2949 (46%)	8 (21.6%)
Sex (%)						
Women	3718 (38%)	532 (35.2%)	169 (30.3%)	578 (45.5%)	2425 (37.8%)	14 (37.8%)
Men	6074 (62%)	980 (64.8%)	388 (69.7%)	691 (54.5%)	3992 (62.2%)	23 (62.2%)
Years 2005–2009						
N (%)	10575 (100.0%)	2138 (20.2%)	736 (7.0%)	1253 (11.8%)	6382 (60.3%)	66 (0.6%)
Age (yrs), mean ± SD	70.1 ± 12.7	66.5 ± 12.6	67.3 ± 11.9	68.3 ± 12.6	71.9 ± 12.5	68.8 ± 12.7
Age group (%)						
35–54	1342 (12.7%)	406 (19%)	104 (14.1%)	187 (14.9%)	635 (9.9%)	10 (15.2%)

55–74	4988 (47.2%)	1089 (50.9%)	421 (57.2%)	638 (50.9%)	2810 (44%)	30 (45.5%)
≥75	4245 (40.1%)	643 (30.1%)	211 (28.7%)	428 (34.2%)	2937 (46%)	26 (39.4%)
Sex (%)						
Women	4165 (39.4%)	786 (36.8%)	228 (31%)	628 (50.1%)	2504 (39.2%)	19 (28.8%)
Men	6410 (60.6%)	1352 (63.2%)	508 (69%)	625 (49.9%)	3878 (60.8%)	47 (71.2%)
Years 2010–2014						
N (%)	11487 (100.0%)	2620 (22.8%)	933 (8.1%)	1450 (12.6%)	6407 (55.8%)	77 (0.7%)
Age (yrs), mean ± SD	70.7 ± 12.8	66.9 ± 13.3	67.9 ± 12.5	69.1 ± 12.6	73.1 ± 12.2	66.9 ± 14.2
Age group (%)						
35–54	1377 (12%)	513 (19.6%)	148 (15.9%)	198 (13.7%)	500 (7.8%)	18 (23.4%)
55–74	5305 (46.2%)	1273 (48.6%)	490 (52.5%)	728 (50.2%)	2784 (43.5%)	30 (39%)
≥75	4805 (41.8%)	834 (31.8%)	295 (31.6%)	524 (36.1%)	3123 (48.7%)	29 (37.7%)
Sex (%)						
Women	4629 (40.3%)	1009 (38.5%)	301 (32.3%)	751 (51.8%)	2534 (39.6%)	34 (44.2%)
Men	6858 (59.7%)	1611 (61.5%)	632 (67.7%)	699 (48.2%)	3873 (60.4%)	43 (55.8%)

Abbreviations: SD, standard deviation.

* Percentages might not add up to 100% because of rounding to the nearest tenth of a percent.

† Persons were categorized as Hispanic (regardless of race) or as one of the following non-Hispanic race groups: Asian or Pacific Islander (API), black, white, or multiple or other (multiple/other).

Table S3. Characteristics of Persons Hospitalized for ST-Segment Elevation Myocardial Infarction by Race/Ethnicity and Year, Kaiser Permanente Southern California, 2000–2014.*

Characteristics	Overall	Hispanic†	Asian or Pacific Islander†	Black†	White†	Multiple/ Other†
Years 2000–2004						
N (%)	6682 (100.0%)	1186 (17.7%)	365 (5.5%)	702 (10.5%)	4397 (65.8%)	32 (0.5%)
Age (yrs), mean ± SD	66.3 ± 12.4	62.2 ± 12.1	62.6 ± 11.5	64.3 ± 11.8	68.1 ± 12.2	62.3 ± 13.1
Age group (%)						
35–54	1280 (19.2%)	341 (28.8%)	106 (29%)	157 (22.4%)	667 (15.2%)	9 (28.1%)
55–74	3544 (53%)	638 (53.8%)	198 (54.2%)	402 (57.3%)	2289 (52.1%)	17 (53.1%)
≥75	1858 (27.8%)	207 (17.5%)	61 (16.7%)	143 (20.4%)	1441 (32.8%)	6 (18.8%)
Sex (%)						
Women	2240 (33.5%)	311 (26.2%)	80 (21.9%)	293 (41.7%)	1550 (35.3%)	6 (18.8%)
Men	4442 (66.5%)	875 (73.8%)	285 (78.1%)	409 (58.3%)	2847 (64.7%)	26 (81.3%)
Years 2005–2009						
N (%)	5181 (100.0%)	1059 (20.4%)	365 (7.0%)	482 (9.3%)	3238 (62.5%)	37 (0.7%)
Age (yrs), mean ± SD	66.0 ± 12.5	62.4 ± 12.4	63.4 ± 11.8	65.1 ± 12.3	67.6 ± 12.4	65.3 ± 12.7
Age group (%)						
35–54	1012 (19.5%)	308 (29.1%)	81 (22.2%)	99 (20.5%)	515 (15.9%)	9 (24.3%)

55–74	2754 (53.2%)	551 (52%)	222 (60.8%)	262 (54.4%)	1700 (52.5%)	19 (51.4%)
≥75	1415 (27.3%)	200 (18.9%)	62 (17%)	121 (25.1%)	1023 (31.6%)	9 (24.3%)
Sex (%)						
Women	1588 (30.7%)	278 (26.3%)	78 (21.4%)	204 (42.3%)	1014 (31.3%)	14 (37.8%)
Men	3593 (69.3%)	781 (73.7%)	287 (78.6%)	278 (57.7%)	2224 (68.7%)	23 (62.2%)
Years 2010–2014						
N (%)	4136 (100.0%)	984 (23.8%)	352 (8.5%)	388 (9.4%)	2379 (57.5%)	33 (0.8%)
Age (yrs), mean ± SD	66.8 ± 12.8	63.6 ± 12.4	64.3 ± 12.7	65.9 ± 12.5	68.8 ± 12.6	62.2 ± 10.7
Age group (%)						
35–54	717 (17.3%)	245 (24.9%)	79 (22.4%)	70 (18%)	318 (13.4%)	5 (15.2%)
55–74	2171 (52.5%)	522 (53%)	187 (53.1%)	210 (54.1%)	1230 (51.7%)	22 (66.7%)
≥75	1248 (30.2%)	217 (22.1%)	86 (24.4%)	108 (27.8%)	831 (34.9%)	6 (18.2%)
Sex (%)						
Women	1304 (31.5%)	278 (28.3%)	83 (23.6%)	167 (43%)	770 (32.4%)	6 (18.2%)
Men	2832 (68.5%)	706 (71.7%)	269 (76.4%)	221 (57%)	1609 (67.6%)	27 (81.8%)

SD, standard deviation.

* Percentages might not add up to 100% because of rounding to the nearest tenth of a percent.

† Persons were categorized as Hispanic (regardless of race) or as one of the following non-Hispanic race groups: Asian or Pacific Islander (API), black, white, or multiple or other (multiple/other).

Table S4. Crude and Age- and Sex-standardized Incidence Rates of Acute Myocardial Infarction Hospitalizations per 100,000 Person-Years by Race/Ethnicity, Kaiser Permanente Southern California, 2000–2014.

	Overall				Hispanic				Asian or Pacific Islander			
Year	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)
2000	2,974	933,256	319	349 (337, 362)	441	224,126	197	307 (275, 339)	161	75,671	213	271 (226, 316)
2001	3,073	986,136	312	343 (331, 355)	500	249,245	201	307 (277, 336)	170	81,805	208	269 (226, 314)
2002	3,036	1,041,102	292	319 (307, 330)	512	275,438	186	266 (241, 292)	157	88,452	177	239 (198, 279)
2003	3,020	1,078,067	280	302 (291, 313)	546	294,148	186	271 (246, 295)	186	93,585	199	240 (203, 276)
2004	3,056	1,107,510	276	294 (284, 305)	527	310,661	170	245 (223, 268)	196	98,447	199	237 (202, 272)
2005	2,971	1,158,747	256	271 (261, 281)	556	337,893	165	237 (216, 258)	177	105,156	168	198 (167, 229)
2006	2,997	1,210,185	248	260 (251, 269)	614	365,433	168	235 (215, 254)	201	112,790	178	213 (182, 244)
2007	2,859	1,243,319	230	241 (232, 249)	572	384,901	149	208 (190, 226)	227	119,090	191	220 (190, 250)
2008	2,912	1,279,658	228	237 (228, 246)	591	405,411	146	205 (187, 222)	215	125,993	171	190 (163, 216)
2009	2,788	1,313,135	212	218 (209, 226)	626	422,749	148	201 (184, 217)	201	133,500	151	168 (144, 192)
2010	2,829	1,360,965	208	211 (203, 219)	609	443,671	137	182 (167, 197)	224	142,723	157	174 (151, 197)
2011	2,978	1,413,077	211	211 (203, 219)	679	467,385	145	190 (175, 205)	240	152,513	157	172 (150, 194)
2012	2,872	1,461,685	196	195 (188, 202)	688	491,191	140	178 (164, 192)	227	161,471	141	155 (134, 175)
2013	2,918	1,495,212	195	191 (184, 198)	652	510,262	128	161 (149, 174)	254	168,216	151	163 (142, 183)

2014	2,859	1,548,722	185	179 (172, 186)	711	538,299	132	162 (149, 174)	266	176,042	151	158 (138, 177)
	Black				**White**				**Multiple or Other**			
Year	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Age- and Sex-standardized Incidence Rate (95% CI)
2000	377	128,240	294	347 (311, 383)	1,982	495,152	400	376 (359, 392)	13	10,067	129	232 (90, 375)
2001	358	132,378	270	329 (294, 364)	2,032	511,679	397	367 (351, 383)	13	11,029	118	195 (71, 319)
2002	330	136,591	242	290 (258, 323)	2,015	528,423	381	351 (335, 366)	22	12,198	180	268 (139, 396)
2003	376	139,168	270	321 (288, 354)	1,902	538,008	354	320 (306, 335)	10	13,157	76	122 (37, 206)
2004	370	141,100	262	303 (272, 335)	1,951	543,281	359	321 (307, 335)	12	14,021	86	121 (44, 198)
2005	344	144,147	239	274 (244, 303)	1,872	556,274	337	298 (285, 312)	22	15,276	144	248 (132, 364)
2006	338	147,349	229	261 (232, 289)	1,829	567,907	322	284 (271, 297)	15	16,706	90	143 (62, 223)
2007	313	148,859	210	231 (205, 257)	1,727	572,497	302	266 (253, 279)	20	17,971	111	180 (91, 270)
2008	328	150,793	218	238 (212, 264)	1,755	578,533	303	263 (250, 275)	23	18,928	122	217 (118, 316)
2009	274	151,984	180	189 (167, 212)	1,661	585,059	284	243 (231, 255)	26	19,844	131	198 (111, 285)
2010	334	154,331	216	225 (200, 249)	1,640	599,043	274	231 (219, 242)	22	21,197	104	178 (93, 264)
2011	347	156,502	222	225 (201, 249)	1,689	614,167	275	229 (217, 240)	23	22,510	102	163 (89, 237)
2012	325	159,049	204	202 (180, 224)	1,609	626,414	257	211 (201, 222)	23	23,560	98	157 (86, 229)
2013	350	159,606	219	213 (191, 236)	1,635	633,182	258	209 (199, 219)	27	23,946	113	122 (72, 172)
2014	340	162,409	209	199 (177, 220)	1,524	647,150	235	189 (179, 198)	18	24,823	73	99 (48, 151)

Table S5. Acute Myocardial Infarction Hospitalizations per 100,000 Person-Years Among Women by Race/Ethnicity, Age Group, and Sex, Kaiser Permanente Southern California, 2000–2014.

	Hispanic		Asian or Pacific Islander		Black		White		Multiple or Other	
Year (age yrs)	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate
(35–54)										
2000	29	34	7	26	33	72	69	53	1	28
2001	30	32	7	24	22	47	61	46	2	52
2002	31	30	8	26	24	50	52	39	2	48
2003	25	23	10	31	31	64	50	37	0	0
2004	32	28	9	27	33	69	43	33	2	44
2005	33	27	4	12	24	50	51	39	1	20
2006	36	28	3	8	24	49	47	36	0	0
2007	28	21	3	8	18	37	52	40	1	18
2008	20	14	8	20	19	39	49	38	0	0
2009	32	22	7	17	23	49	54	43	3	49
2010	22	14	8	19	22	47	39	31	2	31
2011	36	23	10	22	13	28	38	30	1	15
2012	34	21	5	10	22	48	43	34	0	0
2013	35	21	7	14	23	51	34	28	0	0

2014	46	26	10	20	20	45	26	21	2	27
(55–74)										
2000	81	257	20	141	87	352	309	305	2	156
2001	84	243	21	134	90	350	320	303	0	0
2002	72	188	24	137	70	259	304	274	1	61
2003	92	220	36	189	80	284	301	260	1	54
2004	82	183	20	96	81	275	293	246	3	145
2005	74	151	25	110	75	245	273	221	4	172
2006	99	185	35	142	77	243	279	219	2	77
2007	103	180	29	109	78	240	262	201	2	70
2008	109	178	34	119	78	233	236	177	4	132
2009	109	166	20	65	67	194	239	174	2	62
2010	105	148	31	94	75	210	231	161	0	0
2011	123	161	32	90	87	235	258	173	3	79
2012	116	142	40	106	75	196	233	151	1	25
2013	105	120	39	98	78	199	231	146	6	147
2014	129	136	46	110	98	241	227	138	3	70
(≥75)										
2000	48	1,044	10	557	32	680	352	979	2	1,025
2001	30	567	13	628	52	1,014	410	1,084	2	962

2002	40	658	23	987	49	891	399	1,007	1	442
2003	57	822	14	526	55	929	355	863	1	374
2004	57	733	21	697	66	1,049	381	899	1	334
2005	64	731	17	497	58	864	349	792	4	1,212
2006	70	714	25	652	56	781	353	777	1	270
2007	63	592	28	671	55	729	349	759	2	531
2008	73	633	25	542	66	826	353	754	4	1,006
2009	83	659	22	429	59	696	335	697	4	942
2010	72	520	22	388	49	541	326	655	6	1,295
2011	88	577	26	413	68	705	349	678	3	601
2012	82	488	27	390	69	674	346	653	4	733
2013	97	531	35	462	90	834	365	674	2	335
2014	114	573	31	370	60	523	355	635	5	753

Table S6. Acute Myocardial Infarction Hospitalizations per 100,000 Person-Years Among Men by Race/Ethnicity, Age Group, and Sex, Kaiser Permanente Southern California, 2000–2014.

	Hispanic		Asian or Pacific Islander		Black		White		Multiple or Other	
Year (age yrs)	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate	No. of Events	Incidence Rate
(35–54)										
2000	74	103	25	134	43	142	206	183	2	53
2001	85	106	31	156	36	116	185	160	2	49
2002	115	129	29	137	38	120	197	167	5	112
2003	107	113	42	191	47	148	183	156	1	21
2004	104	105	33	146	36	113	189	162	1	20
2005	102	94	27	114	31	97	174	147	3	56
2006	115	98	29	115	41	126	183	153	3	51
2007	94	77	28	107	32	98	183	153	4	65
2008	107	84	36	131	39	120	165	139	1	16
2009	105	80	33	114	18	56	141	120	3	45
2010	120	89	40	130	33	104	143	121	5	71
2011	99	71	34	103	36	114	132	111	0	0
2012	112	78	34	98	22	70	113	95	1	13
2013	94	64	38	106	25	81	106	90	9	119

2014	122	80	36	97	31	102	99	84	6	78
(55–74)										
2000	159	567	79	660	137	707	651	733	4	345
2001	189	611	72	546	114	576	627	676	6	459
2002	203	595	54	371	111	542	672	689	10	663
2003	210	567	60	383	109	516	591	582	6	349
2004	178	447	94	557	112	517	625	600	4	209
2005	203	467	79	432	108	485	638	592	6	282
2006	220	465	76	381	87	378	600	540	5	211
2007	205	408	110	521	97	417	544	480	6	230
2008	191	356	94	419	84	353	553	474	9	320
2009	217	378	93	389	75	307	542	451	11	362
2010	190	308	87	341	103	411	505	403	6	180
2011	231	349	101	372	100	389	517	397	11	301
2012	234	329	70	245	93	350	496	367	12	305
2013	221	291	95	317	76	281	541	388	10	243
2014	209	255	100	321	82	294	481	332	2	46
(≥75)										
2000	50	1,373	20	1,282	45	1,403	395	1,535	2	1,298
2001	82	1,999	26	1,485	44	1,298	429	1,599	1	639

2002	51	1,087	19	981	38	1,073	391	1,404	3	1,732
2003	55	1,029	24	1,086	54	1,459	422	1,470	1	538
2004	74	1,229	19	768	42	1,080	420	1,417	1	461
2005	80	1,172	25	901	48	1,158	387	1,250	4	1,586
2006	74	966	33	1,068	53	1,221	367	1,140	4	1,440
2007	79	958	29	858	33	726	337	1,031	5	1,667
2008	91	1,021	18	482	42	873	399	1,190	5	1,577
2009	80	826	26	625	32	625	350	1,009	3	877
2010	100	943	36	780	52	932	396	1,098	3	797
2011	102	885	37	727	43	717	395	1,056	5	1,255
2012	110	883	51	904	44	689	378	977	5	1,149
2013	100	742	40	645	58	866	358	902	0	0
2014	91	618	43	627	49	690	336	818	0	0

Table S7. Crude and Standardized Age- and Sex-standardized Incidence of Non-ST-Segment Elevation Myocardial Infarction (NSTEMI) Hospitalizations per 100,000 Person-Years by Race/Ethnicity, Kaiser Permanente Southern California, 2000–2014.

	Overall				Hispanic				Asian or Pacific Islander			
Year	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)
2000	1,861	934,766	199	219 (209, 229)	253	224,001	113	181 (156, 206)	87	75,498	115	154 (119, 190)
2001	1,972	986,762	200	222 (212, 231)	294	248,940	118	187 (164, 211)	102	81,521	125	170 (134, 206)
2002	1,954	1,041,324	188	206 (197, 216)	313	274,967	114	173 (152, 195)	105	88,184	119	164 (130, 199)
2003	1,979	1,078,599	183	199 (190, 208)	328	293,690	112	174 (153, 194)	122	93,230	131	154 (125, 183)
2004	2,026	1,108,149	183	196 (188, 205)	324	310,184	104	158 (140, 177)	141	98,138	144	181 (149, 213)
2005	2,055	1,158,916	177	188 (180, 196)	376	337,232	111	169 (150, 187)	120	104,781	115	139 (112, 165)
2006	2,104	1,210,065	174	183 (175, 191)	449	364,682	123	183 (165, 201)	140	112,447	125	151 (125, 178)

2007	2,076	1,242,838	167	175 (168, 183)	409	383,987	107	156 (140, 172)	173	118,716	146	174 (147, 201)
2008	2,205	1,278,910	172	180 (172, 187)	453	404,313	112	160 (144, 176)	161	125,572	128	144 (121, 167)
2009	2,135	1,311,750	163	167 (160, 174)	451	421,489	107	152 (137, 166)	142	133,066	107	120 (100, 141)
2010	2,198	1,359,334	162	164 (157, 171)	455	442,296	103	139 (126, 152)	181	142,262	127	142 (121, 163)
2011	2,359	1,410,960	167	167 (161, 174)	541	465,914	116	156 (142, 170)	175	151,958	115	125 (106, 144)
2012	2,301	1,459,373	158	156 (150, 163)	544	489,528	111	145 (132, 158)	190	160,947	118	129 (110, 148)
2013	2,326	1,492,845	156	153 (146, 159)	514	508,594	101	130 (119, 142)	191	167,638	114	124 (106, 142)
2014	2,303	1,546,152	149	144 (138, 150)	566	536,477	106	132 (120, 143)	196	175,485	112	116 (100, 133)
	Black				**White**				**Multiple or Other**			

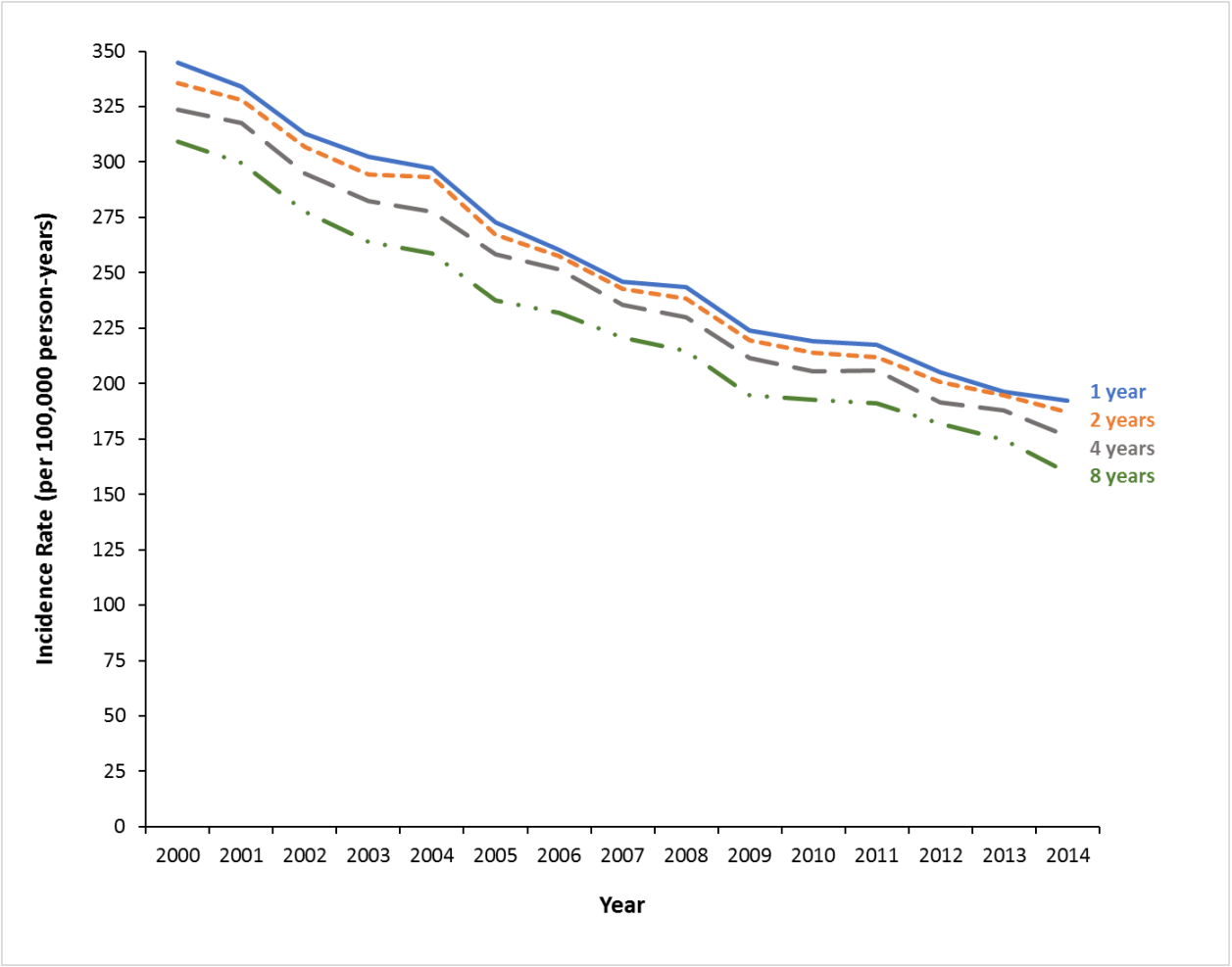
Year	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Adjusted Incidence Rate (95% CI)
2000	258	128,200	201	240 (210, 271)	1,257	497,039	253	234 (221, 247)	6	10,028	60	108 (14, 202)
2001	245	132,286	185	232 (202, 263)	1,325	513,032	258	236 (223, 249)	6	10,983	55	111 (9, 213)
2002	238	136,378	175	212 (185, 240)	1,287	529,645	243	219 (207, 231)	11	12,149	91	131 (42, 219)
2003	265	138,961	191	230 (201, 258)	1,260	539,622	233	208 (196, 219)	4	13,096	31	49 (0, 104)
2004	263	140,882	187	224 (196, 252)	1,288	544,980	236	207 (196, 219)	10	13,966	72	97 (30, 163)
2005	255	143,866	177	209 (183, 235)	1,293	557,834	232	202 (191, 213)	11	15,204	72	120 (40, 200)
2006	251	147,045	171	196 (171, 221)	1,254	569,262	220	191 (180, 202)	10	16,628	60	97 (31, 164)
2007	244	148,503	164	180 (157, 203)	1,238	573,743	216	187 (176, 198)	12	17,888	67	119 (43, 195)
2008	269	150,481	179	197 (173, 221)	1,303	579,712	225	190 (179, 200)	19	18,832	101	182 (91, 273)
2009	234	151,533	154	164 (143, 186)	1,294	585,904	221	185 (175, 196)	14	19,757	71	133 (55, 211)
2010	281	153,846	183	190 (167, 212)	1,265	599,844	211	173 (163, 183)	16	21,086	76	148 (66, 229)
2011	291	155,957	187	189 (167, 211)	1,337	614,732	217	178 (168, 187)	15	22,399	67	125 (55, 195)
2012	280	158,485	177	174 (154, 195)	1,273	626,972	203	164 (155, 174)	14	23,441	60	105 (45, 165)
2013	305	159,058	192	187 (165, 208)	1,300	633,717	205	164 (155, 173)	16	23,838	67	72 (34, 111)
2014	293	161,785	181	171 (151, 191)	1,232	647,695	190	150 (141, 158)	16	24,710	65	99 (44, 153)

Table S8. Crude and Age- and Sex-standardized Incidence of ST-Segment Elevation Myocardial Infarction (STEMI) Hospitalizations per 100,000 Person-Years by Race/Ethnicity, Kaiser Permanente Southern California, 2000–2014.

	Overall				Hispanic				Asian or Pacific Islander			
Year	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)
2000	1,385	939,677	147	159 (151, 168)	220	224,933	98	150 (128, 172)	77	75,997	101	122 (93, 151)
2001	1,361	993,268	137	147 (139, 155)	239	250,168	96	138 (119, 157)	82	82,168	100	119 (92, 146)
2002	1,356	1,048,938	129	139 (131, 146)	242	276,552	88	117 (101, 133)	65	88,844	73	94 (70, 119)
2003	1,298	1,086,626	119	127 (120, 133)	247	295,415	84	114 (99, 130)	70	94,030	74	93 (70, 116)
2004	1,282	1,116,616	115	120 (113, 127)	238	312,080	76	101 (88, 115)	71	98,968	72	79 (60, 99)
2005	1,165	1,168,540	100	103 (97, 109)	230	339,496	68	90 (78, 103)	76	105,751	72	82 (63, 101)
2006	1,146	1,220,590	94	97 (91, 103)	216	367,254	59	75 (64, 86)	75	113,438	66	76 (58, 94)
2007	1,050	1,254,292	84	86 (81, 92)	214	386,899	55	72 (62, 83)	74	119,812	62	65 (50, 82)
2008	960	1,291,314	74	76 (71, 81)	188	407,614	46	61 (52, 71)	69	126,803	54	61 (46, 75)
2009	860	1,325,669	65	65 (61, 70)	211	425,185	50	61 (53, 70)	71	134,407	53	58 (44, 72)
2010	876	1,374,386	64	64 (60, 68)	202	446,398	45	56 (48, 65)	60	143,729	42	46 (34, 58)
2011	852	1,427,486	60	59 (55, 63)	192	470,381	41	51 (43, 58)	77	153,640	50	55 (43, 68)
2012	800	1,477,218	54	53 (49, 57)	200	494,558	40	48 (41, 55)	59	162,736	36	41 (30, 51)
2013	822	1,511,800	54	53 (49, 56)	185	513,953	36	43 (37, 50)	79	169,592	47	49 (38, 60)
2014	786	1,566,512	50	48 (45, 52)	205	542,383	38	44 (38, 50)	77	177,549	43	46 (35, 56)

	Black				White				Multiple or Other			
Year	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)	No. of Events	Denominator	Crude Incidence Rate	Standardized Incidence Rate (95% CI)
2000	150	129,108	116	133 (111, 155)	929	499,543	186	175 (164, 186)	9	10,097	89	146 (34, 257)
2001	153	133,317	115	131 (110, 153)	882	516,549	171	158 (148, 169)	5	11,066	45	51 (4, 97)
2002	123	137,585	89	106 (87, 126)	916	533,715	172	159 (148, 169)	10	12,243	82	125 (35, 216)
2003	143	140,237	102	120 (99, 140)	832	543,745	153	139 (130, 149)	6	13,200	45	73 (8, 137)
2004	133	142,260	93	102 (84, 119)	838	549,245	153	137 (128, 147)	2	14,063	14	25 (0, 65)
2005	117	145,397	80	89 (72, 105)	730	562,569	130	117 (108, 125)	12	15,325	78	128 (46, 209)
2006	112	148,639	75	83 (68, 99)	739	574,493	129	114 (106, 123)	4	16,765	24	41 (0, 86)
2007	105	150,220	70	78 (63, 93)	650	579,330	112	100 (92, 107)	7	18,030	39	57 (11, 104)
2008	82	152,236	54	57 (45, 70)	616	585,672	105	94 (86, 101)	5	18,990	26	39 (0, 78)
2009	66	153,514	43	44 (33, 54)	503	592,644	85	74 (68, 81)	9	19,920	45	49 (14, 85)
2010	84	155,950	54	56 (44, 68)	525	607,025	86	76 (70, 83)	5	21,284	23	32 (0, 65)
2011	85	158,212	54	54 (43, 66)	487	622,644	78	66 (60, 72)	11	22,608	49	70 (24, 116)
2012	70	160,878	44	44 (33, 54)	466	635,377	73	61 (55, 67)	5	23,669	21	28 (0, 56)
2013	79	161,574	49	48 (37, 58)	470	642,611	73	60 (54, 65)	9	24,070	37	43 (12, 73)
2014	70	164,538	43	41 (31, 51)	431	657,079	66	54 (48, 59)	3	24,963	12	12 (0, 25)

Figure S1. Acute Myocardial Infarction (AMI) Hospitalizations per 100,000 Person-Years by Length of Time in Membership, Standardized to the 2010 United States Census by Age and Sex, Kaiser Permanente Southern California, 2000–2014.



AMI hospitalizations, using time in membership (1, 2, 4, and 8 years) requirements, were compared. Trends in the decline of AMI hospitalizations were similar; however, estimated incidence rates were different because this figure includes persons missing race/ethnicity data who were excluded in the main analysis