Racial/Ethnic Disparities in Outcomes After Percutaneous Coronary Intervention

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Asian American/Pacific Islanders (AAPIs) and Hispanics are growing minority United States populations, but are poorly represented in the cardiovascular literature. This study examines guideline adherence and outcomes in AAPIs and Hispanics compared with non-Hispanic Whites (NHWs) in a quaternary care center after inpatient percutaneous coronary intervention (PCI). The primary end points were inpatient post-PCI bleed, heart failure, cardiogenic shock, and all-cause mortality, whereas the secondary end point was the prescription rate of post-PCI guideline-directed medical therapy including aspirin, statins, $P2Y_{12}$ receptor blockers, and cardiopulmonary rehabilitation. Intergroup differences were assessed through analysis of variance or two-way chi-square tests, and the association of race with binary outcomes was examined through logistic regression with NHW as the reference group. Compared with NHW, AAPIs, and Hispanics had higher odds of diabetes mellitus, and AAPIs had higher odds of hypertension and being on dialysis. Hispanics had higher odds of post-PCI mortality versus NHW, both in acute coronary syndrome (odds ratio [OR] 2.04, p = 0.03) and elective PCI (OR 2.51, p = 0.04). AAPI also trended toward higher mortality than NHW in both categories. AAPIs were found to have higher odds of statin prescription (OR 1.91, p = 0.04). Hispanics had lower odds of ticagrelor prescription versus NHW (OR 0.65, p = 0.04), and AAPIs trended toward such. No differences were found for cardiopulmonary rehabilitation prescriptions in groups. This study suggests that despite quality improvement efforts, disparities remain in postprocedural outcomes in minority groups in comparison with NHW. **(Am J Cardiol 2023;205:120−125)**

Keywords: Asian American/Pacific Islanders, health disparities, Hispanics, race/ethnic disparities, social determinants of health

Asian American/Pacific Islanders (AAPIs) and Hispanics are growing minority populations in the United States; AAPIs are projected to double in number to 36 million by 2060 and Hispanics to over 100 million.[1] However, both groups are poorly represented in the cardiovascular literature.[1,2] This dearth of knowledge has been recognized by the White House, the American Heart Association, and the National Heart, Lung, and Blood Institute.[3] As such, recent studies from national cardiovascular disease (CVD) registries, such as Get With the Guidelines, have included Hispanics and AAPIs, contributing to epidemiologic understanding and narrowing racial/ethnic disparities within inpatient settings.[4−7]

Critically, these studies have noted delays in myocardial infarction treatment, higher mortality, and lower rates of critical prescriptions—such as cardiopulmonary rehabilitation—at discharge for Hispanics and AAPIs.[4,5] However, many gaps remain in the relatively nascent field of AAPI and Hispanic health disparity research, including in health outcomes after percutaneous coronary intervention (PCI), with few studies on this topic.[8] The present study examines health disparities in Hispanic and AAPI patients after PCI over the past decade at a large quaternary care center, where guideline adherence has been at the forefront of quality improvement initiatives.

Methods

Patients admitted to Ronald Reagan UCLA Medical Center for acute coronary syndrome or elective PCI from February 28, 2012, to December 30, 2020, with available race and ethnicity data were included. Inclusion criteria were adults (≥18 years) and patients of Hispanic, AAPI, and non-Hispanic White (NHW) race or ethnicity; a total of 1,896 patients were included. African American patients and American Indians were excluded from the analysis because of small sample sizes, along with patients with incomplete racial/ethnic data; these numbered 198 patients. The primary end points were inpatient post-PCI bleed, heart failure, cardiogenic shock, and all-cause mortality, whereas the secondary end points were the rates of guideline-based prescriptions at discharge post-PCI, including statin therapy, $P2Y_{12}$ receptor blockers, angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers, and

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Table 1
Baseline demographics of patients who underwent percutaneous coronary intervention (PCI) between 2012 and 2020, stratified by race/ethnicity

	All (N = 1896)	NHW	AAPI	Hispanic	p-val
Patient, N (%)		1311 (69.1%)	277 (14.6%)	308 (16.2%)	< 0.001
Age					
Median (IQR)	67.5 (59.0-76.3)	68.6 (60.7-77.4)	67.7 (59.9-76.4)	62.6 (54.0-70.9)	< 0.001
Female, N (%)	433 (22.8%)	295 (22.5%)	55 (19.9%)	83 (26.9%)	0.11
Insurance, N (%)					< 0.001
Private	1228 (64.8%)	889 (67.8%)	173 (62.5%)	166 (53.9%)	
Government	611 (32.2%)	384 (29.3%)	93 (33.6%)	134 (43.5%)	
None	57 (3.0%)	38 (2.9%)	11 (4.0%)	8 (2.6%)	
BMI					
Mean ± SD	28.0 ±12.3	28.4 ± 14.3	25.5 ± 4.9	28.1 ± 5.6	0.15
Pre-Procedure Creatinine					
Median (IQR)	1 (0.8-1.3)	1 (0.8-1.3)	0.9 (0.7-1.3)	1 (0.8-1.8)	0.004
Post-Procedure Creatinine					
Median (IQR)	1 (0.8-1.4)	1 (0.9-1.3)	1 (0.8-1.4)	1.1 (0.9-1.8)	0.01

AAPI = Asian-American/Pacific Islander; BMI = body mass index; IQR = interquartile range (p25-p75); NHW = Non-Hispanic White; SD = standard deviation.

Percentages may not add up to 100% due to rounding. p-Value evaluates for between-group differences (AAPI vs. NHW vs. Hispanic).

cardiopulmonary rehabilitation referrals. All patients had provided preprocedural consent permitting their data to be entered into the internal databank of the institution, maintained as part of the submission to the National Cardiovascular Data Registry (NCDR) of the institution. Approval was obtained from the University of California, Los Angeles Institutional Review Board (institutional review board number 22-000207).

Initial differences for the baseline demographics of AAPI and Hispanic patients were assessed relative to NHWs using one-way analysis of variance (or Kruskal −Wallis) for the continuous variables (e.g., age, body mass index), and 2-way chi-square test for group comparisons (e.g., insurance, gender). Quartiles were recorded for the continuous variables. A $p < 0.05$ was considered statistically significant. The association of race with binary outcomes was assessed through logistic regression with NHW as the reference group. Unadjusted and adjusted models were created with race as the main independent variable. Two different adjusted models were fit. Model 1, which was used in evaluating emergent or elective procedures, accounted for age, gender, and insurance. Model 2, which was used in the overall cohort, accounted for model 1 covariates and additional comorbidities, including hypertension, diabetes mellitus, stroke, creatinine, and previous cardiac disease including heart failure, infarction, and PCI. The bar plot estimates of marginal means for certain discharge prescriptions and morbidity and mortality rates were created for emergent and elective procedures based on Model 1 estimates and were only adjusted for age, gender, and insurance status because of small sample sizes. All data management and analysis were conducted in base R version 3.6.3 (R Core Team [2022]. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. *https://www.R-project.org/*).

Results

Baseline demographics are listed in Table 1. Of the 1,896 eligible patients who underwent PCI between 2012 and 2020, 277 were AAPI (15%), 308 Hispanic (16%), and 1,311 NHW (69%). Gender frequency was similar across groups. However, Hispanic patients were found to be younger than AAPIs and NHW, with a median age of 62.5, whereas AAPIs trended toward lower body mass index. Hispanics had the highest rate of government insurance at 44%, versus 34% for AAPIs and 32% for NHW; conversely, NHW had the highest rates of private insurance at 68%. Uninsured rates were similar. Rates of acute coronary syndrome and elective presentations by racial/ethnic group are listed in Supplementary Table 1.

Notable differences in CVD risk factors were found (Table 2). AAPIs had higher odds of diabetes mellitus than NHW (odds ratio [OR] 2.27, $p < 0.01$), and of being on dialysis (OR 2.30, $p < 0.01$). Hispanics also had higher odds of diabetes mellitus than NHW (OR 1.61, $p < 0.01$), and of peripheral artery disease (OR 1.59, $p = 0.05$). Hispanics had lower odds of having a previous PCI than NHW (OR 0.68, $p = 0.02$).

Primary end points were adjusted for age, gender, insurance status, and comorbidities. Hispanics had higher odds of post-PCI mortality (OR 1.92, $p = 0.02$) (Table 3), including in subgroup analyses for emergent (OR 2.04, $p = 0.03$) and elective cases (OR 2.51, $p = 0.04$) (Figure 1). No mortality differences were found between AAPI and NHW patients. There were also no differences across groups for postprocedural morbidity such as bleeding, stroke, cardiogenic shock, or heart failure.

Secondary end points were also adjusted for age, gender, insurance, and comorbidities. Hispanics had lower odds of ticagrelor prescriptions (OR 0.65, $p = 0.04$) (Table 4). However, similar odds of either clopidogrel or ticagrelor prescriptions were noted across groups, and subgroup analyses on patients presenting emergently with acute coronary syndrome also showed no differences in clopidogrel or ticagrelor prescriptions across the groups (Figure 2). AAPIs had higher odds of statin prescription versus NHW (OR 1.91, $p = 0.04$). No reliable differences were found in the odds of aspirin, β blocker, angiotensin-converting enzyme inhibitors, or angiotensin-receptor blockers, and cardiopulmonary

Table 2
Risk factor prevalence in patients presenting for PCI, adjusted for comorbidities along with age, sex, and insurance status

	NHW	AAPI	Hispanic	AAPI vs. NHW		Hispanic vs. NHW	
				OR (95% CI)	p-val	OR (95% CI)	p-val
Diabetes mellitus	429 (32.7%)	146 (52.9%)	148 (48.1%)	2.27 (1.71, 3.01)	**<0.001**	1.61 (1.22, 2.14)	**<0.001**
Hypertension	977 (74.6%)	222 (80.4%)	235 (76.3%)	1.23 (0.87, 1.78)	0.25	1.13 (0.81, 1.58)	0.49
Dyslipidemia	889 (67.9%)	189 (68.5%)	199 (64.6%)	0.87 (0.63, 1.20)	0.39	0.97 (0.71, 1.32)	0.84
Chronic lung disease	123 (9.4%)	22 (8.0%)	22 (7.1%)	0.75 (0.44, 1.22)	0.26	0.84 (0.50, 1.36)	0.50
Current dialysis	87 (6.7%)	39 (14.1%)	59 (19.2%)	2.30 (1.29, 4.10)	**0.004**	1.22 (0.71, 2.07)	0.47
Prior PCI	443 (33.8%)	106 (38.4%)	81 (26.3%)	1.29 (0.94, 1.76)	0.11	0.68 (0.48, 0.95)	**0.024**
Prior MI	403 (30.8%)	77 (27.9%)	90 (29.2%)	0.72 (0.51, 1.01)	0.06	1.00 (0.72, 1.40)	0.98
Prior HF	235 (17.9%)	47 (17.0%)	61 (19.8%)	0.89 (0.60, 1.29)	0.54	1.09 (0.76, 1.56)	0.63
Prior CVD	144 (11.0%)	36 (13.0%)	37 (12.0%)	1.18 (0.77, 1.76)	0.43	1.18 (0.77, 1.77)	0.43
Prior PAD	98 (7.5%)	22 (8.0%)	32 (10.4%)	0.90 (0.54, 1.47)	0.70	1.59 (1.00, 2.50)	**0.047**

AAPI = Asian-American/Pacific Islander; CVD = cardiovascular disease; HF = heart failure; IQR = interquartile range (p25-p75); MI = myocardial infarction; NHW = Non-Hispanic White; PAD = peripheral artery disease; PCI = percutaneous coronary intervention.

Percentages may not add up to 100% due to rounding. p-Value evaluates for between-group differences (AAPI vs. NHW vs. Hispanic).

rehabilitation prescriptions, regardless of the presentation type.

Discussion

This study highlights disparities in outcomes and CVD risk factors in AAPI and Hispanic patients who underwent PCI at a quaternary care center. Despite a strong emphasis in recent years on narrowing inpatient disparities, the analyses previously mentioned suggest that they remain, with minorities such as Hispanic patients suffering worse outcomes despite standardized, guideline-directed care.

Hispanics were found to have significantly higher odds of post-PCI in-hospital mortality, including after adjustment for sociodemographic status such as age, gender, and insurance, along with a greater co-morbidity burden. Furthermore, subgroup analyses on the emergence of the presentation did not alter the finding, with Hispanics having higher odds of post-PCI in-hospital mortality after procedures for both emergent and elective reasons. The mortality rate noted in this study is supported by other studies with larger patient cohorts, with Hispanics having mortality documented as >5%.[6] This statistic may be a result of a multitude of factors, including the higher rates of diabetes mellitus in this group and barriers to healthcare that contribute to delayed clinical presentations of acute coronary syndrome by Hispanics.[5] The lower odds of previous PCI in Hispanic patients—interpreted as a proxy of previous healthcare access—in the present study lends further strength to this theory.[9]

AAPIs were found to have higher odds of statin prescription post-PCI, and no major differences were found in groups in the odds of receiving other discharge prescriptions, including $P2Y_{12}$ inhibitors or cardiopulmonary rehabilitation. These findings are supported by others in the literature, suggesting that rigorous guideline adherence is associated with fewer care-related disparities in racial/ethnic groups.[7,10] Although Hispanics were found to have lower odds of ticagrelor prescriptions, they had the same odds of either clopidogrel or ticagrelor prescriptions as NHWs after both elective and emergent procedures. A hypothesis for ticagrelor prescription differences includes differing insurance coverages, although, in light of these data, it is unlikely that differences in prescription rates played a significant role in the mortality disparities noted in this study.

This study suggests that AAPI patients who underwent PCI face fewer negative outcomes than NHWs or Hispanic patients. However, it is possible that true outcomes are masked by small sample sizes and the lack of subgroup disaggregation; in the analyses, AAPI had numerically higher OR of postprocedural all-cause mortality than NHW but

Table 3
Post-PCI outcomes adjusted for comorbidities along with age, sex, and insurance status

	NHW	AAPI	Hispanic	AAPI vs. NHW		Hispanic vs. NHW	
Post-PCI Outcomes				OR (95% CI)	p-val	OR (95% CI)	p-val
Death	59 (4.5%)	17 (6.1%)	28 (9.1%)	1.44 (0.78, 2.55)	0.22	1.92 (1.12, 3.23)	**0.016**
Bleed: Access site	20 (42.6%)	7 (43.8%)	6 (42.9%)	0.67 (0.15, 2.69)	0.58	0.92 (0.20, 3.96)	0.91
Bleed: Other site	16 (34.0%)	7 (43.8%)	6 (42.9%)	1.53 (0.37, 6.21)	0.55	1.65 (0.37, 7.32)	0.51
Cardiogenic shock	36 (2.8%)	9 (3.3%)	11 (3.6%)	1.48 (0.65, 3.08)	0.32	1.82 (0.84, 3.69)	0.11
Heart failure	11 (0.8%)	3 (1.1%)	5 (1.6%)	1.29 (0.28, 4.31)	0.71	2.53 (0.74, 7.60)	0.11

95% CI = 95% confidence interval; AAPI = Asian-American/Pacific Islander; ACE inhibitor = angiotensin-converting enzyme inhibitor; ARB = angiotensin-receptor blocker; NHW = non-Hispanic White; OR = odds ratio.

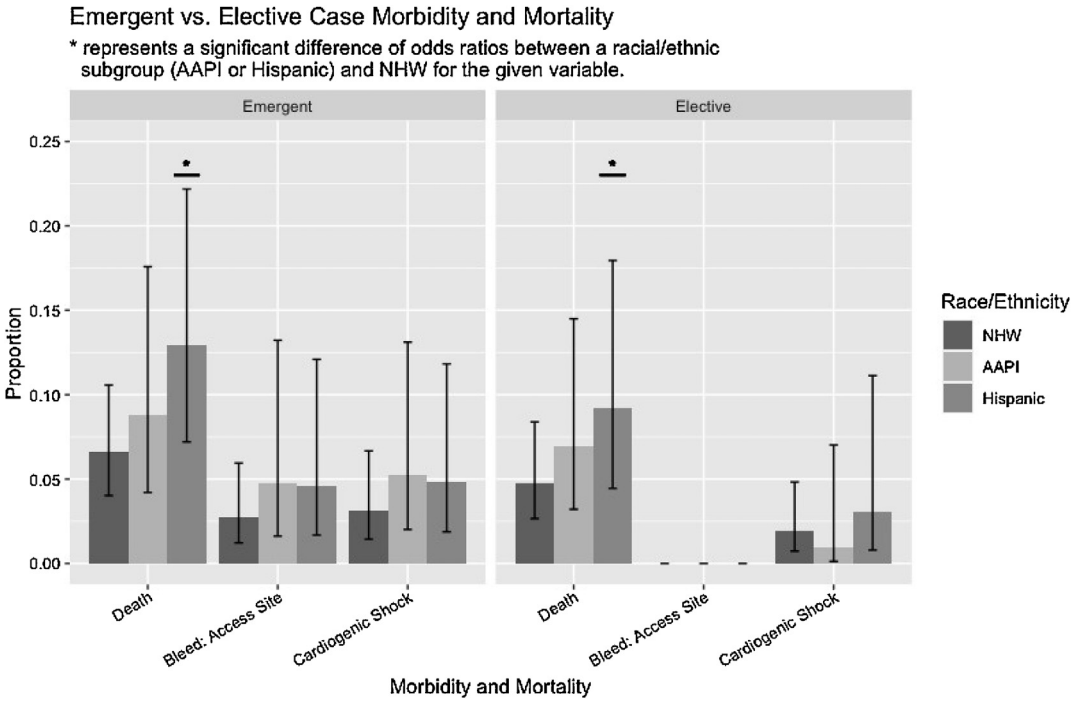

Figure 1. Post-PCI outcomes, separated by emergent and elective presentations, adjusted for age, gender, and insurance status.

did not reach statistical significance. Other disparities also remain. For instance, AAPI have middling rates of government insurance at 34%, higher than NHWs but lower than Hispanic patients. Although imperfect, government insurance status can and has been used as a proxy for low socioeconomic status,[11–13] and individual-level insurance status itself contributes to disparities in care and clinical outcomes.[14]

As such, AAPI rates of government insurance suggest low socioeconomic status levels greater than that of NHWs. This coincides with known data that a significant number of AAPI subgroups, such as Cambodian Americans and Vietnamese Americans, live under the poverty level, with rates up to 93%.[15,16] However, because of the lack of AAPI disaggregation in data collection, subgroups at risk for poverty are masked by those on the other end of the economic spectrum.[16] Even then, AAPIs as a whole still face higher poverty rates than NHWs.[16,17] Similar to Hispanics, AAPIs have higher odds of possessing CVD risk factors such as diabetes mellitus and renal disease; these findings are well-supported by previous literature. It is also known that risks vary in subgroups; for instance, Filipino Americans have one of the subgroups with the highest prevalence of hypertension in AAPIs.[18,19]

The increasing diversity of the United States population means that focusing on minority communities, such as

Table 4
Post-PCI prescriptions adjusted for comorbidities along with age, sex, and insurance status

	NHW	AAPI	Hispanic	AAPI vs. NHW		Hispanic vs. NHW	
Discharge Prescriptions							
Cardiac rehabilitation	430 (34.5%)	74 (28.7%)	88 (31.5%)	0.85 (0.62, 1.15)	0.29	0.96 (0.71, 1.29)	0.80
ACE inhibitor or ARB	737 (59.9%)	156 (61.4%)	150 (56.8%)	0.97 (0.72, 1.31)	0.84	0.91 (0.68, 1.22)	0.52
Aspirin	1206 (98.0%)	250 (98.4%)	259 (98.1%)	0.98 (0.36, 3.46)	0.98	0.82 (0.29, 2.91)	0.73
Statin	1129 (91.7%)	241 (94.9%)	241 (91.3%)	1.91 (1.06, 3.75)	**0.043**	1.10 (0.66, 1.92)	0.73
Non-statin lipid-lowering drugs	256 (20.8%)	49 (19.3%)	35 (13.3%)	0.93 (0.65, 1.32)	0.68	0.54 (0.35, 0.81)	**0.004**
Beta-blocker	965 (78.4%)	195 (76.8%)	202 (76.5%)	0.87 (0.62, 1.22)	0.41	0.76 (0.54, 1.07)	0.11
Clopidogrel	934 (75.9%)	207 (81.5%)	217 (82.2%)	1.36 (0.95, 1.97)	0.10	1.40 (0.98, 2.04)	0.07
Ticlopidine	4 (0.3%)	1 (0.4%)	0 (0.0%)	1.10 (0.06, 7.89)	0.93	-*	-
Prasugrel	32 (2.6%)	3 (1.2%)	4 (1.5%)	0.24 (0.04, 0.81)	0.053	0.45 (0.13, 1.23)	0.16
Ticagrelor	242 (19.7%)	34 (13.4%)	33 (12.5%)	0.68 (0.45, 1.01)	0.06	0.65 (0.43, 0.97)	**0.043**
Clopidogrel or Ticagrelor	1172 (95.2%)	239 (94.1%)	249 (94.3%)	0.88 (0.48, 1.73)	0.70	0.98 (0.53, 1.93)	0.96

95% CI = 95% confidence interval; AAPI = Asian-American/Pacific Islander; ACE inhibitor = angiotensin-converting enzyme inhibitor; ARB = angiotensin-receptor blocker; NHW = non-Hispanic White; OR = odds ratio.

* Inadequate sample size.

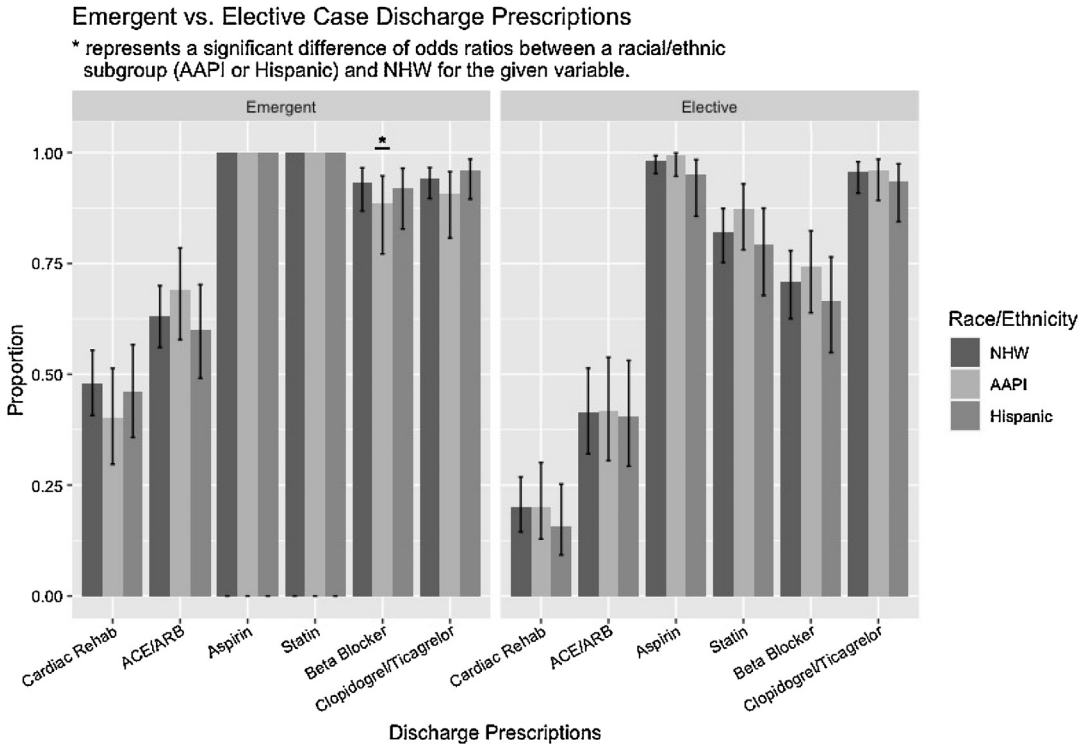

Figure 2. Post-PCI discharge prescriptions, separated by emergent and elective presentations, adjusted for age, gender, and insurance status.

AAPIs and Hispanics, is essential, with particular emphasis on the disparities they face in health and healthcare.[19,20] Within cardiology, quality improvement initiatives have made significant gains in narrowing disparities in the inpatient setting, but continue to be crucial both within and outside of the hospital.[6] Work is needed to increase representation of AAPI and Hispanic patients in medical studies.[21,22] Furthermore, future studies and data collection should disaggregate AAPI and Hispanic patients to allow for the analyses of subgroup differences which, despite the paucity of the current data, have come to light. Finally, socioeconomic policies focused on patients in their communities are needed, as environmental, economic, and educational disparities are known associations with poorer healthcare outcomes.[5,7,9] Surmounting these barriers will be important in narrowing these outcome disparities.

Some limitations of this present study include its retrospective nature, and its use of a single, albeit high-volume, center instead of multiple sites. Another limitation is the lack of extended follow-up, which would allow for the study of behaviors such as medication adherence, along with longer-term morbidity and mortality. Statistical limitations include residual confounding, because of the types of analyses performed and the relatively small sample sizes given the large number of covariates used. Further, relatively low event rates may lead to adjusted models being overfitted. Given the number of primary and secondary outcomes, multiple statistical comparisons of data were performed, increasing the possibility that borderline significant p values could be because of chance. Finally, like most databases, this database does not provide disaggregated data for AAPI and Hispanic patients, which greatly limits the characterization of subgroup variation in healthcare disparities.

This study examines racial/ethnic differences in postprocedural outcomes after both emergent and elective PCI. Results indicate that although rates of guideline-directed prescriptions are similar across racial/ethnic groups, key differences remain, including all-cause mortality. Further work, including in data disaggregation for AAPI and Hispanics, and in investigating the root causes of disparities, is required to better understand and ameliorate them.

Declaration of Competing Interest

The authors have no competing interests to declare.

Supplementary materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.amjcard.2023.07.169.

1. Vespa J, Medina L, Armstrong DM,. Demographic turning points for the United States: population projections for 2020 to 2060. US Department of Commerce, Economics and Statistics Administration, US Census Bureau. Available at: https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1144.pdf. Accessed on January 20, 2023.
2. Rodriguez F, Chung S, Blum MR, Coulet A, Basu S, Palaniappan LP. Atherosclerotic cardiovascular disease risk prediction in disaggregated Asian and Hispanic subgroups using electronic health records. *J Am Heart Assoc* 2019;8:e011874.
3. Hastings KG, Jose PO, Kapphahn KI, Frank AT, Goldstein BA, Thompson CA, Eggleston K, Cullen MR, Palaniappan LP. Leading

causes of death among Asian American subgroups (2003−2011). *PLoS One* 2015;10:e0124341.
4. Li S, Fonarow GC, Mukamal K, Xu H, Matsouaka RA, Devore AD, Bhatt DL. Sex and racial disparities in cardiac rehabilitation referral at hospital discharge and gaps in long-term mortality. *J Am Heart Assoc* 2018;7:e008088.
5. Guzman LA, Li S, Wang TY, Daviglus ML, Exaire J, Rodriguez CJ, Torres VI, Funk M, Saucedo J, Granger C, Piña IL, Cohen MG. Differences in treatment patterns and outcomes between Hispanics and non-Hispanic whites treated for ST-segment elevation myocardial infarction: results from the NCDR ACTION Registry-GWTG. *J Am Coll Cardiol* 2012;59:630–631.
6. Cohen MG, Fonarow GC, Peterson ED, Moscucci M, Dai D, Hernandez AF, Bonow RO, Smith SC Jr.. Racial and ethnic differences in the treatment of acute myocardial infarction: findings from the Get with the Guidelines-Coronary Artery Disease program. *Circulation* 2010;121:2294–2301.
7. Li S, Fonarow GC, Mukamal KJ, Liang L, Schulte PJ, Smith EE, DeVore A, Hernandez AF, Peterson ED, Bhatt DL. Sex and race/ethnicity−related disparities in care and outcomes after hospitalization for coronary artery disease among older adults. *Circ Cardiovasc Qual Outcomes* 2016;9(suppl 1):S36–S44.
8. Manjunath L, Chung S, Li J, Shah H, Palaniappan L, Yong CM. Heterogeneity of treatment and outcomes among Asians with coronary artery disease in the United States. *J Am Heart Assoc* 2020;9:e014362.
9. Fiscella K, Franks P, Gold MR, Clancy CM. Inequality in quality: addressing socioeconomic, racial, and ethnic disparities in health care. *JAMA* 2000;283:2579–2584.
10. Edmund Anstey D, Li S, Thomas L, Wang TY, Wiviott SD. Race and sex differences in management and outcomes of patients after ST-elevation and non−ST-elevation myocardial infarct: results from the NCDR. *Clin Cardiol* 2016;39:585–595.
11. Marcin JP, Schembri MS, He J, Romano PS. A population-based analysis of socioeconomic status and insurance status and their relationship with pediatric trauma hospitalization and mortality rates. *Am J Public Health* 2003;93:461–466.
12. Foraker RE, Rose KM, Whitsel EA, Suchindran CM, Wood JL, Rosamond WD. Neighborhood socioeconomic status, Medicaid coverage and medical management of myocardial infarction: atherosclerosis risk in communities (ARIC) community surveillance. *BMC Public Health* 2010;10:632.
13. Obeng-Gyasi S, O'Neill A, Zhao F, Kircher SM, Lava TR, Wagner LI, Miller KD, Sparano JD, Sledge GW, Carlos RC. Impact of insurance and neighborhood socioeconomic status on clinical outcomes in therapeutic clinical trials for breast cancer. *Cancer Med* 2021;10:45–52.
14. Ghazi L, Osypuk TL, MacLehose RF, Luepker RV, Drawz PE. Neighborhood socioeconomic status, health insurance, and CKD prevalence: findings from a large health care system. *Kidney Med* 2021;3:555–564.e1.
15. Dhooper SS. Health care needs of foreign-born Asian Americans: an overview. *Health Soc Work* 2003;28:63–73.
16. Kim W, Keefe RH. Barriers to healthcare among Asian Americans. *Soc Work Public Health* 2010;25:286–295.
17. Fontenot K, Semega J, Kollar M. Income and Poverty in the United States 2017. US Government Printing Office. Available at: https://www.census.gov/library/publications/2018/demo/p60-263.html. Accessed on January 20, 2023.
18. Gordon NP, Lin TY, Rau J, Lo JC. Aggregation of Asian-American subgroups masks meaningful differences in health and health risks among Asian ethnicities: an electronic health record based cohort study. *BMC Public Health* 2019;19:1551.
19. Wang D, Gee GC, Bahiru E, Yang EH, Hsu JJ. Asian-Americans and pacific islanders in COVID-19: emerging disparities amid discrimination. *J Gen Intern Med* 2020;35:3685–3688.
20. Bibbins-Domingo K. This time must be different: disparities during the COVID-19 pandemic. *Ann Intern Med* 2020;173:233–234.
21. Holland AT, Palaniappan LP. Problems with the collection and interpretation of Asian-American health data: omission, aggregation, and extrapolation. *Ann Epidemiol* 2012;22:397–405.
22. Ngo-Metzger Q, Legedza AT, Phillips RS. Asian Americans' reports of their health care experiences. Results of a national survey. *J Gen Intern Med* 2004;19:111–119.