

# Gender Differences in Patient-Reported Outcomes Among Adults With Atherosclerotic Cardiovascular Disease

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**Background**—Atherosclerotic cardiovascular disease (ASCVD) accounts for approximately one third of deaths in women. Although there is an established relationship between positive patient experiences, health-related quality of life, and improved health outcomes, little is known about gender differences in patient-reported outcomes among ASCVD patients. We therefore compared gender differences in patient-centered outcomes among individuals with ASCVD.

**Methods and Results**—Data from the 2006 to 2015 Medical Expenditure Panel Survey, a nationally representative US sample, were used for this study. Adults  $\geq 18$  years with a diagnosis of ASCVD, ascertained by *International Classification of Diseases, Ninth Revision (ICD-9)* codes and/or self-reported data, were included. Linear and logistic regression were used to compare self-reported patient experience, perception of health, and health-related quality of life by gender. Models adjusted for demographics, socioeconomic status, and comorbidities. There were 21 353 participants included, with  $>10\ 000$  (47%-weighted) of the participants being women, representing  $\approx 11$  million female adults with ASCVD nationwide. Compared with men, women with ASCVD were more likely to experience poor patient–provider communication (odds ratio 1.25 [95% confidence interval 1.11–1.41]), lower healthcare satisfaction (1.12 [1.02–1.24]), poor perception of health status (1.15 [1.04–1.28]), and lower health-related quality of life scores. Women with ASCVD also had lower use of aspirin and statins, and greater odds of  $\geq 2$  Emergency Department visits/y.

**Conclusions**—Women with ASCVD were more likely to report poorer patient experience, lower health-related quality of life, and poorer perception of their health when compared with men. These findings have important public health implications and require more research towards understanding the gender-specific differences in healthcare quality, delivery, and ultimately health outcomes among individuals with ASCVD. (*J Am Heart Assoc.* 2018;7:e010498. DOI: 10.1161/JAHA.118.010498)

**Key Words:** cardiovascular disease • health outcomes • health-related quality of life • secondary prevention • women

Atherosclerotic cardiovascular disease (ASCVD) is one of the leading causes of morbidity and mortality,<sup>1–3</sup> accounting for at least one third of deaths in women worldwide.<sup>4</sup> In the United States, almost 48 million women are affected by ASCVD.<sup>4</sup> The excess mortality from ASCVD in women compared with men<sup>5</sup> has generated much interest in

women's cardiovascular health in recent decades. Research studies have demonstrated an increased risk of hospitalization and higher healthcare expenditure among women compared with men with ASCVD.<sup>6,7</sup> Some studies have also shown that compared with men, women with ASCVD were more likely to experience delays in undergoing lifesaving

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Accompanying Tables S1 through S3 and Figures S1 through S5 are available at <https://www.ahajournals.org/doi/suppl/10.1161/JAHA.118.010498>

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## Clinical Perspective

### What Is New?

- Among individuals with atherosclerotic cardiovascular disease, women were more likely to report poor communication with their healthcare providers, poor satisfaction with their healthcare experience, and poor self-perception of health compared with their male counterparts, even after accounting for sociodemographic factors and other comorbidities.
- Women with atherosclerotic cardiovascular disease were less likely to report aspirin and statin use and had increased use of the Emergency Department compared with their male counterparts.
- There was no significant association between patient-provider gender concordance/discordance with respect to the majority of patient-reported outcomes among individuals with atherosclerotic cardiovascular disease; however, female patients treated by female providers reported better health-related quality of life in the physical component score.

### What Are the Clinical Implications?

- Women with atherosclerotic cardiovascular disease have worse patient-reported outcomes.
- This has important public health implications, and measures should be undertaken to promote equitable healthcare delivery.
- More work is needed to understand why women report poorer communication with their healthcare providers and worse healthcare experience compared with men.

revascularization procedures,<sup>8,9</sup> and less likely to undergo cardiac rehabilitation,<sup>10–12</sup> or receive recommended preventive pharmacotherapies.<sup>13,14</sup> Major cardiovascular risk factors such as smoking, obesity, and diabetes mellitus also appear to be more deleterious in women than in men.<sup>15,16</sup> These overwhelming results have led to the intensification of research, focusing on the influence of sex and gender in cardiovascular disease.<sup>17</sup> These efforts have improved the understanding of gender-specific differences in cardiovascular disease and have resulted in an  $\approx 30\%$  reduction in female mortality from ASCVD.<sup>16</sup>

However, among individuals living with ASCVD, little is known regarding the health-related quality of life (HRQoL) and patient healthcare experience based on gender, even though these patient-reported matrices have been demonstrated to be associated with improved health outcomes among ASCVD patients.<sup>3</sup> To bridge this gap in knowledge, using a nationally representative US sample of individuals with ASCVD, we compared the patient-reported outcomes of their healthcare experience, self-perception of health and HRQoL, based on

gender. Understanding potential gender disparities in patient-centered metrics could provide opportunities for more favorable healthcare delivery and outcomes among individuals with ASCVD.

## Methods

### Data Availability Statement

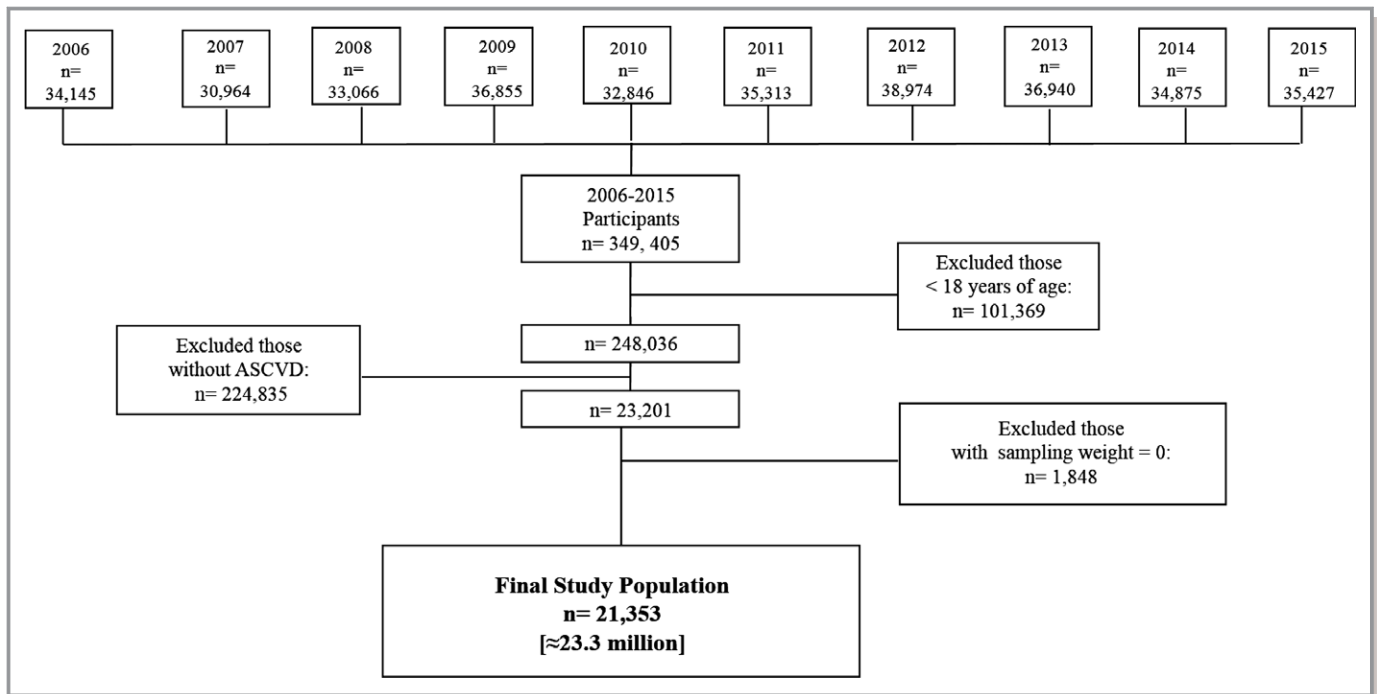
The authors will not directly release the data and materials from this project. However, the Medical Expenditure Panel Survey (MEPS) data sets used in this project are made available from the Agency for Healthcare Research and Quality to prospective researchers and are easily replicable from the methods described in the article.

### Study Design and Sampling

Data from the MEPS were used to conduct this retrospective study. MEPS data are collected and sponsored by the Agency for Healthcare Research and Quality through national series of surveys containing information on individuals and families, their health service providers, and employers. The MEPS is reported annually and collects information on sociodemographic characteristics, patient experience, medical conditions, prescription medication, health resource utilization, associated costs, and sources of payment, reported in different data files. Additional information on healthcare utilization and cost is collected from physicians, hospitals, and pharmacies. To be nationally representative, person-weight and variance estimation stratum are assigned to each respondent to account for survey nonresponse and the characteristics of the national population of the survey year.

To obtain comprehensive information on each participant, using unique person identifiers, we merged 3 different yearly MEPS files: full-year consolidated data files, medical conditions files, and the prescription medicine files, each of which contains specific information on the participants. The full-year consolidated data files contain sociodemographic information, health resource utilization, and information related to patient healthcare experience and healthcare expenditure. The medical conditions files contain information on self-reported and *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnoses of medical conditions. The prescription medicine files contain information on names of medications, drug codes, and dates. According to the Department of Health and Human Services guidelines, this study was exempt from Institutional Review Board review because MEPS is a de-identified, publicly available data set.

We pooled information from 2006 to 2015 MEPS data (Figure 1). For this analysis, individuals  $\geq 18$  years of age with a diagnosis of ASCVD (coronary artery disease, stroke, and/or



**Figure 1.** Flow chart of the patient selection process. ASCVD indicates atherosclerotic cardiovascular disease.

peripheral artery disease, ascertained by self-report or any of the following *ICD-9-CM* codes: 410, 413, 414, 433–437, 440, and 443, respectively) with positive sampling weights (for national representativeness) were included.

## Study Variables

### Patient–provider communication

Annually, participants of the MEPS answered questionnaires derived from the Consumer Assessment of Healthcare Providers and Systems survey. Responses to the following communication-related questions recommended by the Consumer Assessment of Healthcare Providers and Systems consortium were used to assess patient–provider communication (PPC): (1) *How often healthcare providers explained things in a way that was easy to understand?* (2) *How often providers showed respect for what you had to say?* (3) *How often providers spent enough time with you?* (4) *How often providers listened carefully to you?* The responses to these questions were reported on a 4-point Likert scale: 1–never, 2–sometimes, 3–usually, and 4–always. Healthcare provider refers to both physicians and nonphysicians. As recommended by Consumer Assessment of Healthcare Providers and Systems, “never” and “sometimes” responses were collapsed into a single variable labeled “never/sometimes.”<sup>3</sup> The responses were therefore recoded and labeled as 1–never/sometimes, 2–usually, and 3–always (Table S1). The responses to these 4 questions were summed up to give a total score ranging from 4 to 12. We generated a weighted average response from 1 to 3,

represented as 1—“Poor PPC,” 2—“Average PPC,” 3—“Optimal PPC,” and then combined “Average” and “Optimal” PPC to obtain a binary variable (Poor PPC versus Average/Optimal PPC), using poor PPC as the outcome.<sup>3</sup> Similarly, in the analysis of the responses to each of the PPC-related questions, “never/sometimes” responses were used as the outcome of interest (“never/sometimes” versus “usually/always”) (Table S1). The responses to the PPC-related questions are also components of the ALERT model (Always, Listen Carefully, Explain Things Understandably, Respect What the Patient Has to Say, Time Management), designed to help physicians recall the Consumer Assessment of Healthcare Providers and Systems questions.<sup>3,18</sup>

### Patient satisfaction

Patient satisfaction with health care received was assessed using participants’ response to the question: “Rating of health care from all doctors and other health providers,” from 0 (worst health care possible) to 10 (best health care possible). To truly identify unsatisfied respondents, we classified this variable into 2 categories: “Poor Patient Satisfaction” (scores  $\geq 0$  to  $\leq 3$ ) or “Excellent/Good Patient Satisfaction” (scores  $\geq 4$  to  $\leq 10$ ).

### Healthcare-related quality of life and perception of health status

We defined HRQoL using the summary scores from the physical-health component score (PCS) and the mental-health component score (MCS) of the 12-item Short Form version 2,

with PCS and MCS scores ranging from 0 (worst health status possible) to 100 (best health status possible). To detect the mean difference in HRQoL based on gender, we analyzed these summary scores as continuous variables. We also further divided the summary scores into quartiles, using the lowest quartile in both the physical and mental component to reflect poor HRQoL.

Information on self-perception of overall health was collected at 3 different points annually. The responses were provided on a 5-point Likert scale: 1-excellent, 2-very good, 3-good, 4-fair, and 5-poor. It was further dichotomized it into a binary variable, with fair and poor responses as a single variable labeled as “Poor” (average score  $\geq 4$ ) and excellent, very good and good responses combined and labeled as “Good” (average score  $< 4$ ).

### ASCVD medication utilization

Given the established role of aspirin and statin medications for the secondary prevention management of ASCVD, we ascertained the utilization of these medications by gender as a quality-of-care indicator among these individuals with ASCVD.<sup>3</sup> During the data collection process, MEPS participants provided the names of their prescribed medications and where they were obtained. Agency for Healthcare Research and Quality researchers collected more detailed information on these medications, from the drug stores and pharmacies, with the consent of the respondents.<sup>3</sup> Lipid-lowering medications containing a 3-hydroxy-3-methylglutaryl coenzyme A agent were coded as statins.<sup>3</sup> A self-reported response to the question posed by the Agency for Healthcare Research and Quality researchers: “does the person take aspirin frequently?” was used to measure aspirin use.<sup>3</sup>

### Healthcare resource utilization

Information on the total number of Emergency Department visits and hospitalizations per survey year is contained in the MEPS full-year consolidated file. Two or more Emergency Department visits or hospitalizations per survey year were used as a measure of increased health resource utilization.<sup>3</sup>

### Gender of the respondent and other covariates

The gender of the MEPS participants was used as the primary predictor variable. Additional variables used for this study include age, race/ethnicity, family income, health insurance, education, geographical region, marital status, employment status, modified Charlson Comorbidity Index (without cardiovascular components) and cardiovascular modifiable risk factor (CRF) profile. We classified sociodemographic characteristics into various subgroups: 4 categories were used for age (18–39, 40–64, 65–74, and  $\geq 75$  years); 4 categories for race/ethnicity (non-Hispanic White, black, Asian, and Hispanic); 4 categories for family income (poor/very low income

[ $< 125\%$  of the federal poverty level], low income [ $125\%$  to  $< 200\%$  federal poverty level], middle income [ $200\%$  to  $< 400\%$  federal poverty level], and high income [ $\geq 400\%$  federal poverty level]); 5 categories for health insurance (uninsured, Medicaid, private, Medicare, and a combination of private and public insurance); 3 for education (less than high school, high school/Graduate Educational Development, and some college or higher); 4 for geographical region (Northeast, Midwest, South, and West); 5 for marital status (married, widowed, divorced, separated, and never married); 3 for employment status (currently unemployed, currently employed, and currently unemployed but was employed within the past 12 months); and 3 categories for modified Charlson Comorbidity Index (0, 1, and  $\geq 2$ ). Individuals with self-report and/or ICD-9 diagnosis of hypertension; ICD-9 code 401, diabetes mellitus; ICD-9 code 250, and dyslipidemia; ICD-9 code 272, received a score of “1” for each unfavorable cardiovascular risk factor (Table S2). Individuals reporting inadequate physical exercise (lack of participation in moderate-vigorous physical activity for  $\geq 30$  minutes, for  $\geq 5$  times/wk), currently smoking, and obese (body mass index  $\geq 30$  kg/m<sup>2</sup>) also received a score of “1” for each unfavorable risk factor (Table S2). The total of the unfavorable risk factors per individual was used to classify their CRF profile into 3 categories: “Poor CRF Profile” ( $\geq 4$  CRFs), “Average CRF Profile” (2–3 CRFs), or “Optimal CRF Profile” (0–1 CRFs). The responses of the MEPS participants to the question “Is Your Provider Male or Female” were used to identify the gender of the healthcare provider. We gender-matched the respondents and their healthcare providers to evaluate the influence of patient-provider gender concordance/discordance on patient-reported outcomes among individuals with ASCVD.

### Statistical Analysis

All statistical analyses were conducted using Stata, version 13.1 (StataCorp, LP, College Station, TX), with a  $P < 0.05$  considered as statistically significant. All analyses took into consideration the complex survey-specific design of MEPS, and used appropriate variance estimation and person-level weights to achieve national representativeness. We used  $\chi^2$  tests to compare demographic characteristics in the study sample. Linear regression models were used to measure the association of gender (comparing women with men) with the HRQoL scores (continuous), and logistic regression models were applied for all other binary outcomes. All linear and logistic regression models were adjusted for age, race/ethnicity, region, level of income, level of education, health insurance, Charlson Comorbidity Index, and modifiable risk factors of ASCVD. Similar measures of association were used to compare patient-reported outcomes, based on patient-provider gender match. A patient-provider pair was said to be

**Table 1.** Weighted Sample Characteristics of Noninstitutionalized US Adults With ASCVD

	Women	Men	P Value
N	10 036	11 317	
Weighted sample	10 940 309	12 336 944	
Age groups (y) (weighted %)			
18–39	5.3	4.5	<0.001
40–64	35.9	39.4	
65–74	22.8	28.2	
≥75	36.0	27.9	
Race/ethnicity (weighted %)			
Non-Hispanic white	74.5	79.5	<0.001
Black	13.6	9.2	
Asians	2.1	2.7	
Hispanics	9.8	8.6	
Insurance status (weighted %)			
Uninsured	5.6	6.2	<0.001
Private	21.3	26.2	
Medicaid	10.9	8.0	
Medicare	47.3	44.3	
Private+public	14.9	15.3	
Education (weighted %)			
Less than high school	27.1	24.3	<0.001
High school/GED	48.5	46.6	
Some college or higher	24.4	29.1	
Marital status (weighted %)			
Married	40.0	66.7	<0.001
Widowed	31.7	8.9	
Divorced	16.8	13.6	
Separated	2.9	2.3	
Never married	8.6	8.5	
Level of income (weighted %)			
High income	25.3	38.2	<0.001
Middle income	28.9	29.6	
Low income	19.2	15.1	
Poor/very low income	26.6	17.1	
Region (weighted %)			
Northeast	18.2	18.5	<0.001
Midwest	22.6	23.0	
South	40.9	39.4	
West	18.3	19.1	
Employment status (weighted %)			
Currently unemployed	76.3	63.8	<0.001
Currently employed	21.8	33.7	
Currently unemployed but was employed within the past 12 mo	1.9	2.5	

Continued



Table 1. Continued

	Women	Men	P Value
Regular healthcare provider (weighted %)			
Has a regular healthcare provider	92.7	91.6	<0.03
Does not have a regular healthcare provider	7.3	8.4	

ASCVD indicates atherosclerotic cardiovascular disease; GED, Graduate Educational Development.

concordant if they were of the same gender, and discordant if they were of different gender. Finally, we included an interaction term between the gender of the participants and patient-provider gender concordance to assess for any statistically significant effect modification on the various patient-reported outcomes measured.

## Results

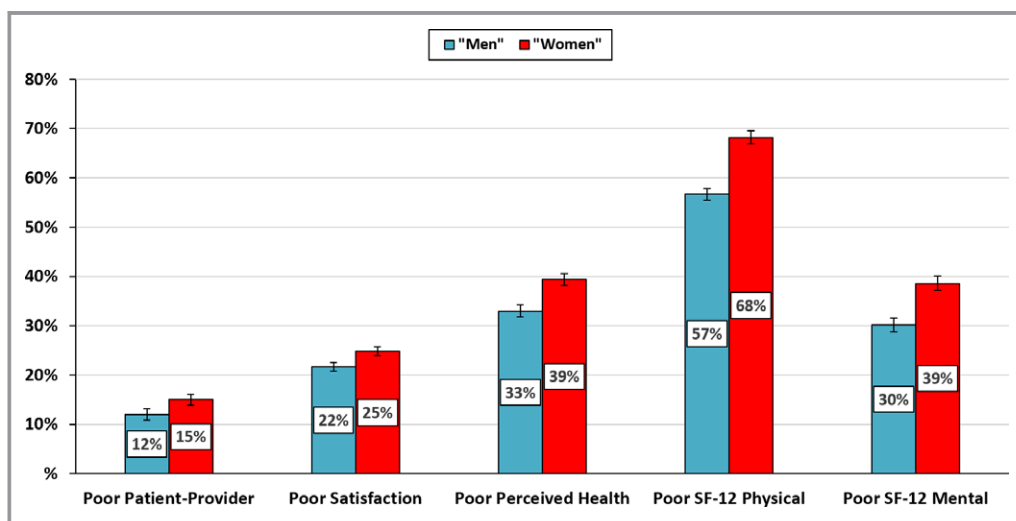
### Sample Characteristics

There were 349 405 individuals sampled in the MEPS from 2006 to 2015, of which 21 353 were included in our study, translating to about 23.3 million noninstitutionalized US civilian adults with ASCVD (Figure 1). A description of the sample population is shown in Table 1. Over 10 000 (47%) of the participants were women (representing ≈11 million female adults with ASCVD nationwide). The majority of the participants were non-Hispanic white, middle-aged, from the southern region of the country, and of higher socioeconomic strata. Women were more likely than men to be unemployed, have less than a high school education, and be widowed/divorced but more likely to have a regular healthcare provider.

### Patient Experience

A greater proportion of women with ASCVD reported poor communication with their healthcare providers (12% of men versus 15% of women,  $P<0.001$ ) (Figure 2). In analyses adjusted for demographics, socioeconomic factors, and comorbidities (Table 2), compared with men, women with ASCVD were more likely to report an overall worse healthcare experience, having a higher odds of reporting that their healthcare provider never/sometimes listened (odds ratio [OR] 1.23, 95% confidence interval [CI] 1.07–1.42), never/sometimes showed respect for their opinion (OR 1.20, 95% CI 1.04–1.38), and never/sometimes spent enough time with them (OR 1.36, 95% CI 1.20–1.54) (Table 2). Overall, compared with men, women with ASCVD had 25% higher odds of experiencing poor communication with their healthcare providers (summary score, OR 1.25, 95% CI 1.11–1.41).

One in 4 women with ASCVD were dissatisfied with the health care received from their providers. A lesser proportion of men reported dissatisfaction with their healthcare providers (22% of men versus 25% of women,  $P<0.001$ ) (Figure 2). Women also had 12% higher adjusted odds of



**Figure 2.** Poor patient-reported outcomes among US adults with ASCVD, stratified by gender. Poor Patient-Provider refers to Communication. ASCVD indicates atherosclerotic cardiovascular disease; SF-12, 12-item Short Form.

**Table 2.** Patient-Reported Outcomes Among US Adults With ASCVD Stratified by Gender—MEPS 2006–2015<sup>\*,†,‡</sup>

	OR (95% CI) <sup>*</sup>
Patient healthcare experience (in women compared with men)	
Patient–provider communication	
Poor patient–provider communication (summary score)	1.25 (1.11–1.41)
Individual components of patient–provider communication	
Doctor never/sometimes listened to you	1.23 (1.07–1.42)
Doctor never/sometimes explained so you understood	1.07 (0.92–1.25)
Doctor never/sometimes showed respect	1.20 (1.04–1.38)
Doctor never/sometimes spent enough time with you	1.36 (1.20–1.54)
Patient satisfaction with health care	
Poor patient satisfaction	1.12 (1.02–1.24)
Patient perception of general health (in women compared with men)	
Poor perceived health status	1.15 (1.04–1.28)
Healthcare-Related Quality of Life (in Women Compared With Men)	
	Adjusted Mean Difference (95% CI) <sup>†</sup>
SF-12 PCS	−2.08 (−2.55 to −1.61)
SF-12 MCS	−1.57 (−2.01 to −1.13)

ASCVD indicates atherosclerotic cardiovascular disease; CI, confidence interval; MCS, mental-health component score; MEPS, Medical Expenditure Panel Survey; OR, odds ratios; PCS, physical-health component score; SF-12, 12-item short form.

<sup>\*</sup>ORs were from logistic regression models.

<sup>†</sup>Beta-coefficients were from linear regression models.

<sup>‡</sup>All models compared women with men and were adjusted for age, race/ethnicity, level of income, region, health insurance, educational status, modified Charlson Comorbidity Index (without the cardiovascular component), and cardiovascular risk factors.

reporting poor satisfaction with health care, when compared with men (OR 1.12, 95% CI 1.02–1.24) (Table 2).

## Perception of Health and HRQoL

More women than men self-perceived their health status as poor (33% of men versus 39% of women,  $P<0.001$ ) (Figure 2). Among those with ASCVD, an individual's gender was significantly associated with the perception of overall health status; compared with men, women had 15% higher adjusted odds of reporting that their health status was poor (OR 1.15, 95% CI 1.04–1.28) (Table 2).

There were gender-specific differences in HRQoL among individuals with ASCVD; women with ASCVD had worse HRQoL when compared with men. Overall, women had significantly lower scores on both the 12-item short form PCS and MCS scales, used to assess HRQoL, with women reporting poorer scores for both the PCS and MCS measurements when compared with men (68% versus 57%, and 39% versus 30%, respectively) (Figure 2). In adjusted linear

regression analyses (Table 2), women with ASCVD were more likely to have worse HRQoL scores with a mean difference of  $-2.08$  (95% CI  $-2.55$ ,  $-1.61$ ) in PCS and  $-1.57$  (95% CI  $-2.01$ ,  $-1.13$ ) in MCS when compared with men. Results were similar in models further adjusted for provider type and provider gender (Table S3).

As displayed in Table 3, female participants were less likely to perceive their health status as poor if they were gender-concordant with their healthcare provider (OR 0.78, 95% CI 0.64, 0.94) and were more likely to attain higher scores in the physical component of the HRQoL item, when compared with a gender-discordant pair. Overall, patient–provider gender concordance/discordance did not seem to show any significant association with the majority of patient-reported outcomes among individuals with ASCVD (Table 3). There were no significant interactions between the gender of the participants and patient–provider gender concordance on any of the patient-reported outcome measures, with the exception of the physical component score of the HRQoL item;  $P$  for interaction=0.03.

In Table 4, the gender-specific differences in the surrogate indicators for quality of cardiovascular care and health resource utilization are shown. Compared with men with ASCVD, women less likely to report use of aspirin (OR 0.65, 95% CI 0.58, 0.72) and statin use (OR 0.55, 95% CI 0.48, 0.62). Women with ASCVD were 1.28 times more likely to utilize the Emergency Department 2 or more times per survey year, compared with men (OR 1.28, 95% CI 1.11, 1.46).

Further analyses also showed that trends in gender differences in patient-reported outcomes among individuals with ASCVD remained mostly the same, even after stratification by race/ethnicity, age, level of income, and insurance status (Figures S1 through S5).

## Discussion

In a nationally representative sample of the US population with ASCVD, women were more likely to report a poor patient experience (poorer patient–provider communication and lower satisfaction with the health care received) when compared with men. Additionally, women were more likely to have a poor perception of their health status and a lower HRQoL when compared with men.

Patient experience is a key element of patient-centered care. Evidence on the influence of gender on patient experience has been conflicting; some studies suggest that women report more effective communication,<sup>19</sup> and are more satisfied with their health care when compared with men.<sup>20</sup> In contrast, other studies report that women are more likely to be dissatisfied with the health care received than men.<sup>21–23</sup> A prior analysis using data from the 2002 MEPS found that among all US adults who had a healthcare experience in the

**Table 3.** Patient–Provider Gender Match and Patient-Reported Outcomes Among US Adults With ASCVD, Stratified by the Gender of the Patient—MEPS 2006–2015. \*,†,‡,§,||,¶

Patient-Reported Health Outcomes	Patient–Provider Gender Match	
	Male Participants	Female Participants
	Concordance vs Discordance	Concordance vs Discordance
Patient healthcare experience		
Patient–provider communication		
Poor patient–provider communication (summary score)—(OR [95% CI])*	1.10 (0.78–1.56)	1.12 (0.88–1.43)
Individual components of patient–provider communication		
Doctor never/sometimes listened to you (OR [95% CI])*	1.18 (0.79–1.74)	1.16 (0.87–1.56)
Doctor never/sometimes explained so you understood (OR [95% CI])*	0.99 (0.69–1.41)	1.19 (0.88–1.62)
Doctor never/sometimes showed respect [OR (95% CI)]*	1.10 (0.74–1.66)	1.21 (0.92–1.59)
Doctor never/sometimes spent enough time with you (OR [95% CI])*	1.12 (0.81–1.54)	0.99 (0.75–1.29)
Patient satisfaction with health care		
Poor patient satisfaction—(OR [95% CI])*	0.98 (0.73–1.31)	1.08 (0.88–1.33)
Patient perception of general health		
Poor perceived health status—(OR [95% CI])*	0.96 (0.76–1.21)	0.78 (0.64–0.94)
Healthcare-related quality of life		
SF-12 PCS (adjusted mean difference [95% CI]) <sup>†,  </sup>	−0.34 (−1.35 to 0.67)	1.66 (0.81–2.50)
SF-12 MCS (adjusted mean difference [95% CI]) <sup>‡</sup>	0.43 (−0.53 to 1.38)	−0.22 (−1.16 to 0.73)

ASCVD indicates atherosclerotic cardiovascular disease; CI, confidence interval; MCS, mental component score; MEPS, Medical Expenditure Panel Survey; OR, odds ratio; PCS, physical component score; SF-12, 12-item short form.

\*ORs were from logistic regression models.

<sup>†</sup>Beta-coefficients were from linear regression models.

<sup>‡</sup>All models compared patient–provider gender-concordant groups with discordant groups and were adjusted for age, race/ethnicity, level of income, region, health insurance, educational status, modified Charlson Comorbidity Index (without the cardiovascular component), and cardiovascular risk factors.

<sup>§</sup>There were no significant interactions between the gender of the participants and patient–provider gender concordance on any of the patient-reported outcome measures, with the exception of the PCS of the health-related quality of life item as noted.

<sup>||</sup>*P* for interaction (participant gender×patient–provider gender concordance) on SF-12 PCS=0.03.

<sup>¶</sup>Concordance—participant and healthcare provider are of the same gender; Discordance—participant and healthcare provider are not of the same gender.

past year, women were less likely than men to feel their providers always spent enough time with them.<sup>24</sup> This is consistent with our findings from the 2006 to 2015 MEPS showing that women with ASCVD were more likely to report poorer patient–provider communication than men.

**Table 4.** Gender Differences in Surrogate Clinical Outcomes Among Individuals With ASCVD, MEPS 2006–2015\*

	Yes vs No; OR (95% CI)*
Surrogate measures for clinical outcomes (in women compared with men)	
Statin use	0.55 (0.48–0.62)
Aspirin use	0.65 (0.58–0.72)
≥2 ED visits/y	1.28 (1.11–1.46)
≥2 hospitalizations visits/y	1.05 (0.88–1.25)

ASCVD indicates atherosclerotic cardiovascular disease; CI, confidence interval; ED, Emergency Department; MEPS, Medical Expenditure Panel Survey; OR, odds ratio.

\*ORs were from logistic regression models. Models compared women with men and were adjusted for age, race/ethnicity, level of income, region, health insurance, educational status, modified Charlson Comorbidity Index (without the cardiovascular component), and cardiovascular risk factors.

Although a positive healthcare experience has been shown to be associated with improved health outcomes among ASCVD patients,<sup>3</sup> there is a paucity of information on the influence of gender on patient experience among ASCVD patients specifically. This current study demonstrates that among individuals with ASCVD, women are more likely to have a negative healthcare experience when compared with men. Our results are similar to the findings shown among surgical patients, which demonstrated lower satisfaction among women compared with men.<sup>25–28</sup> Although the exact mechanism underlying the poor patient experience among female patients is unclear, women may be more assertive, have higher expectations and/or desire more participatory and interactive encounters with their healthcare providers.<sup>19</sup> These social expectations may influence the interpretation of the communication skills of the healthcare provider to a greater degree, hence impacting the overall patient satisfaction with health care. Negative patient experience may be a contributing factor to some of the worse outcomes demonstrated among women with ASCVD. It is therefore important to explore the likely



mechanisms responsible for the poor patient experience among women with ASCVD and possible solutions to address these disparities, which may provide better chances for improved and equitable healthcare delivery.

Certain characteristics of the healthcare provider, such as type of provider (physician versus nonphysician)<sup>29,30</sup> and gender of the healthcare provider have been associated with patient-reported outcomes.<sup>31–33</sup> Although there is a scarcity of information addressing the interplay between these patient and provider characteristics among individuals with ASCVD, overall, reports on the influence of the gender of the healthcare provider and patient–provider gender concordance on patient experience has been mixed.<sup>31–35</sup> Of note, a recent study by Greenwood et al of patients with acute myocardial infarction found a higher mortality for female patients treated by male physicians, but similar outcomes for both male and female patients treated by female physicians.<sup>34</sup> This study and others<sup>35</sup> suggest that outcomes may be better for female patients treated by female physicians. In the study by Greenwood et al, the authors did find an association of better outcomes for female patients if the treating male physicians had worked with more female colleagues and had more experience in treating women patients in the past, compared with male physicians who had not.

Gender disparities in perceived patient–provider communication may be 1 possible explanation for worse outcomes in women with ASCVD. The findings in this current study, which demonstrated poorer patient-reported outcomes among women with ASCVD when compared with men, remained grossly the same after adjusting for provider factors including provider gender. However, female participants had higher scores on the physical component of the HRQoL item if they were gender concordant with their healthcare provider (versus gender discordant), whereas there was no association by provider concordance status in male patients.

Positive patient-reported outcomes such as HRQoL and perception of health have been demonstrated to be associated with improved survival and health outcomes, playing a particularly important role among cancer patients.<sup>36</sup> However, these patient-centered measures have been shown to be poor among individuals with cardiovascular disease,<sup>37</sup> with some gender-specific differences; in post–myocardial infarction patients, HRQoL and self-perception of cardiovascular risk factors have been demonstrated to be worse among women when compared with men.<sup>38–40</sup> Across all indications for coronary angiography, women reported lower HRQoL than men irrespective of the severity or treatment for coronary artery disease.<sup>41</sup> These results align with those generated from this study, as we show that women with ASCVD had a lower HRQoL, which was more prominent in the physical functioning aspect of their quality of life, and a poorer perception of their overall health status when compared with men.

Gender-specific differences have also been described in the management of cardiovascular disease. Compared with men, women were less likely to undergo a coronary artery bypass graft<sup>42</sup> and were less likely to receive evidence-based pharmacological and preventive therapies at discharge following revascularization and/or myocardial infarction, which can contribute to worse clinical outcomes.<sup>42–44</sup> This current study also found that women with ASCVD were less likely to report the use of ASCVD-preventive therapies (eg, aspirin and statins), when compared with men. With the “Go Red For Women” campaign introduced by the American Heart Association and the National Heart, Lung, and Blood Institute in 2001–2002, there has been an increase in the awareness of cardiovascular disease among women.<sup>43</sup> However, significant gender differences still exist in the management and outcomes of cardiovascular disease, so there is still more work that needs to be done to optimize cardiovascular health in women.

Aside from biological sex differences in the manifestation of ASCVD, gender plays a major role in the social, environmental, and psychological aspects of life, influencing health expectations, healthcare-seeking behavior, and perception of health.<sup>45</sup> Women experience an escalated demand for domestic and caregiving responsibilities, and this is particularly prominent among families of ethnic minorities.<sup>46</sup> This is often associated with psychosocial stress that is more common in women,<sup>47–50</sup> with less time for optimal self-care, symptom neglect, poor perception of health, lower quality of life,<sup>46</sup> and worse health outcomes overall. Although several other determinants of health such as level of education, race/ethnicity, and level of income may influence health outcomes, in this current study, the vulnerability of women to worse patient-reported outcomes persisted even after taking these factors into consideration. Gender differences in cardiovascular outcomes are beyond the influence of biological and medical factors,<sup>4</sup> as they extend to the psychosocial and patient-centered determinants of health. Improved recognition and understanding of these gender-specific differences and challenges among women with ASCVD will be vital to the improvement of women’s cardiovascular health.

## Strengths and Limitations

This study has some limitations. Since MEPS has a cross-sectional design, we cannot establish causal mechanisms between gender and patient-reported outcomes among individuals with ASCVD. Since there is no standardized definition for the components of patient experience, all the factors that might influence these measures may not have been accounted for. Also, since our study population includes self-reported diagnosis of ASCVD, the risk of underestimation of the cohort size is a possibility. The timeliness of the MEPS may influence the responses of the participants, hence there is

the possibility of a recall bias, although it should be minimal at best. Also, we could not address the underlying reasons for the gender-specific differences in patient-reported health outcomes, which could be because of treatment differences and referrals, indications and contraindications, patient preference, or other medical-social factors that could contribute to differences in health outcomes. Finally, patient-reported data were used to identify the gender of the MEPS participants, which was reported as either male or female; we therefore could not account for the transgender population.

On the other hand, our study has many strengths, including the design and execution of the MEPS with its multilevel ascertainment of information obtained from survey participants and weighting to make our results generalizable to all noninstitutionalized US adults living with ASCVD.

## Conclusions

In conclusion, women with ASCVD were more likely to report poorer patient experience, lower HRQoL, and poorer perception of their health when compared with men. This has important public health implications, given the established relationship between positive patient experiences, HRQoL, and improved health outcomes. Continued research towards understanding the gender-specific differences in patient-reported matrices may provide an opportunity to improve perception of healthcare quality, delivery, and ultimately health outcomes among women with ASCVD.

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## Disclosures

None.

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# **Supplemental Material**

**Table S1. Patient-Provider Communication Score Questions and patient satisfaction questions.**

<b>PATIENT-PROVIDER COMMUNICATION</b>
1. How often healthcare providers explained things in a way that was easy to understand? <i>1-never/sometimes, 2-usually, 3-always</i>
2. How often providers showed respect for what you had to say? <i>1-never/sometimes, 2-usually, 3-always</i>
3. How often providers spent enough time with you? <i>1-never/sometimes, 2-usually, 3-always</i>
4. How often providers listened carefully to you? <i>1-never/sometimes, 2-usually, 3-always</i>
<b>SATISFACTION/OVERALL RATING OF HEALTHCARE FROM PROVIDERS</b>
Rating of healthcare from doctors and other healthcare providers. <i>0 (worst healthcare possible) to 10 (best healthcare possible)</i>



**Table S2. ICD-9-CM Codes of Diseases and Self-report Information.**

<i>ASCVD and CRF Profile were constructed based on presence of either ICD-9-CM or self-report information:</i>	
	<b>ASCVD</b>
<i>Condition</i>	<i>ICD-9-CM Code(s)</i>
Coronary heart disease	410, 413, 414
Stroke	433-437
Peripheral artery disease	440, 443
	<i>Self-reported questions</i>
Coronary heart disease	Asked if the person had ever been diagnosed as having coronary heart disease
Angina	Asked if the person had ever been diagnosed as having angina, or angina pectoris
Myocardial Infarction	Asked if the person had ever been diagnosed as having a heart attack, or myocardial infarction
Stroke	Asked if the person had ever been diagnosed as having had a stroke or transient ischemic attack (TIA or ministroke).
	<b>CRF Profile</b>
<i>Condition</i>	<i>ICD-9-CM Code(s)</i>
Hypertension	401
Diabetes	250
Dyslipidemia	272
	<i>Self-reported questions</i>
Smoking	Assessed whether individual currently smoked
Dyslipidemia	Ascertained whether the person had ever been diagnosed as having high cholesterol.
Physical Activity	Currently spends half hour or more in moderate to vigorous physical activity at least five times a week
Hypertension	Ascertained whether the person had ever been diagnosed as having high blood pressure (other than during pregnancy).
Diabetes	Indicates whether each person had ever been diagnosed with diabetes (excluding gestational diabetes).

ICD-9-CM; International Classification of Diseases, 9<sup>th</sup> Edition, Clinical Modification, CRF; Cardiovascular Risk Factors, ASCVD; Atherosclerotic Cardiovascular Disease.

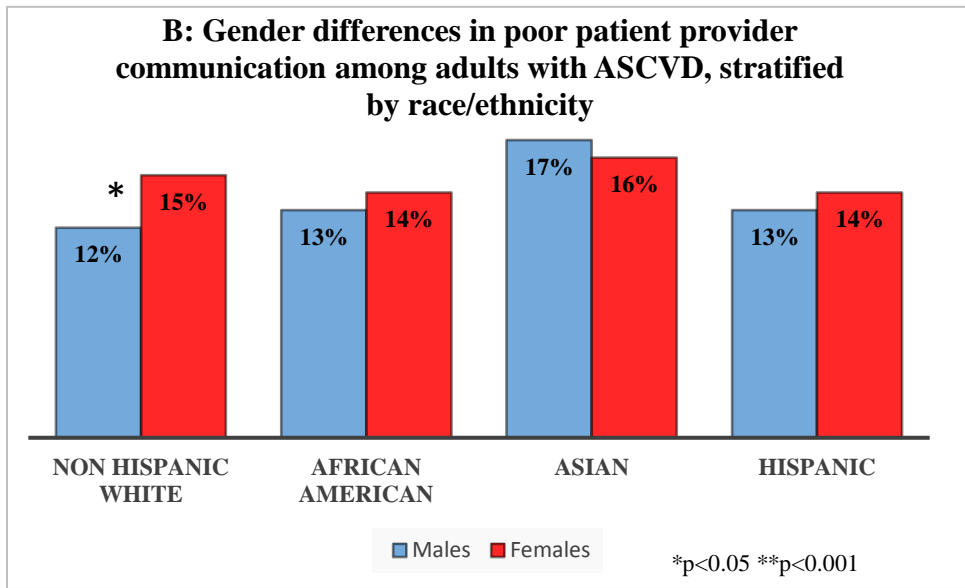
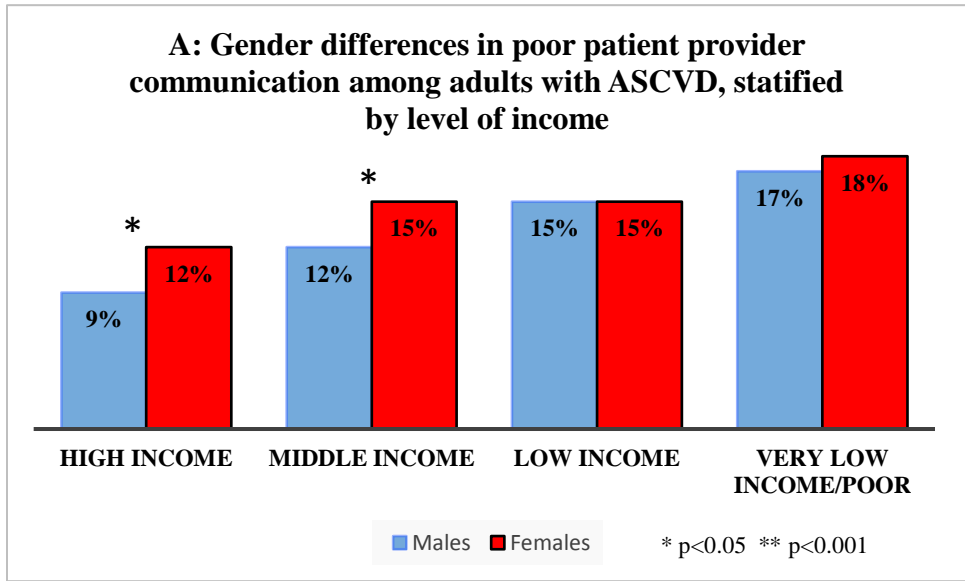
**Table S3. Patient reported outcomes among US adults with ASCVD stratified by gender - MEPS 2006-2015 (odds ratios includes adjustment for type of provider and gender of provider).**

<b>Patient Healthcare Experience (in women compared to men)</b>	<b>OR (95% CI)</b>
<i>Patient-provider communication</i>	
Poor Patient-Provider Communication (summary score)	1.28 (1.09-1.51)
<i>Patient satisfaction with healthcare</i>	
Poor patient satisfaction	1.12 (0.97-1.28)
<b>Patient Perception of General Health (in women compared to men)</b>	<b>OR (95% CI)</b>
Poor Perceived Health Status	1.21 (1.06-1.38)
<b>Healthcare-related Quality of Life (in women compared to men)</b>	<b>Adjusted mean difference (95% CI)</b>
SF-12 PCS	-2.41 (-2.99 to -1.83)
SF-12 MCS	-1.75 (-2.34 to -1.16)

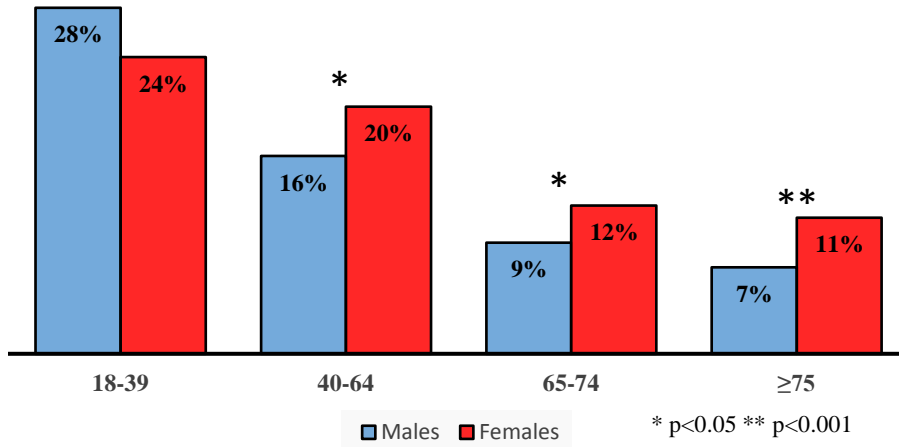
OR, odds ratio; SF-12, 12-item short form; PCS, physical component score; MCS, mental component score, CI, confidence interval; ASCVD, atherosclerotic cardiovascular disease

\*Adjusted for age, race, level of income, region, health insurance, educational status, modified Charlson comorbidity index (without the cardiovascular component), modifiable cardiovascular risk factors, gender of the healthcare provider, type of healthcare provider

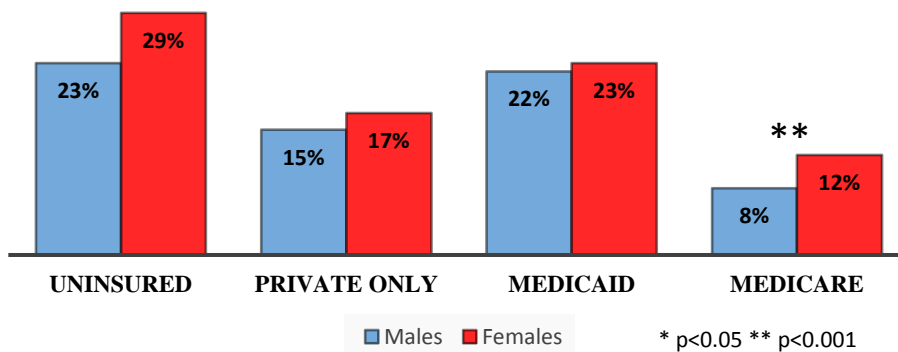
**Figure S1. A-D: Gender differences in poor patient-provider communication among U.S adults with ASCVD, stratified by sociodemographic characteristics.** ASCVD, atherosclerotic cardiovascular disease.



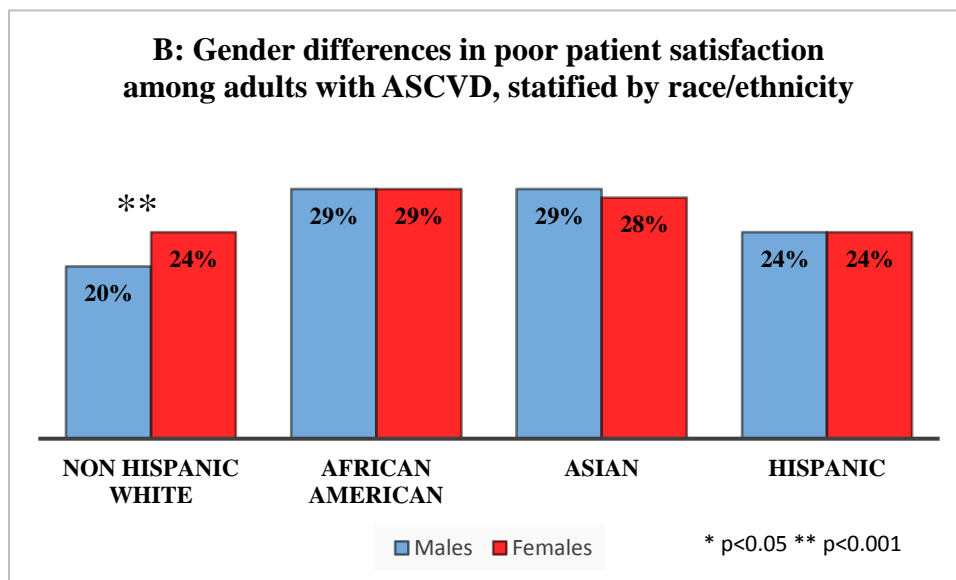
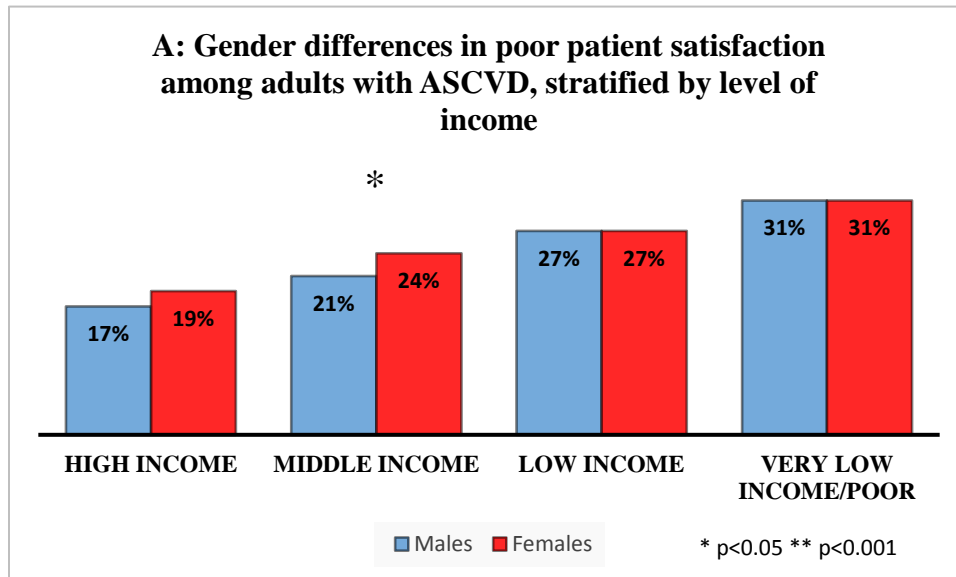
**C: Gender differences in poor patient provider communication among adults with ASCVD, stratified by age (yrs)**



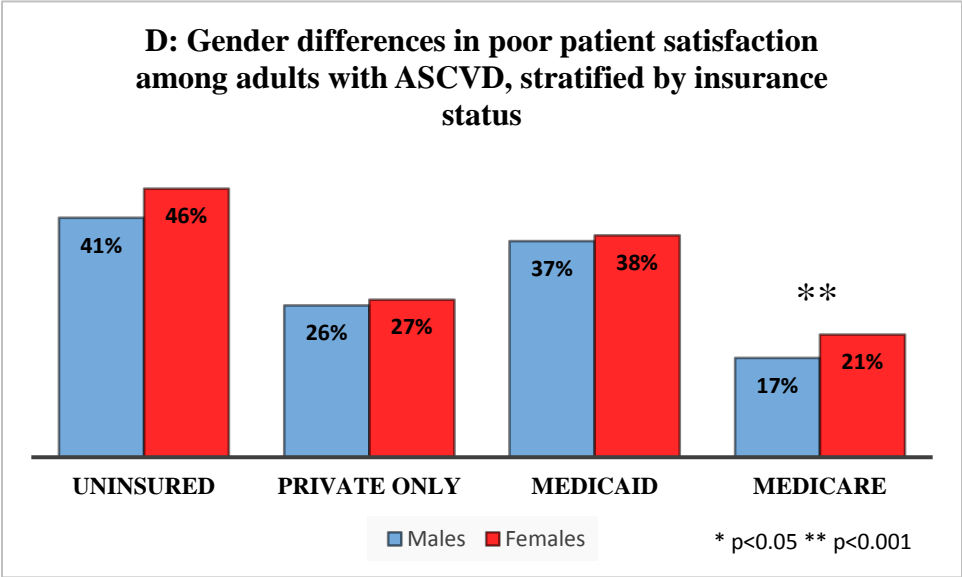
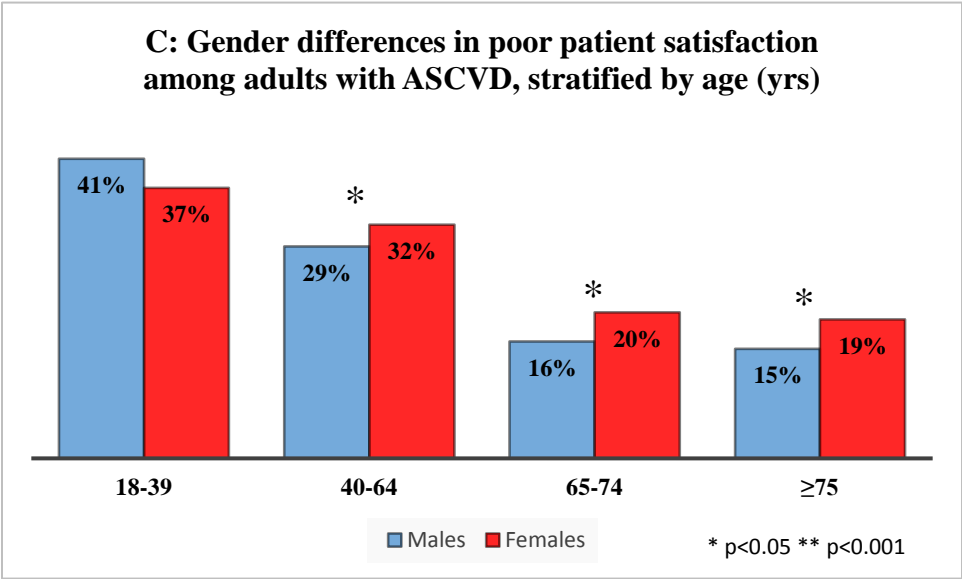
**D: Gender differences in poor patient provider communication among adults with ASCVD, stratified by insurance status**



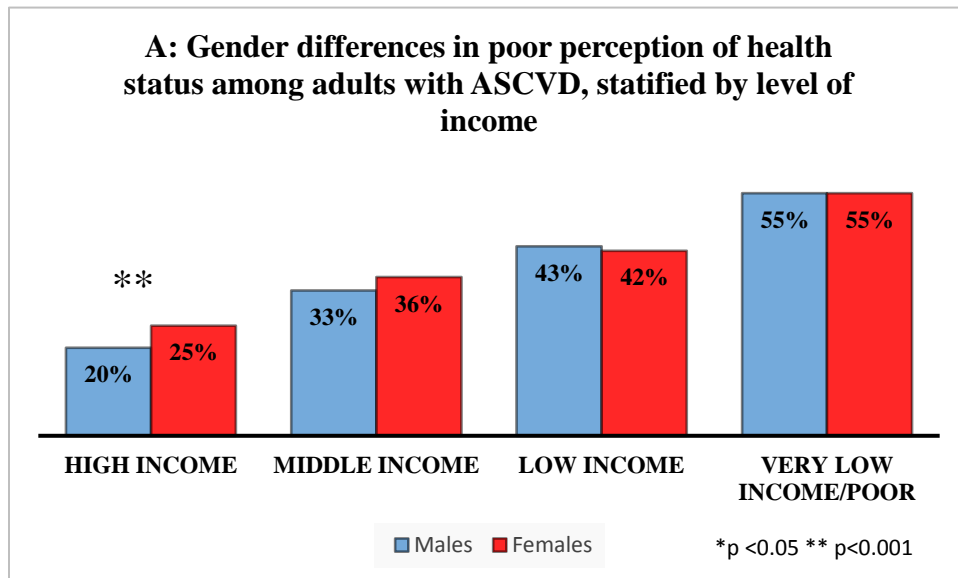
**Figure S2. A-D: Gender differences in poor patient satisfaction among U.S adults with ASCVD, stratified by sociodemographic characteristics.** ASCVD, atherosclerotic cardiovascular disease.



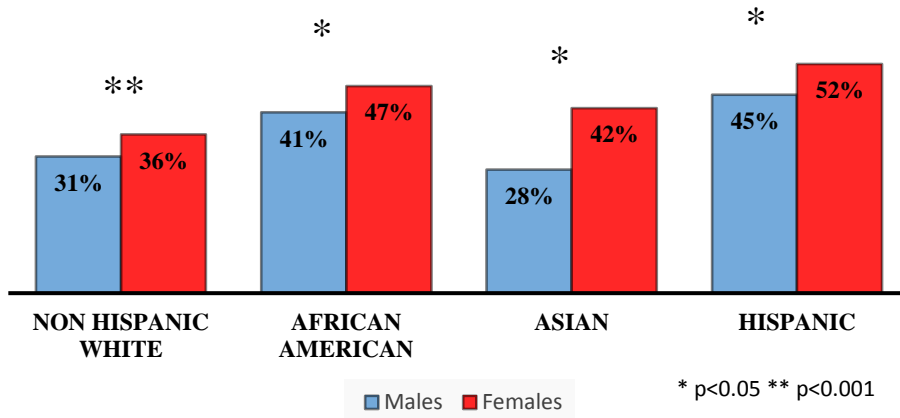




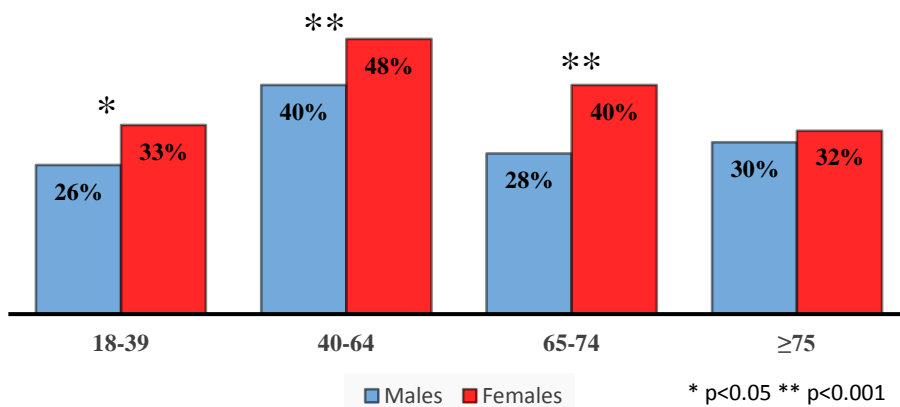
**Figure S3. A-D: Gender differences in poor perception of health status among U.S adults with ASCVD, stratified by sociodemographic characteristics.** ASCVD, atherosclerotic cardiovascular disease.



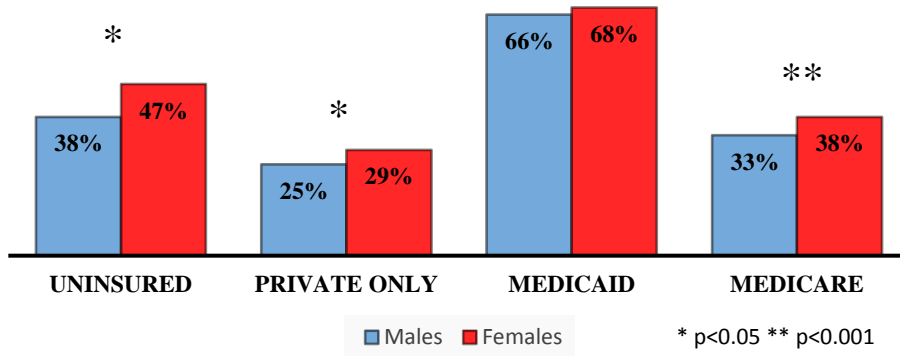
**B: Gender differences in poor perception of health status among adults with ASCVD, stratified by race/ethnicity**



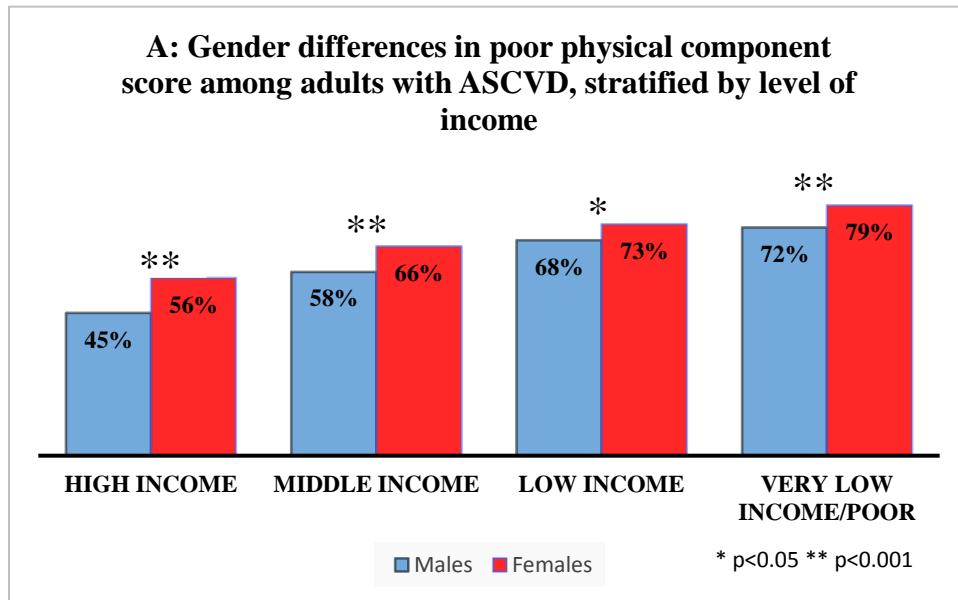
**C: Gender differences in poor perception of health status among adults with ASCVD, stratified by age (yrs)**



**D: Gender differences in poor perception of health status among adults with ASCVD, stratified by insurance status**

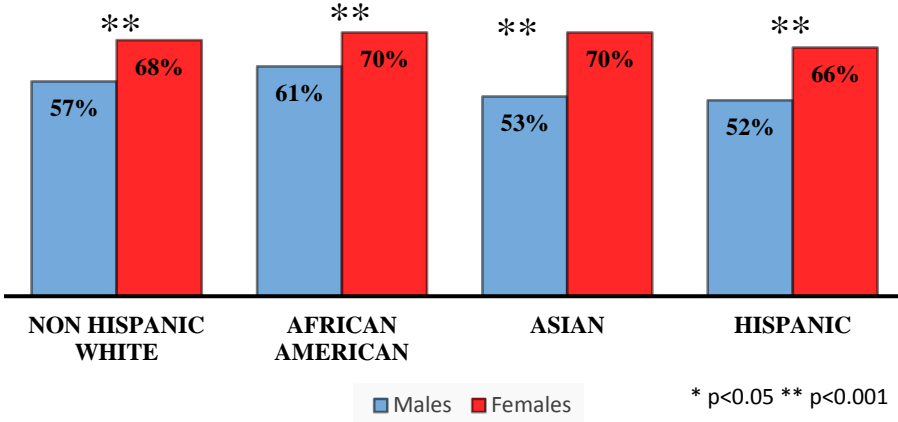


**Figure S4. A-D: Gender differences in poor physical component score among U.S adults with ASCVD, stratified by sociodemographic characteristics.** ASCVD, atherosclerotic cardiovascular disease.

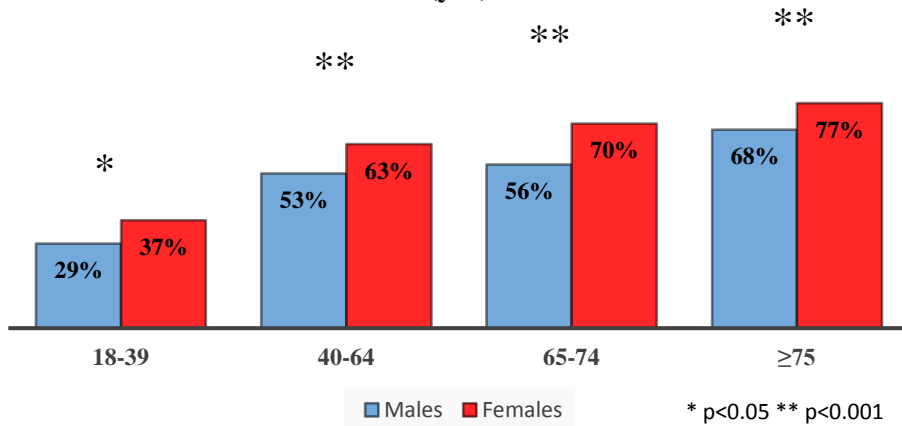




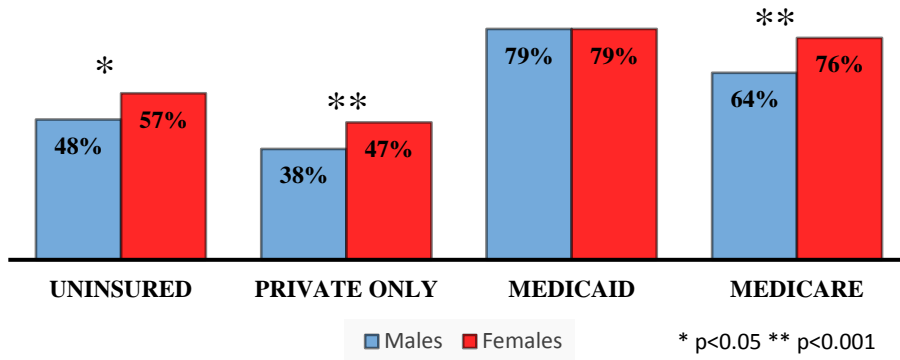
**B: Gender differences in poor physical component score among adults with ASCVD, stratified by race/ethnicity**



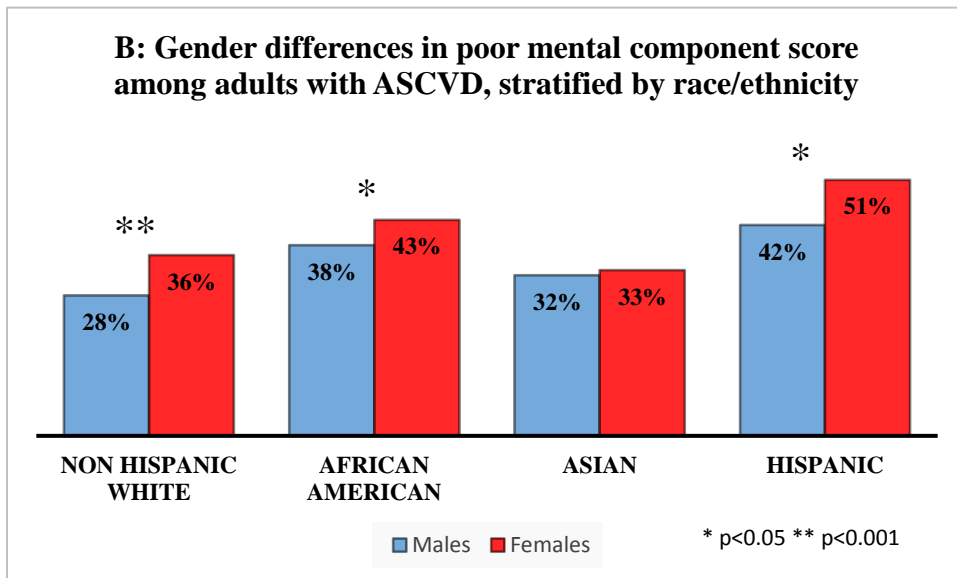
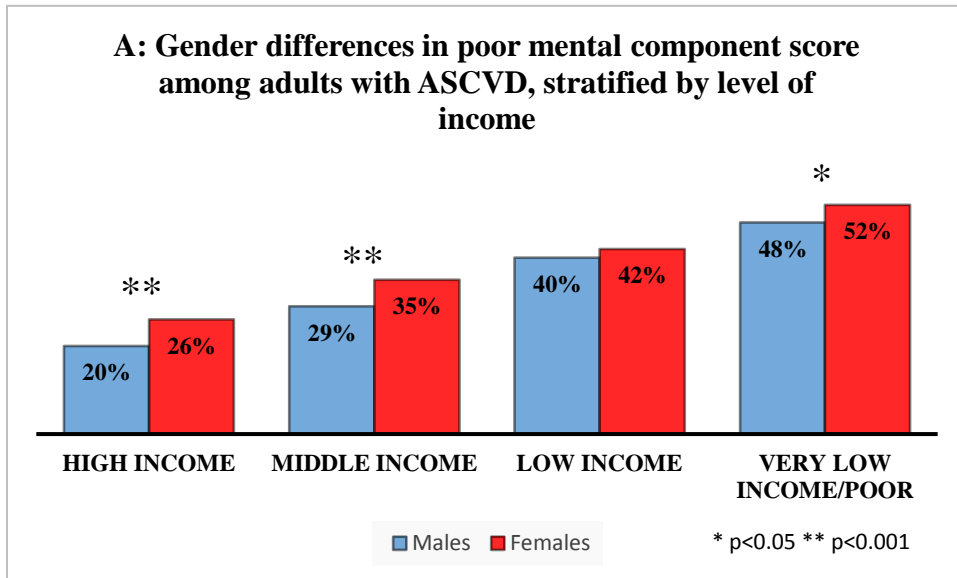
**C: Gender differences in poor physical component score among adults with ASCVD, stratified by age (yrs)**



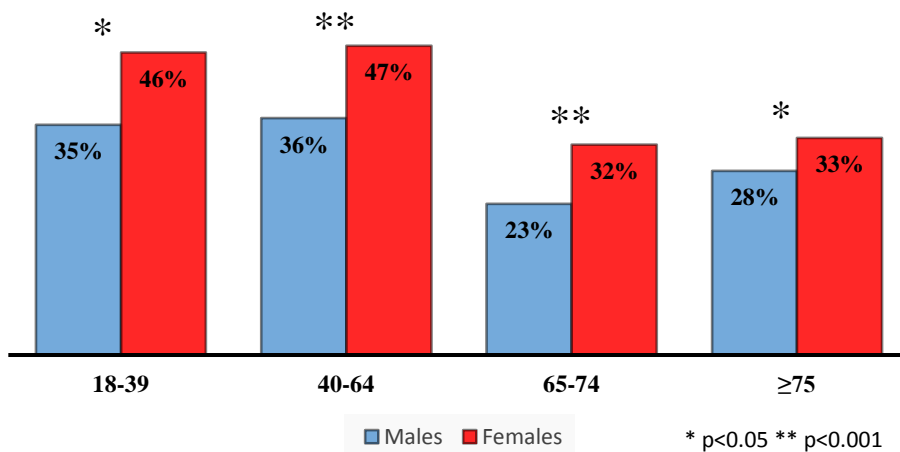
**D: Gender differences in poor physical component score among adults with ASCVD, stratified by insurance status**



**Figure S5. A-D: Gender differences in poor mental component score among U.S adults with ASCVD, stratified by sociodemographic characteristics.** ASCVD, atherosclerotic cardiovascular disease.



**C: Gender differences in poor mental component score among adults with ASCVD, stratified by age (yrs)**



**D: Gender differences in poor mental component score among adults with ASCVD, stratified by insurance status**

