Patient-Reported Health Status in Coronary Heart Disease in the United States
Age, Sex, Racial, and Ethnic Differences

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Background—Coronary heart disease (CHD) affects 15.8 million Americans. However, data on the national impact of CHD on health-related quality of life, particularly among people of different age, sex, racial, and ethnic groups, are limited.

Methods and Results—Using data from the 2000 and 2002 Medical Expenditure Panel Survey, we examined various measures of patient-reported health status, including health-related quality of life, in the CHD and non-CHD populations and differences in the measures among demographic subgroups. These measures included short-form generic measures (Short Form 12; Mental Component Summary-12 and Physical Component Summary-12) and EuroQol Group measures (EQ-5D index and EQ visual analog scale). Ordinary least-squares regressions were used to adjust for sociodemographic characteristics, risk factors, comorbidities, and proxy report. The adjusted difference between the CHD and non-CHD populations was −1.2 for Mental Component Summary-12 (2.4% of the score in the non-CHD population), −4.6 for Physical Component Summary-12 (9.2%), −0.04 for EQ-5D (4.6%), and −7.3 for EQ visual analog scale (9.0%) (all \( P<0.05 \)). Differences among demographic subgroups were observed. Particularly, compared with whites, the differences between CHD and non-CHD in blacks were bigger in all measures except Physical Component Summary-12. A significantly bigger difference in Mental Component Summary-12 also was observed among Hispanics compared with non-Hispanics.

Conclusions—CHD is associated with significant impairment of health-related quality of life and other patient-reported health status in the US adult population. Differences in the impairment associated with CHD exist across different age, racial, and ethnic groups. In addition to preventing CHD, effective public health interventions should be aimed at improving health-related quality of life and perceived health status in the CHD population, especially the most vulnerable groups. (Circulation. 2008;118:491-497.)

Key Words: coronary disease • health status • disparities • quality of life

The past decades have witnessed major national achievements in preventing coronary heart disease (CHD). For example, the prevalence of certain major risk factors such as hypertension, hyperlipidemia, and smoking has substantially decreased in the United States.\(^1\)\(^-\)\(^3\) Consequently, similar trends have been revealed in CHD incidence.\(^4\) Another remarkable achievement is the continuous decline in CHD mortality\(^5\)\(^-\)\(^10\); age-adjusted CHD mortality rates in the United States fell by \(>3\%/y\) between 1970 and 1990.\(^5\) These achievements are attributable to a combination of prevention efforts and advances in the treatment for acute CHD.
These measures can be used as an indicator of the burden of illness, effectiveness of interventions and treatments, and long-term mortality among patients after a cardiac event. Despite the importance of quality of life in disease assessments, to date, only a few studies have compared the health-related quality of life (HRQoL) and health utilities of CHD patients with those of the non-CHD population. National studies regarding this issue are lacking. To fill the void, we quantified the national impact of CHD on patient-reported health status in the noninstitutionalized population in the United States with 4 commonly used measures that provide different perspectives on health status. Because previous studies have shown that the effects of CHD on quality of life could differ by age, sex, race, and ethnicity, we also explored whether such differences exist at the national level and, if so, what their magnitude is.

Methods

Data and Study Population

Data used in this analysis were obtained from the household component of the Medical Expenditure Panel Survey (MEPS), which is administered by the Agency for Healthcare Research and Quality (http://www.meps.ahrq.gov/mepsweb). MEPS has an overlapping panel design, and any given panel is composed of a random sample of the US civilian noninstitutionalized population interviewed 5 times over 30 months. Except for the first year (1996), 2 panels are interviewed each year, and individual sampling weights are assigned to participants in the 2 panels to yield nationally representative statistics for that year. The household component provides detailed information on individuals’ demographic and socioeconomic characteristics and disease status. In addition, since 2000, MEPS has included a self-administered questionnaire that contains HRQoL measures for adults ≥18 years of age. The overall response rate for the self-administered questionnaire was 93.5% in 2000 and 94.4% in 2002.

The subjects in this study consist of all adults ≥18 years of age who were interviewed in 2000 or 2002 and assigned a nonzero sampling weight. Because of the overlapping sampling panel design, we excluded the 2001 data to avoid duplicate observations. Therefore, the study sample is composed of 37,386 adults interviewed in 2000 or 2002 (93.6% of the adult respondents with a nonzero weight).

The self-administered questionnaire was 93.5% in 2000 and 94.4% in 2002.

Measure

MEPS has several measures of patient-reported health status, including the short-form generic measure of health status (12-item Short Form Health Survey [SF-12]) and the measures developed by the EuroQol Group (EQ-5D index and the EQ visual analogue scale [EQ VAS]). The SF-12 is an HRQoL measure that includes the following concepts: physical functioning, role limitations resulting from physical health problems, bodily pain, general health, vitality (energy or fatigue), social functioning, role limitation resulting from emotional problems, and mental health. A scoring system has been developed to generate physical and mental summary scales (SF-12 Physical Component Summary [PCS-12] and SF-12 Mental Component Summary [MCS-12]) from these concepts. These scales have a population mean of 50 and an SD of 10. The EQ-5D index is a preference-based health status (ie, health utility) measure based on the 5 dimensions of health (mobility, self-care, usual activities, pain or discomfort, and anxiety or depression) in the EQ-5D descriptive system. The EQ-5D index score available in MEPS is calculated from the preference weights of the general population of the United Kingdom. These weights are quite different from the preference weights of the US general population. Therefore, in this analysis, we used the US preference weights developed by Shaw et al to generate the EQ-5D index score. EQ VAS is included to capture self-rating of current health status. The EQ VAS scale is a visual thermometer with end points of 100 (best imaginable health state) and 0 (worst imaginable health state). Although not disease specific, these generic measures are better for evaluating the national impact of CHD on HRQoL and health utility because CHD can be compared with other prevalent diseases in this country on the basis of these measures.

A person was considered to have CHD if he or she reported having been diagnosed with CHD, myocardial infarction, or angina pectoris. Covariates included CHD risk factors, comorbidities, sociodemographic characteristics, and proxy report status. CHD risk factors included hypertension, diabetes mellitus, lipid disorder, and obesity. Comorbidities included 2 dichotomous variables indicating whether a person had other heart disease (ie, heart diseases other than CHD) or stroke and a continuous variable indicating the number of noncardiovascular comorbid conditions. Diabetes and hypertension and cardiovascular comorbidities (ie, other heart disease and stroke) were defined on the basis of questions on relevant disease history. Obesity was defined on the basis of a person’s body mass index of ≥30 kg/m². Lipid disorder was defined using the first 3 digits of the International Classification of Diseases, ninth revision, clinical modification (ICD-9-CM) diagnosis code from the MEPS medical condition files. Other noncardiovascular conditions were defined as a count variable indicating the number of other noncardiovascular conditions during the calendar year based on the ICD-9-CM diagnosis code, excluding diabetes and lipid disorder. All these conditions were either self-reported or reported by a proxy. Risk factors and comorbidities were included in the analysis because their prevalence in the CHD and non-CHD populations differed and they could affect HRQoL. We also included sociodemographic variables (age, sex, race, ethnicity, marital status, region, education, and poverty level) and a dummy variable indicating whether the HRQoL data were collected via proxy report because this has been found to affect HRQoL scores.

Statistical Analysis

The population estimates of the 4 patient-reported health status measures were compared between CHD and non-CHD individuals overall and among subgroups defined by age, sex, race, ethnicity, marital status, region, poverty level, risk factors for CHD, and comorbidities. Multivariate ordinary least-squares regressions were conducted to further examine the differences in these measures between adults with and without CHD. The base model controlled for sociodemographic characteristics (age, sex, race, ethnicity, marital status, region, poverty level, years of education, and years of education squared), CHD risk factors (hypertension, diabetes, lipid disorder, and obesity), comorbidities (other heart disease, stroke, and the number of noncardiovascular conditions), and proxy report (see Table 1 for all the independent variables included in the model). In addition to the variables in the basic model, a full model was estimated that included 2-way interaction terms between CHD and demographic characteristics (ie, age, sex, race, and ethnicity) to detect any differences in health status measures among individuals with CHD across these subgroups. All interaction terms were included in 1 model. The analysis was conducted with STATA 8.2 (Stata Corp, College Station, Tex). All analyses were adjusted for the complex survey design in MEPS using the “svyreg” function in STATA. The stratum and primary sampling unit variables were included in the MEPS data. Details of the adjustment can be found at MEPS website (http://www.meps.ahrq.gov/mepsweb/data_stats/download_data/pdfs/h36/h36u05doc.pdf). The authors had full access to and take responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

Results

Of the 37,386 individuals in our sample, 2091 had a history of CHD, representing 5.5% of the noninstitutionalized adult population in the United States. This corresponds to an estimated 10.8 million noninstitutionalized adults ≥18 years
of age with CHD each year. Individuals with CHD were
generally older than those without CHD and were dispro-
portionately male; they also were less likely to be Hispanic and
more likely to live in the Midwest or South. They had fewer
years of education and less income than participants without
CHD (Table 1). They also had a much higher prevalence of
hypertension, diabetes, lipid disorder, obesity, other heart
disease, and stroke, as well as more noncardiovascular
conditions. In addition, proxy report was used more fre-
cently to obtain information on HRQoL in the CHD sample.
The average MSC-12, PCS-12, EQ-5D, and EQ VAS
scores were significantly lower than the corresponding scores
in the non-CHD population (Table 2). Similar results were
found in each population subgroup except for MSC-12 in
“other” race, high income, and nonhypertension groups (Ta-
ble 2). The differences in the 4 scores became smaller after
we adjusted for sociodemographic characteristics, CHD risk
factors, comorbidities, and proxy report status; however, the
results remained significant. After adjustment, on average,
the CHD population had 1.2 (2.4%) lower mental health score
(MCS-12), 4.6 (9.2%) lower physical health score (PCS-12),
0.04 (4.6%) lower health utility (EQ-5D), and 7.3 (9.0%)
lower self-rating of health score (EQ VAS) than the non-
CHD population (Table 3).

Further analysis of interactions in the full model revealed
differences in the impairment of health status among some
CHD populations after controlling for other sociodemog-
graphic characteristics, CHD risk factors, and comorbidities
(Figure). First, although significant differences in health
status existed between the CHD and non-CHD populations in
every age group, the reductions in EQ-5D index score and EQ
VAS in the CHD group were more pronounced in the 2
younger age groups (18 to 49 and 50 to 64 years of age) than
the oldest group (age ≥65 years of age) (P<0.01 for all
interactions; Figure, A). In addition, the reduction in PCS-12
score in the 50- to 64-years-of-age group also was signifi-
cantly greater than in the oldest age group (P<0.01). When
we compared the 2 sexes, the reductions in PCS-12 and
EQ-5D index score were much greater in women with CHD
than in men (both P<0.05), but the reduction in EQ VAS
score was greater in men than in women (P<0.05) (Figure, B).
The reductions in the patient-reported health status scores
associated with CHD were similar between whites and
persons of “other” races. However, considerable gaps in these
scores were evident between whites and blacks. The adjusted
differences in the reductions in health status scores associated
with CHD between whites and blacks were significant in every
measure (P<0.05 for all interactions) except PCS-12
(Figure, C). However, the magnitude of the adjusted differ-
ences was less compared with the unadjusted differences. The
adjusted differences in the reductions in MSC-12, PCS-12,
EQ-5D, and EQ VAS scores were −3.2, −0.2, −0.05, and
−3.9, respectively (Figure, C), compared with the corre-

tponding unadjusted differences of −4.3, −1.7, −0.07, and
−6.5 (numbers were derived from Table 2). Finally, the
reduction in MCS-12 score associated with CHD was signif-
ically greater in Hispanics than in non-Hispanics (P<0.01;
Figure, D). The adjusted difference in the reduction MCS-12
score associated with CHD was close to the unadjusted
difference (−2.7 versus −2.8). No significant differences
were identified in other health status measures scores be-
tween these 2 ethnic groups.

### Discussion

HRQoL and health utility are comprehensive outcome mea-
sures that include physical, psychological, and social well-
ness.
Table 2. HRQoL Scores in Individuals With and Without CHD by Selected Characteristics: MEPS 2000 and 2002

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</tbody>
</table>

Values are mean (SE). All differences in scores between CHD and non-CHD populations are significant on the basis of Z tests (P<0.05) except for MCS-12 scores in other races and high-income and nonhypertension groups. All scores presented were unadjusted.
being and perceived health. Therefore, it has been increasingly used in evaluations of disease impact and new interventions and treatments. Contemporary goals of public health extend beyond reducing morbidity and mortality to improving quality of life. To the best of our knowledge, this study is the first to compare a comprehensive set of patient-reported health status measures between the CHD and non-CHD populations at the national level in the United States and to examine national differences in HRQoL among demographic subgroups. Our findings showed that CHD is significantly associated with the impairment of HRQoL and health utility in the noninstitutionalized US population, particularly with respect to physical health and self-rating of health. The adjusted differences in physical health score and EQ VAS score between the CHD and non-CHD populations exceed the minimum clinically important differences generally reported in the literature. Because we used data from a nationally representative survey, the results could be generalizable to the entire noninstitutionalized adult population in the United States. The overall HRQoL and health utility scores, as well as the scores in the population subgroups, could serve as benchmarks for a national evaluation of CHD prevention and treatment interventions.

In this study, we also identified differences in the impact of CHD on HRQoL and other patient-reported health statuses across demographic subgroups, which may indicate age, sex, racial, and ethnic disparities. Our finding that younger CHD patients tend to have more severely impaired HRQoL than the oldest group (≥65 years of age), especially in health utility and self-rating of health, is consistent with previous research. This difference may be partially explained by the fact that CHD has a much bigger impact on patients who are at their most productive age than those who are retired. Adjustment or coping mechanisms also may contribute to this difference, particularly for overall health perception.

In terms of sex differences, our results showed that the decrement associated with CHD was bigger in women than men for the SF-12 physical component and health utility but was the opposite for self-rated health status. Previous studies using various HRQoL measures have consistently found that women with CHD had poorer HRQoL. In addition, McCollum et al. found that after adjustment for sociodemographic and comorbid factors, women with diabetes had higher self-rated health compared with men with diabetes, despite having similar or poorer HRQoL as measured by the SF-12 MCS and PCS in MEPS. It appears that these paradoxical results suggest some differences between self-rated health and objective health measures. Further research is needed to examine such differences in women with CHD.

Our results concerning racial and ethnic differences in HRQoL and health utility associated with CHD are consistent with reports in the literature regarding the differences in health status and mortality. Reasons for racial and ethnic differences in HRQoL are not well understood. Our analysis showed that after other sociodemographic characteristics, CHD risk factors, and comorbidities are controlled for, the differences between whites and blacks decreased. However, a large proportion of the differences is still unexplained. The residual difference could be related to disparities in quality of care and access to care (2005 National Healthcare Disparities Report, Agency for Healthcare Research and Quality; http://www.ahrq.gov/qual/nhdr05/nhdr05.pdf). For example, the lower rate of revascularization procedures among black cardiac patients may contribute to the lower HRQoL in this population. Whether the differences translate into disparities needs further investigation with more detailed clinical data.

This study has several limitations. First, all disease information was self-reported or reported by proxy, which could have resulted in underestimates of true disease prevalence. The prevalence of CHD in this study (5.5%) was lower than the prevalence in the US adult population in 2002 (6.9%) reported by the American Heart Association. However, because the target population in this study was noninstitutionalized, CHD prevalence is likely to be lower than in the overall US adult population. In addition, because of data limitations, we were unable to adjust for the number of heart attacks, disease onset, and treatment received for CHD, which could have affected HRQoL and health utility. As a result, the patient-reported health status scores in this study are average scores for CHD patients with a mixed history of diseases and treatments. Finally, the data did not provide enough information to address the underlying reasons for differences in patient-reported health status among demographic subgroups. Therefore, we do not know whether these differences were due to disparities among these subgroups or were attributed to differences in treatment eligibility, contraindications, patient preference, or other clinical factors that may affect HRQoL and health utility.

CHD could have a negative impact on patient-reported health status, including HRQoL, through several pathways. For example, the disease can impair patients’ functional status and change their psychosocial profile and perceptions of their general health status. Our findings underscore the importance of CHD prevention not only because it is the leading cause of death in the United States but also because it significantly impairs quality of life. Furthermore, among persons who already have CHD, interventions should aim at improving quality of life. Effective interventions may contain

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**Table 3. Unadjusted and Adjusted Differences and 95% CIs in HRQoL Measures Between Populations With and Without CHD: MEPS 2000 and 2002**

<table>
<thead>
<tr>
<th>Models</th>
<th>Physical Health Score (PCS-12)</th>
<th>Mental Health Score (MSC-12)</th>
<th>Health Utility Score (EQ-SD Index, US)</th>
<th>Self-Rating of Health (EQ VAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unadjusted</td>
<td>−13.1 (−13.8−12.4)</td>
<td>−2.4 (−3.0−1.8)</td>
<td>−0.14 (−0.15−0.13)</td>
<td>−17.7 (−18.9−16.5)</td>
</tr>
<tr>
<td>Ordinary least-squares regression*</td>
<td>−4.6 (−5.2−4.0)</td>
<td>−1.2 (−1.8−0.6)</td>
<td>−0.04 (−0.05−0.03)</td>
<td>−7.3 (−8.4−6.2)</td>
</tr>
</tbody>
</table>

*Results were from the basic model adjusted for all the sociodemographic variables, risk factors for CHD, comorbidities, and proxy reporting.*
2 parts: assessment and treatment. After a CHD event, patients should receive a comprehensive assessment that addresses physical capacity (eg, maximal aerobic power, endurance capacity, and exercise program), psychological profile (eg, anxiety, depression, and perceived illness), and social function (eg, leisure activities and job analysis). Specific treatment should follow to address the individual needs, eg, prescription of physical training, cardiac education, cognitive and behavior treatment, and counseling on recreational and vocational activities. Such interventions may not only improve quality of life but also reduce mortality in the long term because HRQoL is a predictor of long-term mortality among patients with CHD.

Constrained by limited resources, we also need to target CHD interventions to the most vulnerable populations to maximize benefits. The literature and findings from this study indicate that younger adults, women, blacks, and Hispanics with CHD tend to have poorer HRQoL and health utility than other CHD populations. Public health programs should develop more specific interventions to address the needs of these disadvantaged groups. However, such efforts require a better understanding of the causes of differences in patient-reported health status in the different populations affected by CHD.

Future studies on the association of quality of life with CHD should address predictors and determinants of optimum HRQoL as a guide to developing interventions aimed at minimizing impairments in HRQoL and other aspects of health status. The social and economic losses associated with reduced health status, especially HRQoL, in CHD survivors also should be well documented as a stimulus to increasing the investment in CHD prevention.

Disclosures

None.

References

Patient-Reported Health Status in CHD in the US

Quality of life has become an increasingly important outcome in coronary heart disease (CHD) from both clinical and public health perspectives. This study examined the national impact of CHD on health-related quality of life and other patient-reported health statuses measured by the Short Form 12 (Physical Component Summary-12 and Mental Component Summary-12) and EuroQoL (EQ-5D index and EQ visual analog scale). Using data from the 2000 and 2002 Medical Expenditure Panel Surveys, we observed the impairment of health status associated with CHD in all measures but more prominently in physical health score and self-reported health. The adjusted differences between the CHD and non-CHD populations were −1.2 for Mental Component Summary-12 (2.4% of the score in the non-CHD population), −0.04 for EQ-5D (4.6%), and −7.3 for EQ visual analog scale (9.0%). In some measures, the impairment was more pronounced in younger patients, women, blacks, and Hispanics, which indicates disparities in quality of life across different demographic groups. In addition to preventing CHD, healthcare providers and public health departments should work together to improve health-related quality of life and perceived health status of CHD patients. Particular attention should be given to the most vulnerable groups.

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