Cross-Country Differences in the Additive Effects of Socioeconomics, Health Behaviors and Medical Comorbidities on Disability among Older Adults with Heart Disease

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Abstract

Background: Patients with heart disease experience limited activities of daily living (ADL). This is a cross-country comparison of the additive effects of Socioeconomics, health behaviors, and the number of medical comorbidities on disability among patients with heart disease.

Methods: The current study used a cross-sectional design. Data came from the Research on Early Life and Aging Trends and Effects (RELATE). The current analysis utilized data on elderly individuals (age ≥ 60 y) from 13 countries. The outcome was any ADL limitation (i.e. bathing, dressing, using toilet, transferring, lifting heavy things, shopping, and eating meals). Socioeconomics (i.e. age, gender, education, and income), health behaviors (i.e. exercise, smoking, and drinking), and number of chronic medical conditions (i.e. hypertension, respiratory, arthritis, stroke, and diabetes) were entered into country-specific logistic regressions, considering at least one limitation in ADL as the main outcome.

Results: Number of comorbid medical conditions and age were positively associated with disability in 85% of the countries. Physical activity and drinking were linked to disability in 54% and 31% of countries, respectively. Higher education and income were associated with lower disability in 31% and 23% of the countries, respectively. Female gender was associated with higher disability only in 15% of the countries. Smoking was not associated with disability, while the effects of socioeconomics, drinking, exercise, and medical comorbidities were controlled.

Conclusion: Determinants of disability depend on the country; accordingly, locally designed health promotion interventions may be superior to the universal interventions for patients with heart disease. Medical comorbidities, however, should be universally diagnosed and treated.

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Introduction

Functional limitation of patients with heart disease has been documented consistently by cross-sectional and longitudinal studies. In a recent study conducted in 15 countries, with no exception, heart disease was associated with poor subjective health, above and beyond the effect of socioeconomics. The study, however, showed cross-country differences in the interactions between socioeconomic factors and heart disease in shaping well-being of populations. Heart disease had a larger effect on subjective health of the elderly in the U.S. and China, women in the U.S., South Africa, and India, low-income people in China and Costa Rica, and individuals with low education in Uruguay and Ghana.

Most of the research on the determinants of disability and the well-being of patients with heart disease has focused on either psychological, clinical, or behavioral characteristics. Thus, less is known about the additive effects of social, behavioral, and comorbid conditions.

Symptoms associated with heart disease may result in withdrawal from social activities. Multiple aspects of the daily life of patients with heart disease may be influenced by the condition. Heart disease may interfere with relationship, eating, and sexual activity of patients. Heart disease may be accompanied with a wide range of symptoms (e.g. dyspnea, tiredness, and fatigue) leading to functional limitation. Patients with heart disease experience limitations in activities of daily living (ADL). Impaired functional capacity and disturbing symptoms reduce health-related quality of life of patients with heart disease. Additional research on the effect of the social determinants of the well-being of patients with heart disease is needed.

Socioeconomic factors influence the well-being and function of individuals. Old age is associated with limitation in function and impaired well-being, physical, and mental health. Gender also influences perceived health, with women tending to report higher levels of disability and morbidity. Low socioeconomic status impairs health and well-being. Education and income, the most commonly accepted proxies of socioeconomic position, are associated with subjective health, chronic disease, and mortality. Individuals with high education and income commonly report better quality of life and function.

Health behaviors also influence the well-being and disability of individuals. Physical activity, drinking, and smoking influence well-being and disability. Physical activity and exercise reduce the likelihood of health-related disability, especially during old age, and improve health-related quality of life. Total time spent physically active is positively related to quality of life. Drinking, smoking, and physically inactive life style carry individual risks to ADL, especially later in life. Chronic medical conditions associated with heart disease are also major causes of morbidity and mortality. Most studies have documented lower health and well-being, functional status, and health-related quality of life in the presence of chronic medical conditions.

Although we already know that patients with heart disease experience and report functional limitations, the contribution of various determinants on disability may differ across countries. Unfortunately, our information is very limited about cross-country differences in the additive effects of determinants of disability associated with heart disease.

In response to the gap of knowledge on cross-country variations in the determinants of disability among patients with heart disease, we compared countries for the additive effects of social, behavioral, and medical determinants and disability among older adults with heart disease. This analysis included countries from America, Asia, and Africa.

Methods

This study had a cross-sectional design. We used publicly available data of the Research on Early Life and Aging Trends and Effects (RELATE), a collection of multiple surveys from different countries across the world. The RELATE data are composed of the following surveys: 1) Wisconsin Longitudinal Study; 2) China Health and Nutrition Study; 3) Chinese Longitudinal Healthy Longevity Survey (CLHLS); 4) Costa Rican Study of Longevity and Healthy Aging; 5) Puerto Rican Elderly: Health Conditions; 6) Study of Aging Survey on Health and Well Being of Elders; and 7) WHO Study on Global Ageing and Adult Health. Most but not all studies comprising RELATE have enrolled community-based samples. The sample size distribution of each country in the publicly available data is presented in Table 1.

The participating countries represent a diverse range of national income levels and were selected from multiple continents. Ghana represents low-income countries; China and India represent lower middle-income countries; Cuba, Uruguay, Chile, Costa Rica, Brazil, Mexico, and Russia represent upper middle-income countries; and Puerto Rico and Barbados represent high-income countries.

Although the original RELATE study included a few other countries as well, countries participating in the current analysis were limited to those with available data on our variables of interest and included China, Costa Rica, Puerto Rico, Mexico, Barbados, Brazil, Chile, Cuba, Uruguay, India, Ghana, South Africa, and Russia.

The presence of self-reported physician diagnosis of heart disease and age over 65 years were considered as eligibility criteria. Self-reported data on physician-diagnosis of chronic medical conditions such as heart disease is valid and closely associated with the physician-diagnosis of heart disease and medical record data.
The socioeconomic data included age (continuous variable), gender (dichotomous variable), education (continuous variable), and income (continuous variable). Income in this study was per capita annual household income calculated as purchase power parity dollars (PPP$).

To provide the PPP$ or international dollar, costs (or incomes) in local currency units were converted to international dollars using PPP exchange rates. An international dollar is a hypothetical currency that is used as a means of translating and comparing costs from one country to the other using a common reference point, the US dollar. The PPP$ exchange rates are provided by the World Health Organization. A PPP$ exchange rate can be defined as the number of units of a country’s currency required to buy the same amounts of goods and services in the domestic market as the U.S. dollar would buy in the United States.45,46

The number of comorbid medical conditions was calculated based on the presence of self-reported physician diagnosis of diabetes, respiratory conditions, stroke, hypertension, and arthritis. Self-reported data on chronic medical conditions are believed to be in agreement with physician diagnosis of conditions (kappa: 0.74-0.92).44

We approached physical disability from an operational point of view, focusing on limitations in ADL. Thus, our measure of ADL focused on very specific functions. The ADL items included in this study comprised bathing, getting dressed, going to the toilet, transferring, lifting heavy objects, shopping, and eating meals. These items have frequently been used to assess ADL in the community sample.55-57

Data were collected anonymously. All the studies have received approval by the institutional review boards. Informed consent was also provided by all the participants of all the surveys.

For the statistical analyses, the statistical software SPSS version 20.0 for Windows (SPSS Inc., Chicago, IL) was used. As weights were not applicable to surveys from China (CHNS), we did not apply sampling weights. Socioeconomic factors (age, gender, education, and income), health behaviors (exercise, smoking, drinking), and number of chronic medical conditions (hypertension, respiratory, arthritis, stroke, and diabetes) were entered into country-specific hierarchical logistic regressions. In the first step (Model I), we tested the main effects of socioeconomic factors. In the next step (Model II), we also entered health behaviors. In the third step (Model III), we also included the number of chronic medical conditions. Odds ratios (ORs) and 95% confidence intervals (95% CI) were reported. P less than 0.05 was considered statistically significant.

Table 1. Sample size distribution of the participating countries in the RELATE data*

| Country-Survey       | Unweighted Frequency | Percentage |
|----------------------|----------------------|------------|
| Costa Rica-CRELES    | 2827                 | 3.2        |
| Puerto Rico-PREHCO   | 4291                 | 4.9        |
| Barbados-SABE        | 1508                 | 1.7        |
| Brazil-SABE          | 2143                 | 2.4        |
| Chile-SABE           | 1301                 | 1.5        |
| Cuba-SABE            | 1905                 | 2.2        |
| Mexico-SABE          | 1247                 | 1.4        |
| Mexico-WHO/SAGE      | 4142                 | 4.7        |
| Uruguay-SABE         | 1450                 | 1.6        |
| India-WHO/SAGE       | 7150                 | 8.1        |
| Ghana-WHO/SAGE       | 4724                 | 5.4        |
| South Africa-WHO/SAGE| 3830                 | 4.3        |
| Russia-WHO/SAGE      | 4511                 | 5.1        |
| China-WHO/SAGE       | 13368                | 15.1       |
| China-CHNS           | 6452                 | 7.3        |
| China-CLHLS          | 16064                | 18.2       |

*The original RELATE study enrolled more countries than were entered into the current analysis. This manuscript is limited to data from China, Costa Rica, Puerto Rico, Mexico, Barbados, Brazil, Chile, Cuba, Uruguay, India, Ghana, South Africa, and Russia.

RELATE, Research on Early Life and Aging Trends and Effects (RELATE); CRELES, Costa Rican Longevity and Healthy Aging Study; PREHCO, Puerto Rican Elderly: Health Conditions; SABE, Survey on Health, Well-Being, and Aging in Latin American and the Caribbean; WHO, World Health Organization; SAGE, Study on Global Ageing and Adult Health; CHNS, China Health and Nutrition Survey; CLHLS, Chinese Longitudinal Healthy Longevity Survey.
Results

The socioeconomic factors of the participants in each country have been reported elsewhere.3-10-12, 32

In Model I, high age was predictive of ADL limitation in all the countries other than Uruguay, Ghana, and South Africa. Female gender was not associated with ADL limitation in most countries, with the exception of Mexico. In South Africa, the association between gender and ADL limitation was marginally significant. High income was linked to lower odds of ADL limitation only in Costa Rica and Puerto Rico. In Chile, the association between income and limitation in ADL was marginally significant. Higher education was associated with lower ADL limitation in Mexico, India, and Russia. In Chile, the association between education and ADL limitation was marginally significant (Table 2).

As Table 3 depicts, in Model II, only in 4 countries (i.e. China, Puerto Rico, Brazil, and Cuba) was exercise associated with lower ADL limitation. In 3 countries (i.e. India, Costa Rica, and Mexico), the association between exercise and ADL limitation was marginally significant. With a few exceptions (i.e. China, Brazil, Chile, and Uruguay), most countries did not show an association between drinking and ADL limitation. Smoking was not associated with ADL limitation among individuals with heart disease, above and beyond the socioeconomic factors, exercise, and drinking.

As Table 4 demonstrates, in Model III, number of medical comorbidities was positively associated with odds of ADL limitation in 10 countries. The number of medical comorbidities was marginally associated with ADL limitation in one country (Barbados).

Discussion

This study revealed major cross-country differences in the additive effects of socioeconomic, behavioral, and medical characteristics on disability among patients with heart disease. The number of medical comorbidities and age were predictive of disability in most countries, while gender and income were linked to disability in very few countries. Exercise and drinking were linked to disability in 7 and 4 countries, respectively. Surprisingly, smoking was not associated with disability in any of the countries, while socioeconomic factors and other health behaviors (i.e. exercise and drinking) were constant. To summarize, the number of comorbid medical conditions, age, physical activity, drinking, education, income, and gender were associated with disability in 85%, 85%, 54%, 31%, 31%, 23%, and 15% of the countries.

There are very few previous studies to compare our findings with.3, 10-12 Based on a recent study that compared 15 countries, age in the U.S. and China; gender in the U.S., South Africa, and India; income in China and Costa Rica; and education in Uruguay and Ghana modified the effect of heart disease on subjective health. In Puerto Rico, Argentina, Barbados, Brazil, Chile, Cuba, and Russia, the effect of heart disease on subjective health was above and beyond the influence of socioeconomic factors.3

The findings of a recent in press study revealed that countries largely vary in the contributors of ADL limitation in the general population. The study particularly found considerable cross-country differences for the relationship between age and ADL. The contribution of age and gender in explaining the variance of ADL was very high in China and Cuba, respectively. More variation was seen in the effect of education than income as a factor contributing to the ADL across countries. Health behaviors such as exercise and also chronic conditions (in general) consistently explained a significant portion of the variance of ADL across all the 8 countries included in that study.

Based on our study, age was linked to disability among individuals with heart disease in 10 of the 13 countries. Age is known to be positively associated with ADL limitation.61, 62

In almost all countries, number of medical comorbidities was associated with disability among individuals with heart disease. Chronic conditions such as heart disease and diabetes limit abilities to perform ADL.14, 15, 61 Individuals with diabetes are more likely to experience restrictions in ADL, along with reduced mobility and role functioning.64, 65 A recent study documented a significant correlation between the comorbidity score and all the measures of well-being among patients with ischemic heart disease. The comorbidity score was correlated with physical and mental quality of life, psychological distress, sleep quality, and dyadic adjustment. Authors emphasized that primary health care physicians, family physicians, and cardiologists have a major role in identifying and treating comorbid somatic conditions among patients with ischemic heart disease.12

According to a cross-country study, in all countries and with no exception, heart disease was associated with higher odds of poor subjective health, above and beyond the effect of age, gender, education, and income.3 This is in line with previous studies suggesting the role of heart disease on well-being, quality of life, and disability.4, 8 In a study, well-being was mostly affected by heart conditions, followed by asthma/chronic bronchitis, joint complaints, back problems, and diabetes.66 Another study suggested that heart diseases, musculoskeletal diseases, lung diseases, neurological disorders, diabetes, and cancer may have more influence on disability at the population level, compared to other conditions.67 Another study showed that patients with heart disease, as well as patients with hearing impairment, neurological disease, and vision impairment, report the highest levels of distress.68 A study also showed that after controlling the effect of age, sex, educational level, comorbidities, disability and pain, coronary artery disease and chronic hemodialysis were linked to the highest levels.
of depression.\textsuperscript{69} According to a cross-country study, heart disease was the only factor consistently associated with poor perceived health among individuals with diabetes.\textsuperscript{10} Only in two countries, female gender was associated with higher disability among elderly with heart disease. Women report lower levels of quality of life, whereas men have lower mortality.\textsuperscript{70, 71} In general, women report higher rates of chronic diseases\textsuperscript{16} and mental health-related conditions.\textsuperscript{16, 72}

The current study also documented cross-country differences in the association between education and income and ADL limitation among elderly with heart disease. Literature suggests that the education level maybe related to health and ADL.\textsuperscript{73-76}

The results of this study may have implications for cardiologists in different countries. Based on the current study, clinicians in different countries may need to consider different socioeconomic and behavioral factors to estimate or reduce disability (ADL limitation) among patients with heart disease. Based on our findings, locally designed health promotions may be superior to universal programs for patients with heart disease. In almost all countries, however, disability may be reduced if comorbid medical conditions are properly diagnosed and treated. That is, attention to comorbid conditions may be considered as a common component of disability prevention for patients with heart disease.

Similar to other studies, the current study is limited in several ways. Due to the cross-sectional design, causative inferences are implausible. Cross-country differences in the validity of ADL are not known. Health behaviors such as smoking, drinking, and exercise were measured using single items. Only a few comorbid medical conditions were included, and the type of conditions was not entered into the model.

\section*{Conclusion}

To conclude, there are major cross-country differences...
### Table 3. Cross-country differences in associations between socioeconomic factors and health behaviors among patients with heart disease

| Country     | Odds Ratio | 95% CI for Odds Ratio | P value | Odds Ratio | 95% CI for Odds Ratio | P value |
|-------------|------------|-----------------------|---------|------------|-----------------------|---------|
| **China**   |            |                       |         |            |                       |         |
| Age         | 1.102      | 1.091                 | <0.001  |            |                       |         |
| Female gender | 1.047      | 1.010                 | 0.726   |            |                       |         |
| Education   | 1.015      | 0.886                 | 0.831   |            |                       |         |
| Income      | 0.996      | 0.961                 | 0.805   |            |                       |         |
| Smoking     | 1.088      | 0.839                 | 0.525   |            |                       |         |
| Drinking    | 0.736      | 0.581                 | 0.011   |            |                       |         |
| Exercise    | 0.711      | 0.574                 | 0.002   |            |                       |         |
| Costa Rica  |            |                       |         |            |                       |         |
| Age         | 1.085      | 1.056                 | 1.114   |            |                       | <0.001  |
| Female gender | 0.929      | 0.484                 | 1.784   |            |                       | 0.825   |
| Education   | 0.874      | 0.578                 | 1.321   |            |                       | 0.523   |
| Income      | 0.888      | 0.797                 | 0.988   |            |                       | 0.030   |
| Smoking     | 1.281      | 0.721                 | 2.275   |            |                       | 0.398   |
| Drinking    | 0.628      | 0.339                 | 1.163   |            |                       | 0.139   |
| Exercise    | 0.515      | 0.250                 | 1.059   |            |                       | 0.071   |
| Puerto Rico |            |                       |         |            |                       |         |
| Age         | 1.014      | 0.991                 | 1.037   |            |                       | 0.245   |
| Female gender | 0.949      | 0.484                 | 1.419   |            |                       | 0.800   |
| Education   | 1.038      | 0.828                 | 1.302   |            |                       | 0.746   |
| Income      | 0.945      | 0.901                 | 0.992   |            |                       | 0.021   |
| Smoking     | 1.324      | 0.905                 | 1.938   |            |                       | 0.148   |
| Drinking    | 0.760      | 0.422                 | 1.370   |            |                       | 0.361   |
| Exercise    | 0.482      | 0.317                 | 0.733   |            |                       | 0.001   |
| Mexico      |            |                       |         |            |                       |         |
| Age         | 1.053      | 1.028                 | 1.079   |            |                       | <0.001  |
| Female gender | 1.800      | 1.095                 | 2.958   |            |                       | 0.020   |
| Education   | 0.714      | 0.541                 | 0.941   |            |                       | 0.017   |
| Income      | 1.031      | 0.973                 | 1.093   |            |                       | 0.299   |
| Smoking     | 1.077      | 0.683                 | 1.697   |            |                       | 0.750   |
| Drinking    | 1.145      | 0.744                 | 1.763   |            |                       | 0.538   |
| Exercise    | 0.605      | 0.335                 | 1.093   |            |                       | 0.096   |
| Barbados    |            |                       |         |            |                       |         |
| Age         | 1.110      | 1.055                 | 1.169   |            |                       | <0.001  |
| Female gender | 1.205      | 0.434                 | 3.346   |            |                       | 0.720   |
| Education   | 0.636      | 0.317                 | 1.276   |            |                       | 0.202   |
| Income      | 0.906      | 0.784                 | 1.048   |            |                       | 0.186   |
| Smoking     | 1.769      | 0.619                 | 5.058   |            |                       | 0.287   |
| Drinking    | 0.585      | 0.271                 | 2.005   |            |                       | 0.394   |
| Exercise    | 0.757      | 0.279                 | 2.058   |            |                       | 0.586   |
| Ghana       |            |                       |         |            |                       |         |
| Age         | 1.023      | 0.980                 | 1.068   |            |                       | 0.301   |
| Female gender | 1.269      | 0.490                 | 3.286   |            |                       | 0.623   |
| Education   | 0.717      | 0.483                 | 1.063   |            |                       | 0.097   |
| Income      | 0.982      | 0.918                 | 1.050   |            |                       | 0.589   |
| Smoking     | 1.418      | 0.482                 | 4.170   |            |                       | 0.526   |
| Drinking    | 1.274      | 0.531                 | 3.059   |            |                       | 0.587   |
| Exercise    | 0.601      | 0.251                 | 1.436   |            |                       | 0.252   |
| South Africa|            |                       |         |            |                       |         |
| Age         | 1.009      | 0.980                 | 1.038   |            |                       | 0.559   |
| Female gender | 1.718      | 0.934                 | 3.163   |            |                       | 0.082   |
| Education   | 1.018      | 0.849                 | 1.220   |            |                       | 0.849   |
| Income      | 0.998      | 0.970                 | 1.025   |            |                       | 0.860   |
| Smoking     | 0.710      | 0.331                 | 1.523   |            |                       | 0.379   |
| Drinking    | 1.635      | 0.698                 | 3.829   |            |                       | 0.257   |
| Exercise    | 1.714      | 0.671                 | 4.379   |            |                       | 0.260   |
Table 4. Cross-country differences in associations between socioeconomic factors, health behaviors, and medical conditions among patients with heart disease

| Country | Odds Ratio | Lower | Upper | P value |
|---------|------------|-------|-------|---------|
| China   |            |       |       |         |
| Age     | 1.108      | 1.097 | 1.119 | 0.000   |
| Female gender | 1.041 | 0.802 | 1.350 | 0.765   |
| Education | 1.032    | 0.897 | 1.187 | 0.659   |
| Income  | 1.000      | 0.965 | 1.035 | 0.987   |
| Smoking | 1.089      | 0.837 | 1.419 | 0.525   |
| Drinking | 0.749     | 0.589 | 0.953 | 0.018   |
| Exercise | 0.736     | 0.591 | 0.915 | 0.006   |
| Medical comorbidities | 0.957   | 0.902 | 1.014 | 0.137   |
| Costa Rica |         |       |       |         |
| Age     | 1.077      | 1.047 | 1.107 | 0.000   |
| Female gender | 0.811 | 0.411 | 1.599 | 0.545   |
| Education | 0.855    | 0.559 | 1.308 | 0.471   |
| Income  | 0.873      | 0.775 | 0.984 | 0.026   |
| Smoking | 1.044      | 0.571 | 1.911 | 0.888   |
| Drinking | 0.743     | 0.387 | 1.426 | 0.372   |
| Exercise | 0.599     | 0.287 | 1.250 | 0.172   |
| Medical comorbidities | 1.620   | 1.226 | 2.142 | 0.001   |
| Puerto Rico |         |       |       |         |
| Age     | 1.006      | 0.982 | 1.030 | 0.620   |
| Female gender | 0.858 | 0.567 | 1.300 | 0.470   |
| Education | 1.027    | 0.816 | 1.293 | 0.820   |
| Income  | 0.943      | 0.898 | 0.991 | 0.021   |
| Smoking | 1.041      | 0.464 | 1.530 | 0.573   |
| Exercise | 0.502     | 0.328 | 0.768 | 0.001   |
| Medical comorbidities | 1.576   | 1.285 | 1.932 | 0.900   |
| Mexico  |            |       |       |         |
| Age     | 1.044      | 1.018 | 1.070 | 0.000   |
| Female gender | 1.475 | 0.879 | 2.476 | 0.141   |
| Education | 0.680    | 0.512 | 0.904 | 0.008   |
| Income  | 1.040      | 0.980 | 1.040 | 0.194   |
| Smoking | 0.942      | 0.587 | 1.510 | 0.803   |
| Drinking | 1.009     | 0.644 | 1.581 | 0.968   |
| Exercise | 0.642     | 0.348 | 1.185 | 0.156   |
| Medical comorbidities | 2.070   | 1.611 | 2.661 | 0.000   |
| Barbados |          |       |       |         |
| Age     | 1.108      | 1.052 | 1.167 | 0.000   |
| Female gender | 1.123 | 0.397 | 3.181 | 0.826   |
| Education | 0.602    | 0.298 | 1.214 | 0.156   |
| Income  | 0.914      | 0.792 | 1.054 | 0.216   |
| Smoking | 1.647      | 0.560 | 4.841 | 0.364   |
| Drinking | 0.592     | 0.171 | 2.046 | 0.407   |
| Exercise | 0.841     | 0.305 | 2.316 | 0.738   |
| Medical comorbidities | 1.488   | 0.933 | 2.372 | 0.095   |
| Brazil  |            |       |       |         |
| Age     | 1.040      | 1.006 | 1.075 | 0.020   |
| Female gender | 0.911 | 0.498 | 1.667 | 0.763   |
| Education | 0.815    | 0.559 | 1.187 | 0.286   |
| Income  | 0.975      | 0.926 | 1.026 | 0.331   |
| Smoking | 1.413      | 0.801 | 2.493 | 0.232   |
| Drinking | 0.369     | 0.167 | 0.819 | 0.014   |
| Exercise | 0.425     | 0.180 | 1.008 | 0.052   |
| Medical comorbidities | 1.808   | 1.357 | 2.410 | 0.000   |
| Russia  |            |       |       |         |
| Age     | 1.055      | 1.014 | 1.099 | 0.009   |
| Female gender | 0.565 | 0.208 | 1.533 | 0.262   |
| Education | 0.586    | 0.355 | 0.966 | 0.036   |
| Income  | 1.012      | 0.882 | 1.160 | 0.869   |
| Smoking | 0.456      | 0.160 | 1.298 | 0.141   |
| Drinking | 0.915     | 0.432 | 1.935 | 0.816   |
| Exercise | 0.538     | 0.209 | 1.387 | 0.199   |
| Medical comorbidities | 1.686   | 1.245 | 2.284 | 0.001   |
in the determinants of disability among patients with heart disease. The findings advocate designing and implementing country-specific programs to reduce disability among patients with heart disease.

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