Original Article

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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Received 21 May 2014; Accepted 18 October 2014

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.*

J Teh Univ Heart Ctr 2015;10(1):24-33

This paper should be cited as: Assari S. Cross-Country Differences in the Additive Effects of Socioeconomics, Health Behaviors and Medical Comorbidities on Disability among Older Adults with Heart Disease. J Teh Univ Heart Ctr 2015;10(1):24-33.

Keywords: *Health • Socioeconomic factors • Activities of daily living • Health behavior • Cardiovascular diseases*

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Introduction

Functional limitation of patients with heart disease has been documented consistently by cross-sectional and longitudinal studies.[1, 2] 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.[3] 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.[3]

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.[4] 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.[5] Multiple aspects of the daily life of patients with heart disease may be influenced by the condition.[4] Heart disease may interfere with relationship, eating, and sexual activity of patients.[4] Heart disease may be accompanied with a wide range of symptoms (e.g. dyspnea, tiredness, and fatigue) leading to functional limitation.[6, 7] Patients with heart disease experience limitations in activities of daily living (ADL).[7] Impaired functional capacity and disturbing symptoms reduce health-related quality of life of patients with heart disease.[5, 8] 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.[9-12] Old age is associated with limitation in function and impaired well-being, physical, and mental health.[13, 14] Gender also influences perceived health, with women tending to report higher levels of disability and morbidity.[15, 16] Low socioeconomic status impairs health and well-being.[17, 18] Education and income, the most commonly accepted proxies of socioeconomic position,[19] are associated with subjective health, chronic disease, and mortality.[20-24] Individuals with high education and income commonly report better quality of life and function.[14]

Health behaviors also influence the well-being and disability of individuals.[10] Physical activity, drinking, and smoking influence well-being and disability.[25] Physical activity and exercise reduce the likelihood of health-related disability, especially during old age, and improve health-related quality of life.[26-30] Total time spent physically active is positively related to quality of life.[31-36] Drinking, smoking, and physically inactive life style carry individual risks to ADL, especially later in life.[37-40]

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.[41-51]

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.[3, 10-12] 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[13] 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.[52, 53]

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.[53] 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.[52, 53] 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.[52, 53] 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.[54]

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

Measures

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$).[55-57]

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.[54-56]

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).[54]

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.[58-60]

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.

Results

The socioeconomic factors of the participants in each country have been reported elsewhere.[3, 10-12, 52]

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, 63] 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

Table 2. Cross-country differences in associations between socioeconomic factors and disability among patients with heart disease

		95% CI for Odds Ratio				95% CI for Odds Ratio		
	Odds Ratio	Lower	Upper	P value	Odds Ratio	Lower	Upper	P value
China					Chile			
Age	1.096	1.086	1.105	< 0.001	Age 1.061	1.014	1.110	0.011
Female gender	1.133	0.908	1.414	0.270	Female gender 1.678	0.733	3.839	0.220
Education	0.954	0.836	1.088	0.481	Education 0.719	0.497	1.040	0.080
Income	1.001	0.967	1.036	0.957	Income 0.809	0.638	1.027	0.082
Costa Rica					Cuba			
Age	1.089	1.060	1.118	< 0.001	Age 1.070	1.035	1.106	< 0.001
Female gender	1.226	0.760	1.978	0.403	Female gender 1.159	0.544	2.470	0.702
Education	0.815	0.544	1.222	0.322	Education 0.849	0.578	1.248	0.406
Income	0.881	0.788	0.984	0.025	Income 0.953	0.858	1.058	0.367
Puerto Rico					Uruguay			
Age	1.023	1.000	1.046	0.050	Age 0.995	0.934	1.060	0.878
Female gender	0.971	0.677	1.392	0.872	Female gender 2.165	0.802	5.846	0.127
Education	0.971	0.778	1.214	0.798	Education 0.824	0.492	1.381	0.462
Income	0.934	0.890	0.980	0.006	Income 0.999	0.914	1.092	0.979
Mexico					India			
Age	1.055	1.030	1.081	< 0.001	Age 1.045	1.021	1.069	< 0.001
Female gender	1.755	1.153	2.672	0.009	Female gender 1.393	0.871	2.228	0.167
Education	0.729	0.555	0.957	0.023	Education 0.769	0.602	0.981	0.035
Income	1.028	0.973	1.086	0.323	Income 0.930	0.846	1.021	0.127
Barbados					Ghana			
Age	1.116	1.064	1.172	< 0.001	Age 1.023	0.980	1.067	0.301
Female gender	1.126	0.475	2.668	0.788	Female gender 1.150	0.486	2.718	0.750
Education	0.688	0.371	1.276	0.235	Education 0.742	0.502	1.095	0.133
Income	0.905	0.783	1.046	0.178	Income 0.981	0.911	1.056	0.603
Brazil					South Africa			
Age	1.056	1.024	1.089	< 0.001	Age 1.009	0.981	1.037	0.545
Female Gender	1.050	0.634	1.737	0.850	Female gender 1.698	0.947	3.045	0.076
Education	0.843	0.599	1.186	0.326	Education 1.002	0.840	1.195	0.986
Income	0.963	0.916	1.013	0.141	Income 0.997	0.970	1.025	0.838

of depression.[69]

According to a cross-country study, heart disease was the only factor consistently associated with poor perceived health among individuals with diabetes.[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.[70, 71] In general, women report higher rates of chronic diseases[16] and mental health-related conditions.[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.[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.

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

	95% CI for Odds Ratio					95% CI for Odds Ratio			
	Odds Ratio	Lower	Upper	P value		Odds Ratio	Lower	Upper	P value
China					Brazil				
Age	1.102	1.091	1.112	< 0.001	Age	1.053	1.020	1.087	0.001
Female gender	1.047	0.810	1.353	0.726	Female gender	1.027	0.576	1.833	0.927
Education	1.015	0.886	1.163	0.831	Education	0.847	0.587	1.222	0.376
Income	0.996	0.961	1.031	0.805	Income	0.979	0.933	1.027	0.385
Smoking	1.088	0.839	1.412	0.525	Smoking	1.408	0.814	2.436	0.221
Drinking	0.736	0.581	0.933	0.011	Drinking	0.347	0.159	0.757	0.008
Exercise	0.711	0.574	0.881	0.002	Exercise	0.389	0.166	0.908	0.029
Costa Rica					Chile				
Age	1.085	1.056	1.114	< 0.001	Age	1.062	1.012	1.114	0.014
Female gender	0.929	0.484	1.784	0.825	Female gender	1.267	0.521	3.079	0.601
Education	0.874	0.578	1.321	0.523	Education	0.707	0.482	1.038	0.076
Income	0.888	0.797	0.988	0.030	Income	0.804	0.634	1.020	0.072
Smoking	1.281	0.721	2.275	0.398	Smoking	1.328	0.617	2.856	0.468
Drinking	0.628	0.339	1.163	0.139	Drinking	0.276	0.113	0.678	0.005
Exercise	0.515	0.250	1.059	0.071	Exercise	0.946	0.358	2.499	0.911
Puerto Rico					Cuba				
Age	1.014	0.991	1.037	0.245	Age	1.071	1.035	1.109	< 0.001
Female gender	0.949	0.635	1.419	0.800	Female gender	1.197	0.510	2.810	0.680
Education	1.038	0.828	1.302	0.746	Education	0.872	0.589	1.291	0.494
Income	0.945	0.901	0.992	0.021	Income	0.945	0.851	1.050	0.294
Smoking	1.324	0.905	1.938	0.148	Smoking	1.540	0.835	2.839	0.167
Drinking	0.760	0.422	1.370	0.361	Drinking	0.593	0.200	1.755	0.345
Exercise	0.482	0.317	0.733	0.001	Exercise	0.367	0.154	0.873	0.023
Mexico					Uruguay				
Age	1.053	1.028	1.079	< 0.001	Age	0.996	0.932	1.065	0.913
Female gender	1.800	1.095	2.958	0.020	Female gender	0.973	0.311	3.044	0.962
Education	0.714	0.541	0.941	0.017	Education	0.850	0.490	1.474	0.563
Income	1.031	0.973	1.093	0.299	Income	1.021	0.927	1.123	0.677
Smoking	1.077	0.683	1.697	0.750	Smoking	0.623	0.247	1.570	0.315
Drinking	1.145	0.744	1.763	0.538	Drinking	0.222	0.066	0.749	0.015
Exercise	0.605	0.335	1.093	0.096	Exercise	0.455	0.086	2.395	0.353
Barbados					India				
Age	1.110	1.055	1.169	< 0.001	Age	1.037	1.012	1.063	0.003
Female gender	1.205	0.434	3.346	0.720	Female gender	1.205	0.682	2.129	0.521
Education	0.636	0.317	1.276	0.202	Education	0.744	0.579	0.957	0.021
Income	0.906	0.784	1.048	0.186	Income	0.932	0.850	1.021	0.130
Smoking	1.769	0.619	5.058	0.287	Smoking	1.156	0.711	1.880	0.560
Drinking	0.585	0.171	2.005	0.394	Drinking	0.734	0.377	1.430	0.364
Exercise	0.757	0.279	2.058	0.586	Exercise	0.607	0.341	1.081	0.090
Ghana					Russia				
Age	1.023	0.980	1.068	0.301	Age	1.067	1.026	1.110	0.001
Female gender	1.269	0.490	3.286	0.623	Female gender	0.734	0.289	1.864	0.515
Education	0.717	0.483	1.063	0.097	Education	0.601	0.369	0.980	0.041
Income	0.982	0.918	1.050	0.589	Income	1.015	0.892	1.156	0.819
Smoking	1.418	0.482	4.170	0.526	Smoking	0.574	0.216	1.527	0.266
Drinking	1.274	0.531	3.059	0.587	Drinking	0.932	0.448	1.940	0.851
Exercise	0.601	0.251	1.436	0.252	Exercise	0.543	0.218	1.347	0.188
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

	95% CI for Odds Ratio					95% CI for Odds Ratio			
	Odds Ratio	Lower	Upper	P value		Odds Ratio	Lower	Upper	P value
China					Chile				
Age	1.108	1.097	1.119	0.000	Age	1.063	1.010	1.118	0.018
Female gender	1.041	0.802	1.350	0.765	Female gender	1.087	0.424	2.789	0.862
Education	1.032	0.897	1.187	0.659	Education	0.668	0.452	0.989	0.044
Income	1.000	0.965	1.035	0.987	Income	0.794	0.603	1.046	0.102
Smoking	1.089	0.837	1.419	0.525	Smoking	1.091	0.481	2.477	0.834
Drinking	0.749	0.589	0.953	0.018	Drinking	0.354	0.138	0.908	0.031
Exercise	0.736	0.591	0.915	0.006	Exercise	0.970	0.346	2.717	0.953
Medical comorbidities	0.957	0.902	1.014	0.137	Medical comorbidities	2.171	1.400	3.366	0.001
Costa Rica					Cuba				
Age	1.077	1.047	1.107	0.000	Age	1.067	1.030	1.104	0.000
Female gender	0.811	0.411	1.599	0.545	Female gender	1.060	0.443	2.538	0.896
Education	0.855	0.559	1.308	0.471	Education	0.881	0.590	1.315	0.534
Income	0.873	0.775	0.984	0.026	Income	0.941	0.850	1.041	0.236
Smoking	1.044	0.571	1.911	0.888	Smoking	1.425	0.764	2.657	0.265
Drinking	0.743	0.387	1.426	0.372	Drinking	0.618	0.206	1.854	0.391
Exercise	0.599	0.287	1.250	0.172	Exercise	0.387	0.162	0.927	0.033
Medical comorbidities	1.620	1.226	2.142	0.001	Medical comorbidities	1.509	1.101	2.068	0.011
Puerto Rico					Uruguay				
Age	1.006	0.982	1.030	0.620	Age	0.990	0.921	1.064	0.792
Female gender	0.858	0.567	1.300	0.470	Female gender	0.664	0.193	2.287	0.517
Education	1.027	0.816	1.293	0.820	Education	1.030	0.561	1.893	0.923
Income	0.943	0.898	0.991	0.021	Income	1.012	0.907	1.130	0.826
Smoking	1.291	0.873	1.910	0.201	Smoking	0.474	0.169	1.327	0.155
Drinking	0.842	0.464	1.530	0.573	Drinking	0.193	0.054	0.697	0.012
Exercise	0.502	0.328	0.768	0.001	Exercise	0.465	0.070	3.089	0.428
Medical comorbidities	1.576	1.285	1.932	0.000	Medical comorbidities	3.823	2.082	7.020	0.000
Mexico					India				
Age	1.044	1.018	1.070	0.001	Age	1.035	1.010	1.061	0.006
Female gender	1.475	0.879	2.476	0.141	Female gender	1.132	0.634	2.022	0.674
Education	0.680	0.512	0.904	0.008	Education	0.740	0.574	0.953	0.020
Income	1.040	0.980	1.104	0.194	Income	0.936	0.858	1.022	0.141
Smoking	0.942	0.587	1.510	0.803	Smoking	1.113	0.680	1.821	0.671
Drinking	1.009	0.644	1.581	0.968	Drinking	0.708	0.360	1.391	0.316
Exercise	0.642	0.348	1.185	0.156	Exercise	0.623	0.347	1.116	0.112
Medical comorbidities	2.070	1.611	2.661	0.000	Medical comorbidities	1.434	1.128	1.825	0.003
Barbados					Ghana				
Age	1.108	1.052	1.167	0.000	Age	1.023	0.979	1.068	0.307
Female gender	1.123	0.397	3.181	0.826	Female gender	1.306	0.501	3.409	0.585
Education	0.602	0.298	1.214	0.156	Education	0.736	0.494	1.098	0.133
Income	0.914	0.792	1.054	0.216	Income	0.982	0.922	1.047	0.582
Smoking	1.647	0.560	4.841	0.364	Smoking	1.398	0.473	4.135	0.545
Drinking	0.592	0.171	2.046	0.407	Drinking	1.390	0.568	3.404	0.471
Exercise	0.841	0.305	2.316	0.738	Exercise	0.581	0.241	1.401	0.227
Medical comorbidities	1.488	0.933	2.372	0.095	Medical comorbidities	1.297	0.799	2.106	0.294
Brazil					South Africa				
Age	1.040	1.006	1.075	0.020	Age	1.009	0.980	1.039	0.541
Female gender	0.911	0.498	1.667	0.763	Female gender	1.580	0.848	2.944	0.150
Education	0.815	0.559	1.187	0.286	Education	1.017	0.845	1.223	0.860
Income	0.975	0.926	1.026	0.331	Income	0.998	0.972	1.026	0.902
Smoking	1.413	0.801	2.493	0.232	Smoking	0.649	0.300	1.404	0.272
Drinking	0.369	0.167	0.819	0.014	Drinking	1.666	0.707	3.928	0.243
Exercise	0.425	0.180	1.008	0.052	Exercise	1.738	0.670	4.508	0.256
Medical comorbidities	1.808	1.357	2.410	0.000	Medical comorbidities	1.433	1.081	1.899	0.012
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.

Acknowledgements

The publication of this manuscript was made possible by a joint Postdoctoral Fellowship Fund awarded by Department of Psychiatry and the Center for Research on Ethnicity, Culture, and Health, University of Michigan to Shervin Assari. Public data of the Research on Early Life and Aging Trends and Effects (RELATE), available at the Interuniversity Consortium for Political and Social Research (ICPSR), Institute for Social Research, University of Michigan, was used. The RELATE was funded by the United States Department of Health and Human Services, the National Institutes of Health, and the National Institute on Aging (K25AG027239). Full details of the funding sources for each of the country-specific studies are available in the appendices for the RELATE data. Although this paper is the result of original work by the author, the author has not contributed to the collection of the data presented here.

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