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Does Multi-morbidity Mediate the Effect of Socioeconomics on Self-rated Health? Cross-country Differences

Shervin Assari[1,2], Maryam Moghani Lankarani[1,2]

[1]Department of Psychiatry, School of Medicine, [2]Center for Research on Ethnicity, Culture and Health, School of Public Health, University of Michigan, Michigan, USA

Correspondence to:
Dr. Shervin Assari, Department of Psychiatry, School of Medicine, Michigan, 4250 Plymouth Rd., Ann Arbor, MI 48109-2700, USA. E-mail: assari@umich.edu

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ABSTRACT

Background: This study explored cross-country differences in how multi-morbidity explains the effects of socioeconomic characteristics on self-rated health.

Methods: The study borrowed data from the Research on Early Life and Aging Trends and Effects. Participants were 44,530 individuals (age >65 years) who were sampled from 15 countries (i.e. United States, China, India, Russia, Costa Rica, Puerto Rico, Mexico, Argentina, Barbados, Brazil, Chile, Cuba, Uruguay, Ghana and South Africa). Multi-morbidity was measured as number of chronic medical conditions. In Model I, main effects of socioeconomic factors on self-rated health were calculated using country-specific logistic regressions. In Model II, number of chronic conditions were also added to the models to find changes in coefficients for demographic and socioeconomic factors.

Results: In the United States, number of chronic medical conditions explained the effect of income on subjective health. In Puerto Rico, number of chronic medical conditions explained the effect of marital status on subjective health. In Costa Rica, Argentina, Barbados, Cuba, and Uruguay, number of chronic medical conditions explained gender disparities in subjective health. In China, Mexico, Brazil, Russia, Chile, India, Ghana and South Africa, number of chronic medical conditions did not explain the effect of demographic or socioeconomic factors on subjective health.

Conclusions: Multi-morbidity explains the effect of demographic and socioeconomic factors on subjective health in some but not other countries. Further research is needed.

Keywords: Chronic medical conditions, physical health, sociodemographics, subjective health

INTRODUCTION

Research has consistently shown cross-country differences in subjective and objective measures of health and well-being.[1-6] World Values Survey, European Values Study, Eurobarometer, and Latino-barometer, have shown self-rated health, physical health, life expectancy, and all-cause mortality vary across countries.[7-10] What is, however, not known is cross-country differences in factors that influence health and well-being.

Socioeconomic status (SES) is associated with health and well-being.[11] High social status provides multiple benefits for individuals through a higher access to financial and material resources.[12] Unfortunately, most of our knowledge about the mechanisms of the effects of SES on health and well-being has originated from

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studies conducted within a single country,[13,14] thus cross-country comparison of mechanisms for the effects of SES on health is still needed.[15-18]

Gender is a demographic and social factor with major implications for health and well-being.[19] Compared to men, women tend to report a higher number of chronic conditions and also poorer self-reported health.[19,20] Pinquart and Sörensen listed four reasons for gender differences in subjective measures of health. First, women may have lower material resources due to gender inequities and gendered social power. Gendered labor market may result in lower stable employment among women.[11] Among those in the labor market, women's pensions are lower than men's.[21,22] Women more frequently live in poverty than older men.[23] Women also have lower access to health care resources while also requiring more care in later life than men.[24] Due to gender difference in longevity, a larger part of women's life is spent with illness and disabilities.[25] Third, older women are more likely to be widowed than older men.[23] In the United States, nearly four times as many older women than men live alone.[24] Finally, due to gender differences in response sets, women may have a higher tendency to report negative feelings and emotions.[26]

Multi-morbidity - defined as multiple chronic medical conditions-is an important predictor of subjective health,[11] as people with higher number of chronic medical conditions report lower physical and mental health-related quality of life (HRQL).[27-29] In one study, chronic medical conditions had a consistent dose-dependent effect on all aspects of well-being, namely physical functioning, role limitation due to physical health problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional problems and mental health.[30] Another study in the United States showed that any additional chronic medical condition leads to 3–4 decrements of mental quality of life decline.[31] Another study among 21,133 showed an association between the presence of one chronic condition and lower well-being across all subjective health domains including physical function, fatigue, pain, emotional distress, and social function. The presence of two or more morbidities was associated with a larger decrement in HRQL, compared to a single condition.[32] Another large study of adults showed that after adjustments for SES, and health behaviors (i.e., smoking, alcohol consumption, and physical activity), people with 3 or more chronic medical conditions are more likely to report poor general health, mental distress, physical distress, and activity limitations compared to individuals who have one or two chronic conditions.[33,34]

Despite our knowledge about cross-country differences in health and well-being,[7-10] it is not clear if countries are also different in the mechanisms by which demographic (i.e., age and gender), and socioeconomic (e.g., income and education) influence health, and if chronic medical conditions explain some of health disparities associated with low SES.[1-6] Research on Early Life and Aging Trends and Effects (RELATE) has provided a unique opportunity for cross-country studies on socioeconomic, chronic medical conditions and subjective health among the elderly. The RELATE is a cross-national survey in 15 countries located in North America, South America, Asia, and Africa.[35,36]

Using RELATE data, this study compared 15 countries for the mediating effect of multi-morbidity (defined as number of chronic medical conditions) on the effects of demographic and socioeconomic characteristics on self rated health.

METHODS

Study design and participants

Data came from the RELATE, a study composed of the following national surveys: (1) China Health and Nutrition Study (CHNS), (2) Chinese Longitudinal Healthy Longevity Survey, (3) Costa Rican Study of Longevity and Healthy Aging, (4) Puerto Rican Elderly: Health Conditions, (5) Study of Aging Survey on Health and Well-being of Elders, (6) WHO Study on Global Ageing and Adult Health, and (7) Wisconsin Longitudinal Study.[35,36]

We included 44,530 elderly individuals (age >65 years). Participants were sampled in the following 15 countries: Puerto Rico (n = 3,102, 7.0%), Costa Rica (n = 2,374, 5.3%), China (n = 2,2034, 49.5%), India (n = 2069, 4.6%), Mexico (n = 2,031, 4.6%), Ghana (n = 1,923, 4.3%), Russia (n = 1,860, 4.2%), Brazil (n = 1633, 3.7%), Cuba (n = 1,345, 3.0%), South Africa (n = 1,333, 3.0%) Barbados (n = 1,160, 2.6%), Uruguay (n = 1,066, 2.4%), Chile (n = 958, 2.2%), United States (n = 894, 2.0%), Argentina (n = 748, 1.7%).

From the participating countries, Barbados, Puerto Rico and the United States represent high-income countries; Argentina, Cuba, Uruguay, Chile, Costa Rica, Brazil, Mexico, and Russia represent upper middle-income countries; China and India represent lower middle-income countries; and Ghana represents a low-income country. Thus, the RELATE project represented countries from a diverse range in national income levels.

Measures

Demographic characteristics

The study collected data on age (continuous variable) and gender (dichotomous variable).

Socioeconomic characteristics

The study also measured the following socioeconomic factors: Education level (four-level categorical variable of no schooling, primary to elementary, secondary to intermediate, and higher), household income (continuous variable), and marital status (dichotomous variable of married and other statuses).

Multi-morbidity

We measured multi-morbidity as number of chronic medical conditions. Chronic medical conditions were measured based on self-reported physician diagnosis of seven conditions (i.e., hypertension, cancer, pulmonary disease, heart disease, diabetes, stroke, and arthritis). The multi-morbidity score potentially ranged from 0 to 7, with a higher score indicative of the higher number of chronic medical conditions. The agreement between self-report and physician diagnosis of chronic medical conditions has been shown to be high (kappa: 0.74–0.92).[37]

Main outcome

The outcome was subjective health (self-rated health), which was measured using a single-item. Although it was measured using a five Likert scale (i.e., very bad health, bad, moderate, good, very good), we collapsed the scale to a dichotomous outcome: Poor health (very bad health, bad health) versus good health (moderate health, good health, very good health).

Single-item measures of subjective health and well-being have been frequently used and are well accepted.[38-46] Test-retest reliability for single-item is high for brief time intervals, with a range from 0.7 to 0.8.[42] Validation studies have consistently shown surprisingly high correlations between single-item indicators and multi-item measures of perceived health.[42] Single-item measures of self-rated health also have high predictive validity for mortality above and beyond traditional risk factors.[47]

Data analysis

Statistical analysis was conducted using SPSS 20.0 for Windows (IBM Inc. Armonk, NY). We used country-specific logistic regressions to determine if the effects of demographic (i.e., age and gender) and socioeconomic (i.e., education, income, and marital status) factors vary across countries or not.

We also tested if number of chronic medical conditions differently explains the links between demographic and socioeconomic factors and subjective health. Although most country-specific surveys had sampling weights, the current study did not apply sampling weights, because sampling weights were not applicable to data from United States (Wisconsin) and China (CHNS).

Mediation analysis

For this purpose, we used hierarchical regression approach. In Model I, only demographic and socioeconomic factors were included. In Model II, we also entered number of chronic physical conditions. Changes in the regression coefficients of demographic and socioeconomic factors from significant to nonsignificant association was defined as full mediation.[48]

RESULTS

Table 1 shows that mean age, education, income, and number of chronic medical conditions were significantly different across countries.

Model I

Based on Model I, high age was associated with better subjective health in China, Costa Rica and Argentina. High age was associated with poor subjective health in Barbados, India, South Africa and Russia. Age and subjective health were not significantly associated In Puerto Rico, United States, Mexico, Brazil, Chile, Cuba and Uruguay [Table 2].

Female gender was associated with worse subjective health in China, Costa Rica, Puerto Rico, Barbados, Cuba and Uruguay. Gender was not associated with subjective health in other countries [Table 2].

In the US, Ghana and South Africa, education was not associated with subjective health High education was associated with high subjective health in all other countries [Table 2].

Surprisingly, high income was associated with poor subjective health in Ghana. In Argentina, Chile, Cuba, Uruguay and South Africa, income was not associated with subjective health. In other countries, high-income was associated with better subjective health [Table 2].

Being currently married was associated with better subjective health in Mexico. Being currently married was associated with worse subjective health in Costa Rica, Puerto Rico, and Brazil. Marital status was not associated with subjective health in other countries [Table 2].

Model II

The number of chronic conditions explained the association between gender and subjective health in Costa Rica, Argentina, Barbados, Cuba, Uruguay. In these 5 countries, the significant association between gender and subjective health became nonsignificant after introducing the number of chronic conditions to the model [Table 3].

In the US, number of chronic conditions explained the association between income and subjective health. That said, the association between income and subjective health that was significant in the previous model did not remain significant after entering number of conditions to the model [Table 3].

In Puerto Rico, number of conditions explained the association between marital status and subjective health. That said, the association between marital status and

Table 1: Comparison of demographic and socioeconomic factors among participants in each country

	China	Costa Rica	Puerto Rico	United States	Mexico	Argentina	Barbados	Brazil	Chile	Cuba	Uruguay	India	Ghana	South Africa	Russia	*P**
Age	82.99 (11.74)	78.94 (9.11)	76.25 (7.72)	66.15 (0.52)	74.78 (6.83)	73.96 (6.01)	75.54 (7.01)	76.63 (6.77)	74.84 (6.81)	75.99 (7.5)	73.96 (6.15)	73.39 (6.12)	75.05 (7.22)	73.81 (6.52)	74.32 (5.98)	<0.001
Education	1.55 (0.86)	1.94 (0.75)	2.55 (0.93)	0.78 (2.06)	1.83 (0.98)	2.53 (0.76)	2.15 (0.63)	1.74 (0.75)	2.05 (1)	2.34 (0.73)	2.3 (0.92)	1.48 (1.15)	1.31 (1.1)	1.59 (1.46)	2.99 (0.72)	<0.001
Income	5.02 (9.07)	0.5 (1.25)	5.96 (9.34)	24.54 (35.92)	12.02 (32.9)	3.13 (5.35)	9.49 (32.48)	3.83 (7.68)	280.04 (261.74)	1.48 (5.71)	44.07 (74.19)	16.37 (43.11)	148.51 (259.31)	11.96 (38.87)	67.91 (51.78)	<0.001
Number of CMCs	0.93 (1.57)	0.82 (0.91)	1.22 (1.02)	1.15 (1.02)	0.88 (0.9)	1.11 (0.91)	0.98 (0.9)	1.02 (0.98)	1.07 (0.96)	1.28 (1.04)	1.05 (0.94)	0.66 (0.89)	0.47 (0.73)	0.83 (0.96)	2 (1.27)	<0.001

*ANOVA. CMCs=Chronic medical conditions

subjective health that was significant in the absence of number of chronic conditions in the previous model did not stay significant after entering this variable to the model. Interestingly, after entering number of conditions to the model, the nonsignificant association between age and subjective health became statistically significant. This finding suggests that number of conditions may have a suppressor effect on age – subjective health association [Table 3].

In China, Mexico, Brazil, Russia, Chile, India, Ghana, and South Africa, number of chronic medical conditions did not fully explain the associations between demographic and SES and subjective health. In other words, in these countries, the associations between demographic and SES factors and subjective health were above and beyond number of chronic medical conditions [Table 3].

DISCUSSION

This study documented major cross-country differences in the role of multi-morbidity – defined as number of chronic medical conditions - in explaining the associations between demographic and socioeconomic characteristics and subjective health. In Costa Rica, Argentina, Barbados, Cuba, and Uruguay, number of chronic medical conditions explain the association between gender and subjective health. In the United States number of chronic medical conditions explained the association between income and subjective health. In Puerto Rico, they explain the association between marital status and subjective health. In China, Mexico, Brazil, Russia, Chile, India, Ghana and South Africa, number of conditions do not explain the associations between SES and subjective health. These findings suggest that mechanisms for the effects of demographic and socioeconomic factors on self rated health may vary across countries.

Women reported worse self rated health only in six countries (i.e. China, Costa Rica, Puerto Rico, Barbados, Cuba and Uruguay), and in Costa Rica, Argentina, Barbados, Cuba, and Uruguay, chronic conditions explained such an association. Literature has consistently shown gender differences in health and well-being.[19] Although some researchers have attributed the effect of gender on perceived health to income,[21-23] and marital status,[23,24] the effect of gender on self rated health was above and beyond these SES factors in our study. Research has shown that women report higher number of chronic conditions and poorer health,[19] and we found that higher rate of multi-morbidity may be the reason female gender is associated with poor self-rated health, at least in some countries in South America.

Multi-morbidity had a suppressor effect on the association between age and self rated health in Puerto Rico. That is, only after controlling for number of chronic conditions, the association between age and self rated health became significant. This finding has important implications for future research on age effect on subjective health in Puerto Rico. The inclusion of a suppressor to a regression equation is known to enhances the relationship between subjective health and age in this country by removing the unwanted variance from the predictor variable.[49] In other words, in Puerto Rico, studies that wish to test the association between age and well-being need to control for number of conditions not as a mediator, but as a suppressor.

With an exception of only three countries (i.e. United States, Ghana and South Africa), education was associated with a better subjective health. United States, Ghana, and South Africa were the three countries where education did not independently predict self rated health. In some countries, the effect of education on health and well-being may be due to income or marital status,[50] which were both controlled in our study.

In nine countries including the United States, high income was associated with better self rated health. Surprisingly, high income was found to be associated with poor subjective health in Ghana. In five other countries, income was not associated with self rated health. Why income does not have a protective effect on perceived health in Ghana, Argentina, Chile, Cuba, Uruguay, and South Africa needs more research.

Table 2: Results of model I on the associations between demographics and socioeconomics and self-rated health

	B	SE	OR	95% CI for OR	
				Lower	Upper
China					
Age	−0.020	0.002	0.981	0.977	0.984
Female	0.129	0.040	10.138	10.052	10.231
Currently married	0.070	0.044	10.072	0.984	10.168
Education level	−0.250	0.026	0.779	0.741	0.819
Income	−0.022	0.003	0.979	0.972	0.985
Costa Rica					
Age	−0.014	0.005	0.986	0.976	0.997
Female	0.193	0.098	10.213	10.001	10.469
Currently married	0.255	0.104	10.290	10.052	10.582
Education level	−0.351	0.072	0.704	0.611	0.811
Income	−0.141	0.064	0.869	0.766	0.986
Puerto Rico					
Age	−0.007	0.007	0.993	0.980	10.006
Female	0.492	0.101	10.636	10.343	10.993
Currently married	0.239	0.106	10.270	10.032	10.564
Education level	−0.490	0.058	0.612	0.546	0.687
Income	−0.023	0.007	0.977	0.964	0.991
United States					
Age	0.031	0.277	10.032	0.599	10.776
Female	0.111	0.337	10.117	0.577	20.164
Currently married	−0.516	0.361	0.597	0.294	10.212
Education level	−0.726	0.627	0.484	0.142	10.654
Income	−0.020	0.010	0.980	0.961	10.000
Mexico					
Age	−0.003	0.008	0.997	0.981	10.012
Female	0.052	0.111	10.054	0.848	10.310
Currently married	−0.194	0.110	0.824	0.663	10.023
Education level	−0.261	0.066	0.770	0.676	0.878
Income	−0.011	0.003	0.989	0.983	0.996
Argentina					
Age	−0.036	0.015	0.964	0.936	0.994
Female	0.382	0.197	10.466	0.996	20.156
Currently married	0.026	0.191	10.026	0.705	10.493
Education level	−0.725	0.126	0.484	0.378	0.620
Income	−0.029	0.023	0.971	0.928	10.016
Barbados					
Age	0.029	0.010	10.030	10.010	10.050
Female	0.374	0.145	10.453	10.094	10.931
Currently married	−0.185	0.154	0.831	0.614	10.124
Education level	−0.315	0.117	0.730	0.581	0.918
Income	−0.005	0.003	0.995	0.990	10.000
Brazil					
Age	−0.002	0.008	0.998	0.983	10.014
Female	0.142	0.115	10.153	0.920	10.444
Currently married	0.334	0.115	10.397	10.114	10.752
Education level	−0.196	0.073	0.822	0.713	0.948
Income	−0.035	0.009	0.965	0.949	0.982
Chile					
Age	0.001	0.011	10.001	0.980	10.022
Female	0.185	0.160	10.203	0.879	10.648
Currently married	−0.110	0.161	0.896	0.653	10.228
Education level	−0.295	0.075	0.744	0.643	0.862
Income	0.000	0.000	10.000	0.999	10.000
Cuba					
Age	−0.010	0.009	0.990	0.972	10.008
Female	0.456	0.141	10.577	10.197	20.078
Currently married	0.087	0.149	10.091	0.815	10.461
Education level	−0.265	0.091	0.767	0.642	0.917
Income	−0.018	0.012	0.982	0.960	10.005
Uruguay					
Age	0.013	0.011	10.013	0.990	10.035
Female	0.341	0.158	10.406	10.032	10.916
Currently married	0.102	0.154	10.107	0.818	10.498
Education level	−0.467	0.084	0.627	0.532	0.738
Income	0.000	0.001	10.000	0.998	10.002
India					
Age	0.042	0.008	10.043	10.026	10.060
Female	0.048	0.124	10.049	0.822	10.339
Currently married	−0.057	0.121	0.945	0.745	10.198
Education level	−0.223	0.069	0.800	0.699	0.917
Income	−0.009	0.003	0.991	0.985	0.996
Ghana					
Age	0.053	0.009	10.054	10.036	10.073
Female	0.118	0.180	10.126	0.790	10.603
Currently married	−0.104	0.179	0.902	0.635	10.280
Education level	−0.111	0.082	0.895	0.761	10.051
Income	0.001	0.000	10.001	10.000	10.001
South Africa					
Age	0.034	0.012	10.035	10.012	10.059
Female	0.188	0.196	10.206	0.822	10.771
Currently married	−0.093	0.192	0.911	0.626	10.327
Education level	−0.036	0.057	0.965	0.864	10.078
Income	−0.008	0.005	0.992	0.983	10.002
Russia					
Age	0.056	0.011	10.058	10.035	10.080
Female	0.234	0.143	10.263	0.954	10.672
Currently married	−0.178	0.137	0.837	0.640	10.094
Education level	−0.253	0.086	0.776	0.656	0.918
Income	−0.003	0.001	0.997	0.994	0.999

CI=Confidence interval, OR=Odds ratio, SE=Standard error

Age, gender, income, education, chronic medical conditions, and perceived health have complex inter-relations, and these links may vary based on country. Dynamics of social power associated with age, gender, income, education vary from one to another country. The degree by which income, education, gender, age, and other demographic and social

Table 3: Results of Model II on the associations between demographics, socioeconomics, and number of chronic medical conditions and self-rated health

	B	SE	OR	95% CI for OR	
				Lower	Upper
China					
Age	−0.010	0.002	0.990	0.986	0.994
Female	0.141	0.043	1.151	1.057	1.254
Currently married	0.066	0.048	1.069	0.973	1.173
Education level	−0.217	0.029	0.805	0.760	0.852
Income	−0.020	0.004	0.980	0.973	0.987
Number of CMCs	0.136	0.011	1.146	1.122	1.171
Costa Rica					
Age	−0.013	0.006	0.987	0.976	0.998
Female	0.079	0.102	1.082	0.886	1.322
Currently married	0.221	0.108	1.247	1.009	1.540
Education level	−0.375	0.075	0.687	0.593	0.797
Income	−0.123	0.062	0.884	0.782	0.999
Number of CMCs	0.440	0.054	1.552	1.396	1.726
Puerto Rico					
Age	−0.015	0.007	0.985	0.972	0.999
Female	0.327	0.106	1.386	1.125	1.708
Currently married	0.155	0.112	1.168	0.938	1.453
Education level	−0.487	0.062	0.615	0.544	0.694
Income	−0.024	0.007	0.977	0.963	0.991
Number of CMCs	0.802	0.058	2.230	1.992	2.496
United States					
Age	0.220	0.281	1.246	0.718	2.163
Female	−0.090	0.453	0.914	0.376	2.221
Currently married	−0.272	0.483	0.762	0.296	1.964
Education level	−0.941	1.061	0.390	0.049	3.125
Income	−0.018	0.015	0.983	0.955	1.011
Number of CMCs	0.667	0.187	1.949	1.352	2.808
Mexico					
Age	−0.006	0.008	0.994	0.979	1.010
Female	−0.023	0.113	0.977	0.783	1.220
Currently married	−0.194	0.112	0.824	0.662	1.025
Education level	−0.269	0.067	0.764	0.669	0.872
Income	−0.011	0.003	0.990	0.983	0.996
Number of CMCs	0.242	0.057	1.274	1.140	1.424
Argentina					
Age	−0.037	0.016	0.963	0.933	0.995
Female	0.241	0.212	1.273	0.839	1.930
Currently married	0.026	0.207	1.027	0.685	1.540
Education level	−0.658	0.133	0.518	0.399	0.671
Income	−0.044	0.028	0.957	0.906	1.011
Number of CMCs	0.888	0.110	2.431	1.959	3.018
Barbados					
Age	0.030	0.011	1.031	1.009	1.052
Female	0.151	0.156	1.163	0.856	1.579
Currently married	−0.158	0.165	0.854	0.618	1.179
Education level	−0.301	0.125	0.740	0.579	0.946
Income	−0.005	0.003	0.995	0.990	1.001
Number of CMCs	0.825	0.091	2.281	1.908	2.727
Brazil					
Age	−0.003	0.008	0.997	0.981	1.014
Female	0.032	0.122	1.032	0.812	1.311
Currently married	0.305	0.122	1.357	1.068	1.723
Education level	−0.213	0.077	0.808	0.695	0.940
Income	−0.035	0.009	0.966	0.949	0.983
Number of CMCs	0.656	0.062	1.927	1.707	2.175
Chile					
Age	0.008	0.011	0.992	0.971	1.014
Female	0.015	0.168	1.015	0.731	1.411
Currently married	−0.099	0.167	0.906	0.653	1.258
Education level	−0.310	0.077	0.734	0.631	0.854
Income	0.000	0.000	1.000	0.999	1.001
Number of CMCs	0.665	0.089	1.944	1.633	2.314
Cuba					
Age	−0.013	0.010	0.987	0.968	1.006
Female	0.051	0.154	1.052	0.779	1.422
Currently married	0.004	0.159	1.004	0.734	1.372
Education level	−0.275	0.097	0.759	0.628	0.918
Income	−0.018	0.015	0.982	0.954	1.012
Number of CMCs	0.924	0.082	2.519	2.145	2.958
Uruguay					
Age	0.009	0.012	1.009	0.985	1.034
Female	0.112	0.174	1.118	0.795	1.574
Currently married	−0.063	0.170	0.939	0.673	1.310
Education level	−0.493	0.090	0.611	0.512	0.729
Income	0.000	0.001	1.000	0.997	1.002
Number of CMCs	0.963	0.089	2.620	2.200	3.119
India					
Age	0.041	0.008	1.042	1.025	1.059
Female	0.010	0.125	1.010	0.790	1.291
Currently married	−0.075	0.122	0.928	0.730	1.178
Education level	−0.298	0.072	0.742	0.645	0.854
Income	−0.010	0.003	0.990	0.984	0.996
Number of CMCs	0.345	0.058	1.413	1.260	1.584
Ghana					
Age	0.053	0.009	1.054	1.036	1.073
Female	0.068	0.182	1.070	0.749	1.530
Currently married	−0.118	0.179	0.889	0.625	1.263
Education level	−0.131	0.083	0.877	0.745	1.032
Income	0.001	0.000	1.001	1.000	1.001
Number of CMCs	0.160	0.085	1.173	0.992	1.387
South Africa					
Age	0.040	0.012	1.041	1.016	1.065
Female	0.060	0.206	1.062	0.709	1.590
Currently married	−0.172	0.201	0.842	0.568	1.248
Education level	−0.062	0.059	0.940	0.838	1.055
Income	−0.008	0.005	0.992	0.982	1.002
Number of CMCs	0.458	0.081	1.580	1.348	1.853

Contd...

Contd...

Table 3: Contd...

	B	SE	OR	95% CI for OR	
				Lower	Upper
Russia					
Age	0.053	0.011	1.055	1.032	1.078
Female	0.072	0.152	1.074	0.798	1.447
Currently married	−0.126	0.144	0.882	0.664	1.171
Education level	−0.290	0.091	0.748	0.626	0.894
Income	−0.005	0.002	0.995	0.992	0.998
Number of CMCs	0.561	0.054	1.753	1.576	1.949

CI=Confidence interval, OR=Odds ratio, SE=Standard error

factors shape populations' access to resources may vary from one to another country. Thus, countries may differ on how social and health factors confound, mediate, or suppress the effects of demographic and socioeconomic factors on health and well-being. There is empirical evidence suggesting that the complex inter-relation between socioeconomics, chronic medical conditions, and subjective health vary across countries.[16-18,46]

Interestingly, number of chronic medical conditions did not fully explain the effect of age on subjective health in any of the 15 countries. Age and subjective health were differently linked across countries, as well. In three countries (i.e. China, Costa Rica and Argentina), high age was associated with better subjective health, while in four countries (i.e. Barbados, India, South Africa and Russia), high age was associated with low subjective health. Interestingly, in seven other countries (i.e. Puerto Rico, United States, Mexico, Brazil, Chile, Cuba and Uruguay), there was no linear association between age and subjective health. There are studies reporting a positive net effect of age on well-being among the elderly.[51,52]

The number of chronic medical conditions explained the association between marital status and subjective health in Puerto Rico. Being currently married was associated with better subjective health in Mexico. The same status was linked to worse subjective health in three other countries (i.e. Costa Rica, Puerto Rico, and Brazil). Marital status was not associated with subjective health in the other 11 countries. The two main hypotheses explaining health effects of marital status are marriage protection and marriage selection.[53-55] None of these theories, however, have hypothesized being married as a risk factor for health. More research is needed to find out why married people do worse in Costa Rica, Puerto Rico, and Brazil.

Limitations

There are a number of limitations to consider. First, the study was a cross-sectional study, and causative associations are not plausible. In addition, cross – country differences in the validity of chronic medical conditions measurement and even subjective health cannot be ruled out. The study did not measure mental health as a predictor of self-rated health. Exclusion of individuals with a mental disorder limits generalizability of the findings to the populations. The study also ignores the type of chronic conditions, as only number of conditions were included in the models.

CONCLUSIONS

To conclude, our study suggests cross-country differences in the way number of chronic medical conditions may explain the effects of demographic and socioeconomic factors on subjective health.

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