Disparities in mortality rates from aortic aneurysm and dissection by country-level income status and sex

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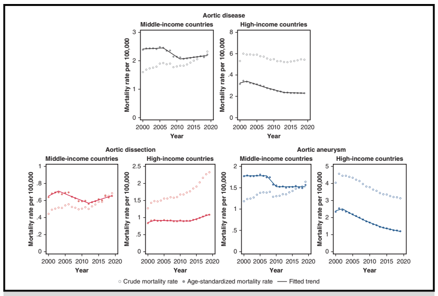
ABSTRACT

Objective: To investigate the impact of national income level and sex on mortality trends from aortic aneurysm and dissection in addition to all aortic disease as a whole.

Methods: Using data from the World Health Organization mortality database, we conducted an analysis of mortality trends from aortic disease between 2000 and 2019, Countries were categorized into middle-income and high-income countries (MICs and HICs) on the basis of income level. Age-standardized and sex-specific age-standardized mortality rates per 100,000 persons, along with male-to-female mortality ratios, were calculated. Trends over the study period were analyzed using joinpoint regression.

Results: Our analysis comprised 29 MICs and 46 HICs, with an average population of 595 million and 1042 million during the observation period. During the observation period, age-standardized mortality rates from aortic disease decreased to 2.21 (2.17-2.25) and 2.28 (2.26-2.30) in MICs and HICs, respectively (average annual percentage change of −0.5% in MICs and −1.8% in HICs, $P < .05$ for both). However, mortality rates from aortic dissection increased in HICs from 2000 to 2019 (average annual percentage change of 1.3%, $P < .001$). Mortality from aortic disease, aortic dissection, and aortic aneurysm were male dominant in MICs and HICs but decreasing trends during the observation periods except for aortic dissection in MICs.

Conclusions: We present the contemporary and comprehensive analysis of global socioeconomic status and aortic diseases mortality. Although trends of mortality from aortic diseases are on the decline in both MICs and HICs, there is a striking increase in mortality for aortic dissection, specifically in HICs. (JTCVS Open 2024;21:224-38)



Crude and age-standardized mortality rates from aortic disease by country income levels.

CENTRAL MESSAGE

From 2000 to 2019, mortality from all aortic diseases decreased globally in both middle- and high-income countries. However, mortality from aortic dissection increased in high-income countries.

PERSPECTIVE

In this contemporary analysis of global trends of aortic diseases using WHO mortality data, an overall decreasing trend of mortality from aortic diseases was noted in both middle- and high-income countries from 2000 to 2019. However, an increase in mortality from aortic dissection in high-income countries was noted; further investigation into causal factors is warranted.

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Abbreviations and Acronyms

APC = annual percentage change
CI = confidence interval
CVD = cardiovascular disease
WHO = World Health Organization

The aorta was recently recognized by the European Association for Cardio-Thoracic Surgery and Society of Thoracic Surgeons as the 24th organ of the human body.[1] As the major throughway of blood, the aortic organ serves a vital function in delivering oxygen-rich blood from the cardiac chambers to end organs. Across its entire length, the aorta is subject to pathology derived from both congenital and acquired mechanisms that can manifest in acute, subacute, or chronic time frames.[1,2] These conditions are often life-threatening, with global mortality rates from aortic disease having increased to 2.78 from 2.49 per 100,000 from 1990 to 2010.[3]

The relationship between social status and the burden of cardiovascular disease (CVD) has been well described in within-country analyses. Indeed, both socioeconomic status and gender/sex distribution have been shown to have measurable and significant effects on the incidence and outcomes of CVD.[4,5] From a global perspective, national income level has also been demonstrated to influence the prevalence of CVD along with its associated morbidity/mortality, with low- and middle-income countries carrying approximately 80% of the global burden of CVD.[4]

Despite these well-established correlations in CVD more broadly, the exact impact of national income level on disparities in outcomes of aortic disease is not well-studied. As such, the purpose of the present analysis was to elucidate the impact of nation income level and sex on mortality trends from aortic disease using data from the World Health Organization (WHO) mortality database.

METHODS

Data Sources and Collection

Data collected in this study were gathered from the WHO Mortality Database,[6] which collates national statistics obtained from authorities in contributing countries. The cause of death is classified in the database according to the *International Classification of Diseases* code. Multiple previous investigations have used data from this database for epidemiologic research in multiple disease processes and populations, including for cardiovascular and thoracic disease.[7,8] In the current analysis, we identified mortalities attributable to aortic disease using *International Classification of Diseases, Tenth Revision*, codes (aortic dissection, I710; aortic aneurysm, I711 and I712 for thoracic aortic aneurysm, I713 and I714 for abdominal aortic aneurysm, I715 and I 716 for thoracic aortic aneurysm, and I 718 and I719 for aortic aneurysm of unspecified site) and evaluated trends in aortic disease mortality from 2000 to 2019. The income levels of included countries were determined by the gross national income per capita in 2019, as documented by the World Bank, and each country was classified accordingly into 1 of the 3 following categories: low-income (≤$1035 USD), middle income ($1036-$12,535 USD), and high income (>$12,535 USD).[9] The 2022 United Nations World Population Prospects was used to extract data on countries' age distribution at mid-year.[10] Ethics approval was forgone, given that all of the data used presently was obtained from publicly available sources and was anonymously extracted without any personal information.

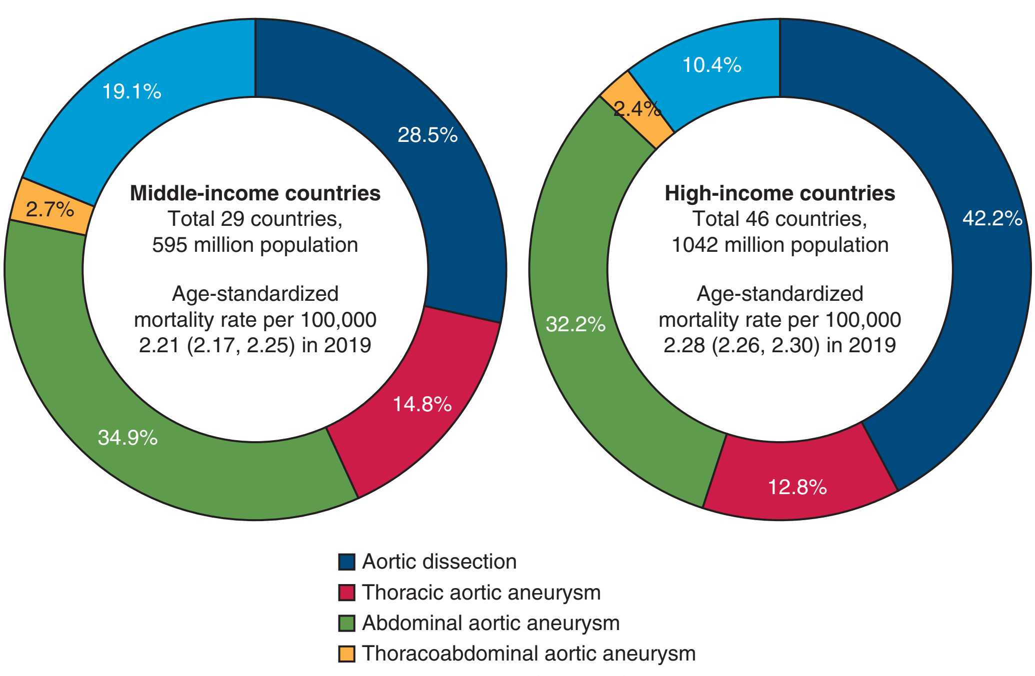


FIGURE 1. Distribution of mortality from aortic disease in middle-income and high-income countries in 2019.

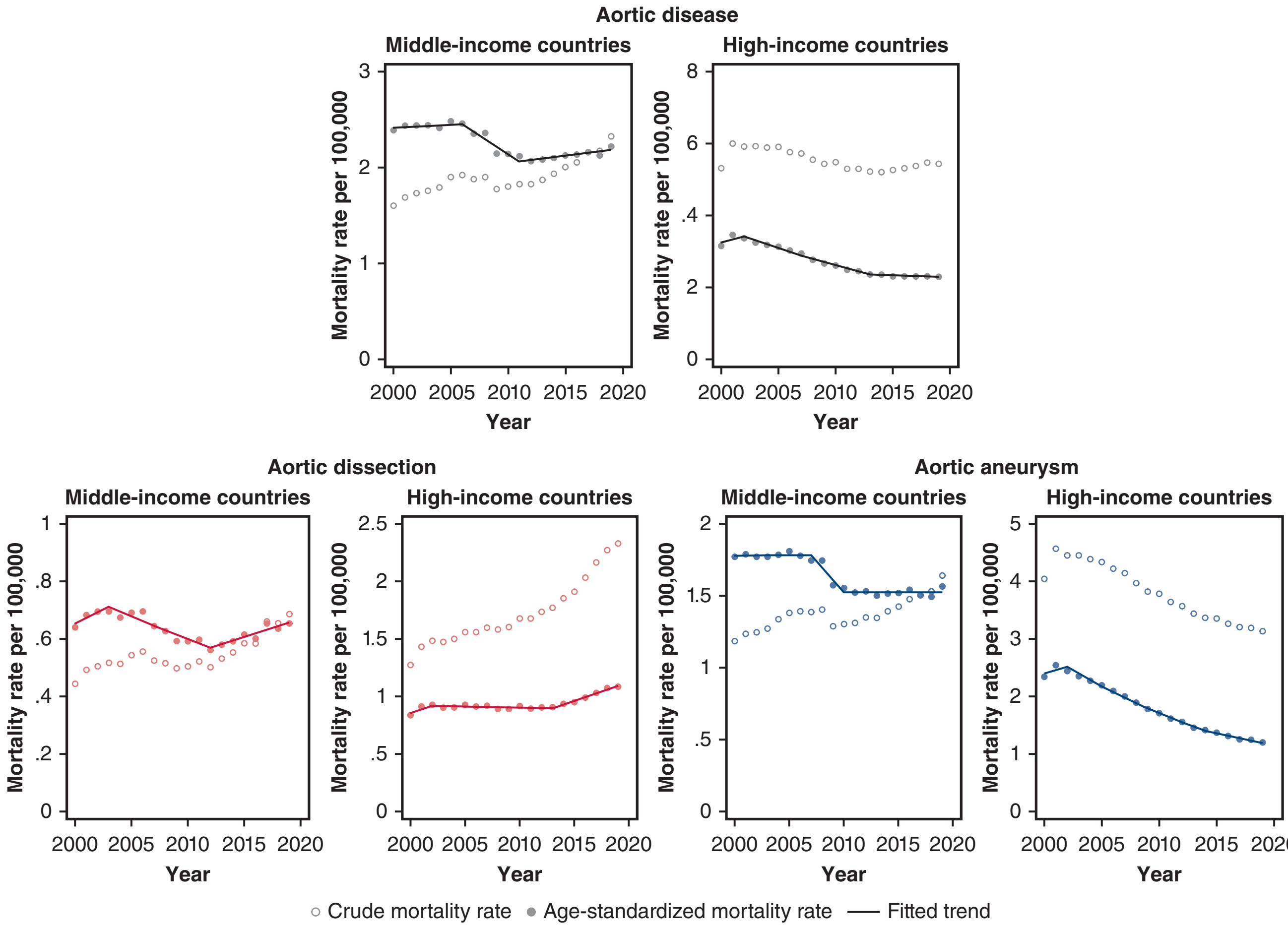


FIGURE 2. Crude and age-standardized mortality rates from aortic disease by country income levels.

Data Analysis

The number of deaths from each cause was divided by the number of persons in a group of countries to determine crude mortality rates. Age-specific mortality rates were similarly calculated in each age category (≤39, 40-64, 65-79, ≥80 years). Subsequently, age-standardized mortality rates in a group of countries were estimated with 95% confidence intervals (CI) using the WHO Standard Population.[11] In order to do so, previously reported formulas developed by Tiwari and colleagues[12] were employed. Countries with mortality data reported for ≥9 years during the observation period were included, and joinpoint regression analysis was conducted to evaluate trends of age-specific and age-standardized mortality rates through estimation of average annual percentage change (APC).[13] The optimal joinpoint model (and associated 95% CI) was determined by using the Monte Carlo permutation method with 4499 randomly permuted data sets. The average APC (and 95% CI) was subsequently calculated as a weighted average of the APC from the joinpoint model. A significantly increasing or decreasing trend was defined as the entire 95% CI range (ie, both limits) being either positive or negative. Years with missing data were excluded from the analysis. All statistical analyses were performed using the STATA 17 software (StataCorp LP) and Joinpoint Regression Program (Statistical Research and Applications Branch, National Cancer Institute).

RESULTS

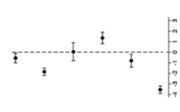
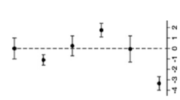
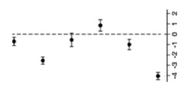
Population and Overall Trend

A total of 75 countries were included in the present analysis, of which 29 were middle-income and 46 were high-income (Tables E1 and E2). There were no low-income countries that satisfied the inclusion criteria. The respective average populations were 595 million and 1042 million in each of the groups, respectively. In 2019, amongst both middle- and high-income countries, the majority of mortality from aortic disease were related to abdominal aortic aneurysms (34.9% in middle- and 32.2% in high-income countries) and aortic dissection (28.5% in middle- and 42.2% in high-income countries) (Figure 1). Overall mortality trend from aortic disease in the studied countries was a decreasing trend (average APC of −1.6% (−2.0, −1.2) [$P < .001$]) (Figure E1).

Crude and Age-Standardized Mortality Rates Stratified by Income Level and Sex

The crude mortality rate from aortic disease per 100,000 in 2019 was 2.32 in middle- and 5.45 in high-income countries. After age standardization, these rates were altered to 2.21 (2.17-2.25) and 2.28 (2.26-2.30), both of which showed statistically significant reductions during the observation period (average APC of −0.5% (−1.0, 0.01) [$P = .025$] and −1.8% (−2.2, −1.5) [$P < .001$] in

TABLE 1. Crude, age-standardized, and sex-specific age-standardized mortality rate of aortic disease and its subgroups in middle- and high-income countries

Category and subgroup of valve disease	Income category	Crude mortality rate per 100,000 in 2019	Age- standardized mortality rate per 100,000 (95% CI) in 2019	Average annual percentage change (95% CI) during observation period	P value	Female: Age- standardized mortality rate per 100,000 (95% CI) in 2019	Female: Average annual percentage change (95% CI) during observation period	Female: P value	Male: Age- standardized mortality rate per 100,000 (95% CI) in 2019	Male: Average annual percentage change (95% CI), during observation period	Male: P value
Aortic disease	Middle	2.32	2.21 (2.17-2.25)		.025	1.44 (1.40-1.47)		.97	3.19 (3.13-3.26)		<.001
	High	5.45	2.28 (2.26-2.30)		<.001	1.50 (1.48-1.52)		<.001	3.21 (3.17-3.24)		<.001
Aortic dissection	Middle	0.69	0.65 (0.62-0.66)		.92	0.45 (0.43-0.47)		.66	0.88 (0.85-0.92)		.10
	High	2.32	1.08 (1.07-1.10)		<.001	0.80 (0.78-0.82)		<.001	1.37 (1.34-1.40)		.003
Aortic aneurysm	Middle	1.64	1.57 (1.54-1.60)		.011	0.99 (0.96-1.02)		.87	2.31 (2.25-2.37)		<.001
	High	3.13	1.20 (1.19-1.22)		<.001	0.70 (0.69-0.72)		<.001	1.84 (1.82-1.87)		<.001

CI, Confidence interval.

middle- and high-income countries, respectively; Figure 2). When stratified by sex, age-standardized mortality rates showed trends of significant reduction in both male and female citizens in high-income countries ($P < .001$ for both) but only among male citizens in middle-income countries ($P < .001$ in men, $P = .97$ in women). Although mortality rates from aortic aneurysm followed a similar trend as for all aortic disease, mortality rates from aortic dissection were constant during the study period in middle-income countries (average APC of 0.0% (−0.8, 0.9) [$P = .92$]) and increased in high-income countries (average APC of 1.3% [0.8-1.9] [$P < .001$]). These trends were consistent in both men and women (Tables 1 and 2). Although mortality from abdominal aortic aneurysm was a decreasing trend in both middle- ($P = .007$) and high-income countries ($P < .0001$), mortality from thoracic aortic aneurysm was a decreasing trend only in high-income countries ($P < .0001$) (Figure E2).

Male-to-Female Ratio of Age-Standardized Mortality Rates

In middle-income countries, the mean male-to-female ratios for mortality rates from aortic disease, aortic dissection, and aortic aneurysm were 2.41 (2.35-2.46), 1.94 (1.90-1.98), and 2.60 (2.53-2.67) respectively (Table E3). Among high-income countries, mortality rates were similarly greater amongst men in aortic disease (2.53 [2.42-2.64]), aortic dissection (1.89 [1.83-1.94]), and aortic aneurysm (2.97 [2.88-3.05]). These ratios demonstrated decreasing trends during the observation periods ($P \leq .001$ for all), except for aortic dissection in middle-income countries ($P = .19$) (Figures 3 and 4).

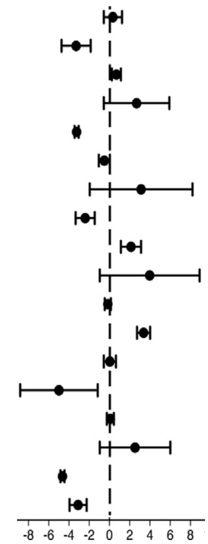
Mortality Rates Stratified by Income Level and Age Category

Further stratification of data by age category (≤39 years, 40-64 years, 65-79 years, and ≥80 years) demonstrated that in high-income countries, the reduction in mortality rates from aortic disease during the observation period was confined to those >65 years of age (average APCs [95% CI] ≤39 years: 0.3% [–0.7, 1.2] [$P = .59$]; 40-64 years: −0.3% [–0.9, 0.3] [$P = .33$]; 65-79: −2.8% [–3.1, −2.5] [$P < .001$]; ≥80: −1.3 [–1.8, −0.8] [$P < .001$]) (Tables 3 and E4). Although there was no statistically significant reduction in aortic disease mortality amongst any of the age strata within middle-income countries, there was a signal toward increased mortality from aortic disease over the observation period in individuals ≤39 years (2.0% [1.5-2.5] [$P < .001$]).

With respect to aortic dissection mortality, there was a trend toward increasing mortality over the observation period in all age strata within high income countries, reaching statistical significance in those 40-64, 65-79, and ≥80 years of age. Conversely, within

TABLE 2. Trend change in age-standardized mortality rate of aortic disease and its subgroups

Category and subgroups of valve disease	Income category	From	To	Annual percentage change	*P* value
Aortic disease	Middle	2000	2006		.49
		2006	2011		<.001
		2017	2019		.009
	High	2000	2002		.099
		2002	2013		<.001
		2013	2019		.041
Aortic dissection	Middle	2000	2003		.22
		2003	2012		<.001
		2012	2019		.001
	High	2000	2002		.11
		2002	2013		.19
		2013	2019		<.001
Aortic aneurysm	Middle	2000	2007		.89
		2007	2010		.015
		2010	2019		.94
	High	2000	2002		.15
		2002	2014		<.001
		2014	2019		<.001



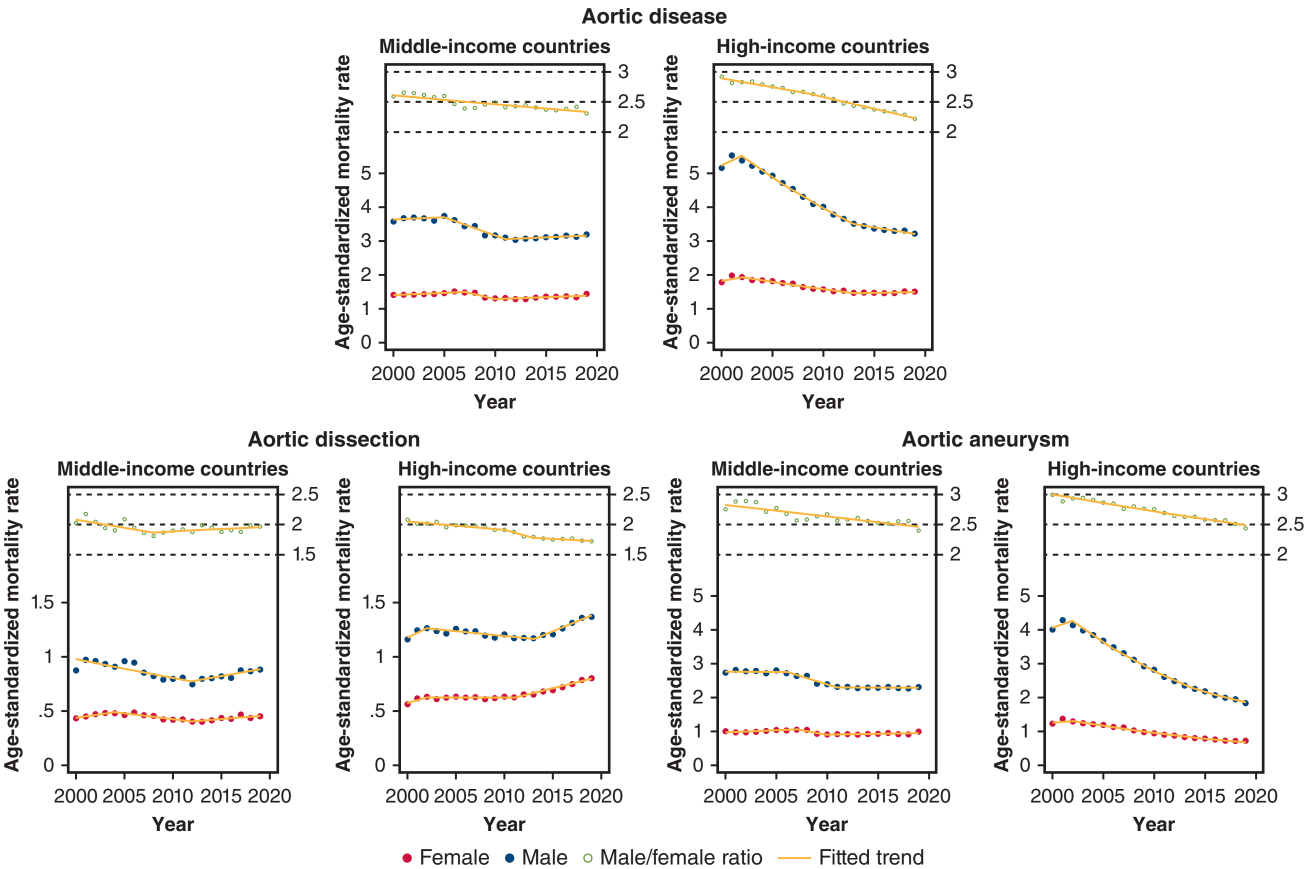


FIGURE 3. Sex-specific age-standardized mortality rates from aortic disease per 100,000 in female and male citizens and its ratio in middle- and high-income countries.

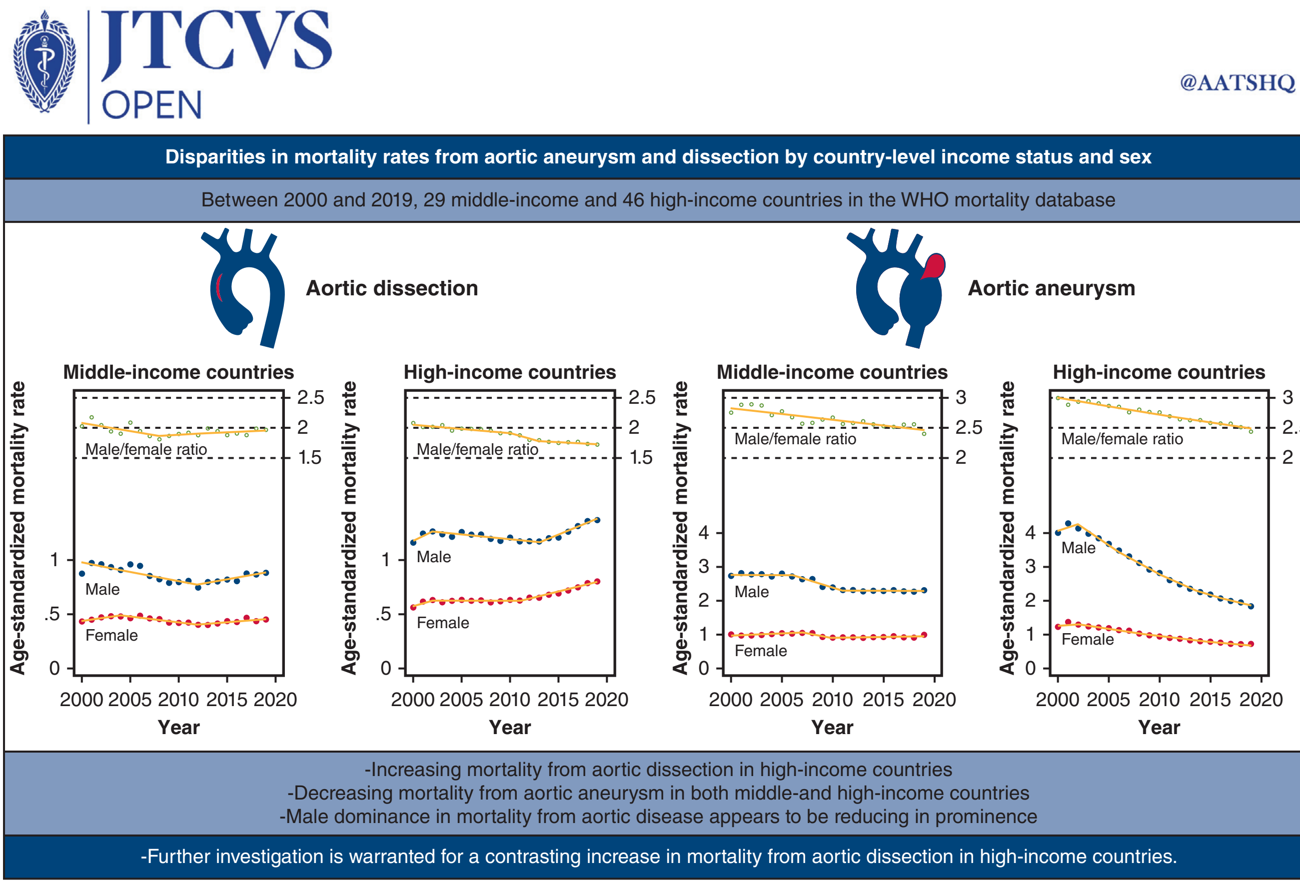


FIGURE 4. Graphical abstract showing sex-specific age-standardized mortality rates from aortic dissection and aneurysm and male-to-female ratios in middle- and high-income countries.

middle-income countries, aortic dissection mortality increased only amongst those ≤39 years of age but was consistent in all other strata. High-income countries saw a statistically significant reduction in mortality from aortic aneurysms in all age stratifications, while reductions in mortality from aortic aneurysms were confined to those between 40-64 years and 65-79 years of age in middle-income countries. Individuals ≤39 years of age in middle-income countries had an increase in mortality from aortic aneurysms in middle income countries from 2000 to 2019 (Table 3, Figures E3-E5).

DISCUSSION

The present analysis represents the most updated and comprehensive analysis of global trends in aortic disease mortality according to national socioeconomic status and sex. We report 3 central findings: (1) there is a decreasing trend of aortic disease related mortality in both middle- and high-income countries from 2000 to 2019 in both sexes, although this decrease was not observed among in female citizens within middle-income countries; (2) there is a significant increase in mortality from aortic dissection, particularly in high-income countries; (3) the male dominance in mortality from aortic diseases appears to be reducing in prominence, except for those from aortic dissection in middle-income countries.

These results are an encouraging improvement on previous reports that have documented an increasing burden of aortic disease over time in specifically developing regions compared with high-income regions[3] and corroborate previous findings of an overall global decline in the burden of aortic disease.[14-16] These data may be the result of improvements in screening and detection,[17-20] increased accessibility and safety of endovascular/minimally invasive treatment options,[21] and new emergency management protocols for acute aortic syndrome.[22] Furthermore, previous findings that revealed an interaction between country income levels and outcomes from aortic disease were also confirmed in this study.[15]

Although the current investigation noted a greater mortality rate from aortic disease amongst men in both high- and middle-income countries, this trend was largely decreasing over the observation period. These findings certainly confirm the gender discrepancy in aortic disease that has been well documented to have predilection for men,[23-26] whereas

TABLE 3. Age-specific mortality rate of aortic disease and its subgroups by 4 age groups

Category and subgroups of valve disease	Income category	≤39 y			40-64 y			65-79 y			≥80 y		
		Age-specific mortality rate per 100,000 in 2019	Average annual percentage change (95% CI), during observation period	*P* value	Age-specific mortality rate per 100,000 in 2019	Average annual percentage change (95% CI), during observation period	*P* value	Age-specific mortality rate per 100,000 in 2019	Average annual percentage change (95% CI), during observation period	*P* value	Age-specific mortality rate per 100,000 in 2019	Average annual percentage change (95% CI), during observation period	*P* value
Aortic disease	Middle	0.12	2.0% (1.5-2.5)	<.001	2.29	−0.5% (−1.0, 0.0)	.071	14.54	−0.7% (−1.5, 0.2)	.11	36.86	0.3% (−0.8, 1.3)	.61
	High	0.14	0.3% (−0.7, 1.2)	.59	2.38	−0.3% (−0.9, 0.3)	.33	13.86	−2.8% (−3.1, −2.5)	<.001	51.06	−1.3% (−1.8, −0.8)	<.001
Aortic dissection	Middle	0.048	3.7% (2.9-4.5)	<.001	0.94	−0.3% (−1.0, 0.4)	.41	3.85	0.2% (−1.4, 1.9)	.81	7.72	−0.2% (−0.8, 0.5)	.59
	High	0.10	1.1% (−0.1-2.4)	.068	1.57	1.4% (0.8-2.0)	<.001	5.91	0.5% (0.1-0.9)	.013	17.73	2.4% (1.9-2.9)	<.001
Aortic aneurysm	Middle	0.070	1.0% (0.3-1.6)	.010	1.35	−0.8% (−1.3, −0.3)	.001	10.72	−0.9% (−1.6, −0.1)	.021	29.19	0.0% (−1.1, 1.0)	.96
	High	0.035	−1.9% (−2.5, −1.3)	<.001	0.82	−2.7% (−3.2, −2.1)	<.001	7.96	−4.4% (−4.7, −4.0)	<.001	33.34	−2.8% (−3.3, −2.2)	<.001

declining mortality from aortic disease was reported to be more prominent in men compared with women.[27] Indeed, consistent with this, current literature has identified disproportionately greater rates of aneurysmal ruptures and unplanned admissions in women compared with men.[28-30] It is notable that the only subgroup of patients that did not experience an overall decrease in mortality from aortic disease were women within middle-income countries, a finding that may be linked to intersectional disparities in screening, detection, and treatment outcomes.[23,31] Even among greater-income countries, social factors including race/ethnicity,[26,32] sex/gender,[33] and socioeconomic position,[34-36] likely modulate the burden of aortic disease. It is important to note that differences in the burden of aortic disease between subpopulations may also reflect differences in other risk factors for aortic disease including arterial stiffness,[37] anthropometry,[24,38] and traditional cardiovascular risk factors including smoking, hypertension, and dyslipidemia.[24,25,39] Finally, internation differences in practice patterns regarding operative approaches and intervention thresholds may also play a role in noted differences.[40-44] A complex intersection of all of these factors may be involved in explaining the differences in aortic disease manifestations amongst different populations.

There was a strikingly high increase in mortality from aortic dissection specifically amongst high-income countries and irrespective of sex in our analysis. This finding could be a result of improvement in recognition of aortic dissection-related mortality owing to advancement in diagnostic modalities and pathways.[45] Nevertheless, mortality is still quite significant for aortic dissection, with rates near 20% at 1 month, 30% at 6 months, and 35% to 45% at 5+ years for patients with aortic dissection, even with treatment.[46,47] Our findings corroborate previous reports of increased mortality from aortic dissection in high-income countries and warrant further investigation into causal factors.[16]

The findings of the present investigation should be interpreted in the context of important limitations. First, granular data related to comorbid conditions and prevalent risk factors could not be elucidated from the databases used in this analysis, and therefore they were not adjusted for in mortality calculations. Second, whether mortality was related to procedural/interventional outcomes or the index disease was not captured in this study. Third, this study cannot account for under-reporting or detection of mortality related to aortic disease, and therefore the data described are likely underestimates of true values. Finally, various information biases and practice patterns regarding data entry may exist between included countries.

CONCLUSIONS

In summary, we report the largest and most comprehensive analysis of the relationship between aortic disease mortality and global socioeconomic status. Although trends of mortality from aortic diseases are on the decline, there are modulations in these trends on the basis of national income level and sex. Furthermore, amongst high-income countries, there is an increasing trend in mortality for aortic dissection that warrants further investigation.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

We are thankful for the data publicly made available by World Health Organization. We are solely responsible to the analyses, interpretations, or conclusions of this publication.

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Key Words: aortic disease, mortality trends, income levels, sex difference

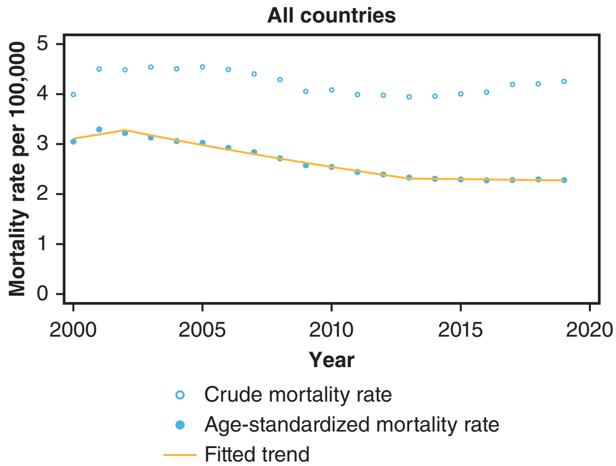

FIGURE E1. Crude and age-standardized mortality rates from aortic disease per 100,000 in overall middle- and high-income countries.

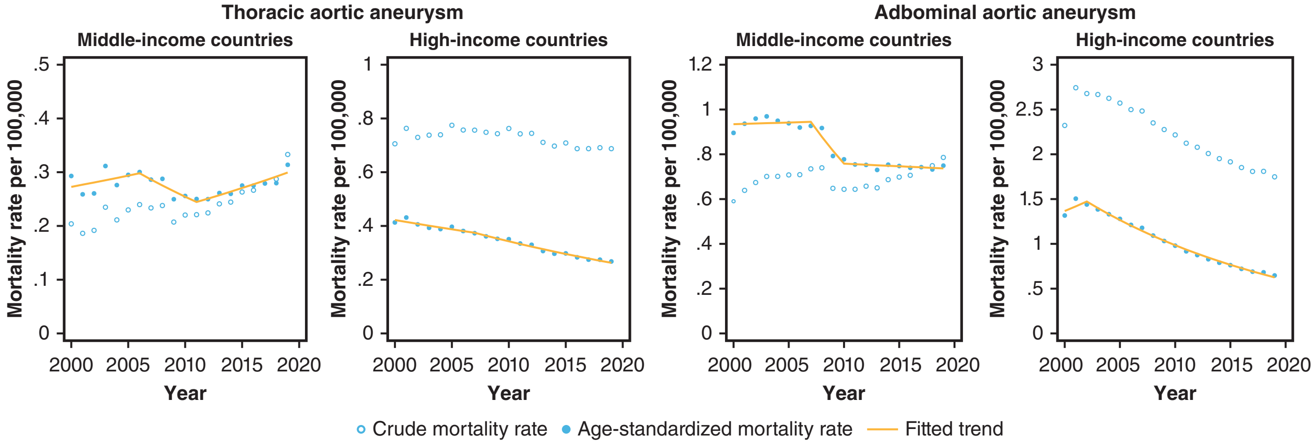

FIGURE E2. Crude and age-standardized mortality rates from thoracic and abdominal aortic aneurysm per 100,000 in overall middle- and high-income countries.

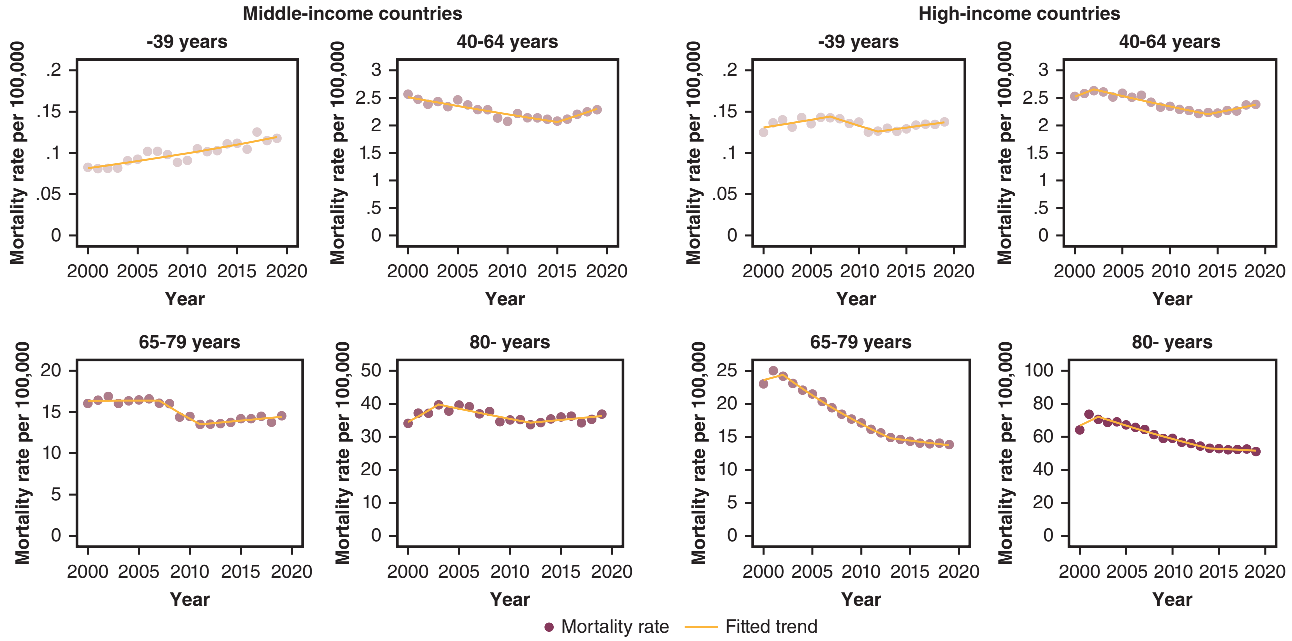

FIGURE E3. Age-specific mortality rates per 100,000 from aortic disease stratified by income levels.

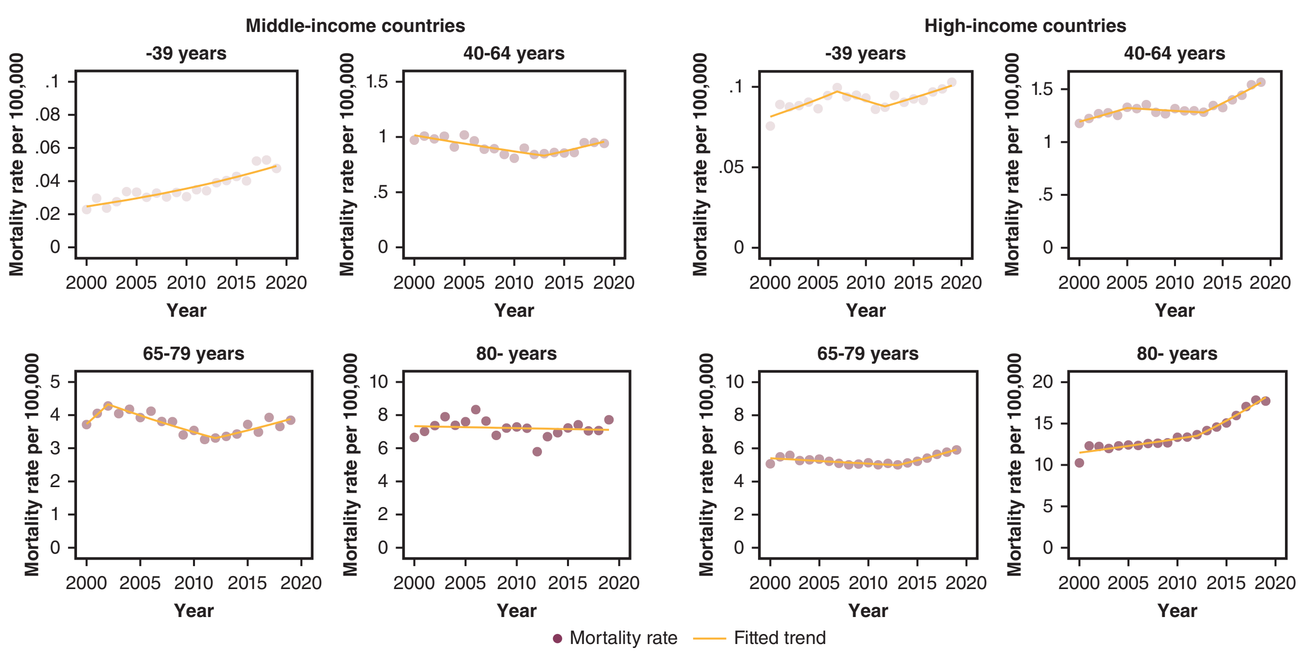

FIGURE E4. Age-specific mortality rates per 100,000 from aortic dissection stratified by income levels.

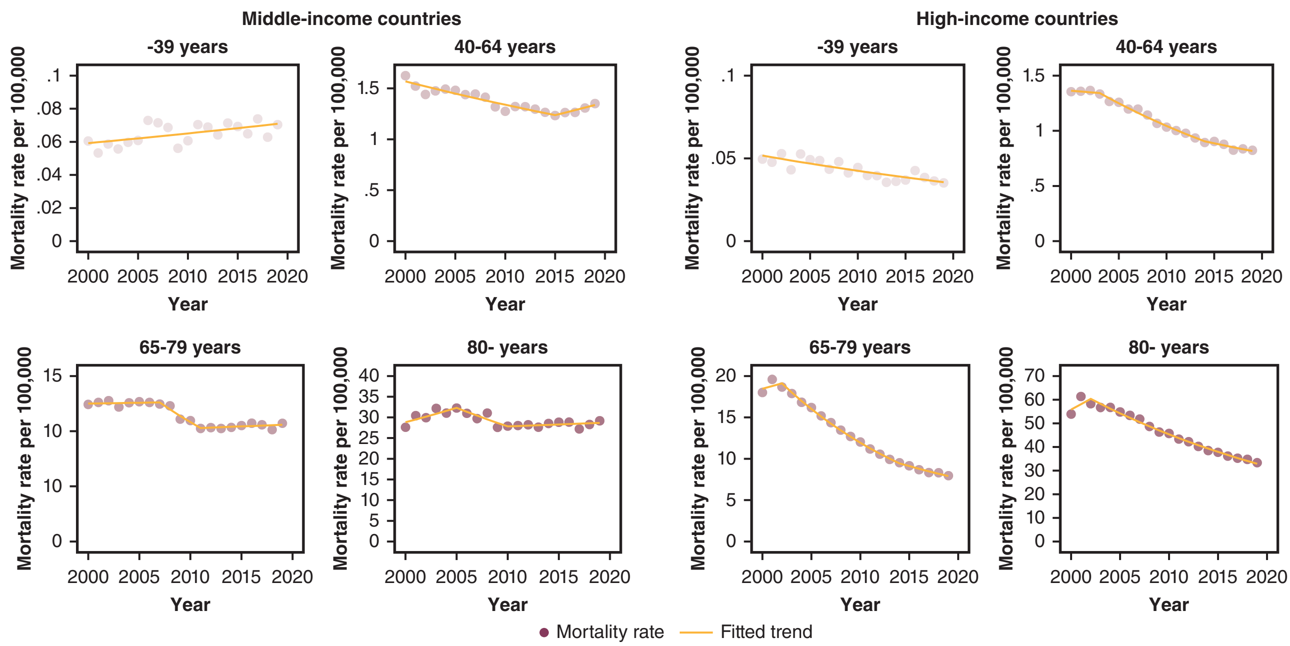

FIGURE E5. Age-specific mortality rates per 100,000 from aortic aneurysm stratified by income levels.

TABLE E1. Summary of countries included in analysis of aortic disease and its subgroups

Category and subgroups of valve disease	Income category	Number of included countries	Average observation years per country (average ± SD)	Average total population in included countries per year
Aortic disease	Middle	29	18.60 ± 3.07	595,113,500
	High	46	18.92 ± 2.73	1,042,956,070
Aortic dissection	Middle	26	17.48 ± 3.75	580,764,283
	High	42	18.87 ± 3.01	1,039,520,860
Aortic aneurysm	Middle	29	18.48 ± 3.16	593,592,544
	High	45	18.92 ± 2.79	1,042,835,107

SD, Standard deviation.

TABLE E2. List of countries included in analysis of aortic disease and its subgroup

Country	Aortic disease	Aortic dissection	Aortic aneurysm
High-income countries			
Antigua and Barbuda	X		X
Aruba	X		X
Australia	X	X	X
Austria	X	X	X
Bahamas	X	X	X
Barbados	X	X	X
Belgium	X	X	X
Bermuda	X		X
Canada	X	X	X
Chile	X	X	X
Croatia	X	X	X
Cyprus	X	X	X
Czech Republic	X	X	X
Denmark	X	X	X
Estonia	X	X	X
France	X	X	X
Germany	X	X	X
Hong Kong SAR	X	X	X
Hungary	X	X	X
Iceland	X	X	X
Ireland	X	X	X
Israel	X	X	X
Italy	X	X	X
Japan	X	X	X
Kuwait	X		X
Latvia	X	X	X
Lithuania	X	X	X
Luxembourg	X	X	X
Malta	X	X	X
Netherlands	X	X	X
New Zealand	X	X	X
Norway	X	X	X
Panama	X	X	X
Poland	X	X	X
Portugal	X	X	X
Puerto Rico	X	X	X
Republic of Korea	X	X	X
Romania	X	X	X
Spain	X	X	X
Sweden	X	X	X
Switzerland	X	X	X
Trinidad and Tobago	X	X	X
United Kingdom	X	X	X
United States of America	X	X	X
Uruguay	X	X	X
Virgin Islands (USA)	X	X	
Middle-income countries			
Argentina	X	X	X
Belize	X		X
Brazil	X	X	X
Colombia	X	X	X
Costa Rica	X	X	X
Cuba	X	X	X

(Continued)

TABLE E2. Continued

Country	Aortic disease	Aortic dissection	Aortic aneurysm
Dominica	X		X
Dominican Republic	X	X	X
Ecuador	X	X	X
El Salvador	X	X	X
Fiji	X	X	X
Georgia	X	X	X
Grenada	X	X	X
Guatemala	X	X	X
Guyana	X	X	X
Jamaica	X	X	X
Kyrgyzstan	X	X	X
Mauritius	X	X	X
Mexico	X	X	X
Morocco	X	X	X
Nicaragua	X	X	X
Paraguay	X	X	X
Peru	X	X	X
Republic of Moldova	X	X	X
Saint Lucia	X	X	X
Saint Vincent and Grenadines	X	X	X
Suriname	X		X
Turkey	X	X	X

TABLE E3. Mean male-to-female ratio of sex-specific age-standardized mortality rates and its average annual percentage change of aortic disease and its subgroups in middle- and high-income countries

Mortality cause	Country	Mean male-to-female ratio during the observation period (95% CI)	Average annual percentage change (95% CI), during observation period	*P* value
Aortic disease	Middle	2.41 (2.35-2.46)	−0.7% (−0.9, −0.5)	<.001
	High	2.53 (2.42-2.64)	−1.5% (−1.7, −1.4)	<.001
Aortic dissection	Middle	1.94 (1.90-1.98)	−0.4% (−0.9, 0.2)	.19
	High	1.89 (1.83-1.94)	−0.9% (−1.4, −0.4)	.001
Aortic aneurysm	Middle	2.60 (2.53-2.67)	−0.8% (−1.0, −0.6)	<.001
	High	2.97 (2.88-3.05)	−1.1% (−1.2, −1.0)	<.001

CI, Confidence interval.

TABLE E4. Trend change in age-specific mortality rate of subgroups of aortic disease by 4 age groups

		≤39 y			40-64 y			65-79 y			≥80 y		
Mortality cause	**Income category**	**Periods**	**Annual percentage change (95% CI)**	***P* value**	**Periods**	**Annual percentage change (95% CI)**	***P* value**	**Periods**	**Annual percentage change (95% CI)**	***P* value**	**Periods**	**Annual percentage change (95% CI)**	***P* value**
Aortic disease	Middle	2000-2019	2.0% (1.5-2.5)	<.001	2000-2015	−1.3% (−1.6, −1.0)	<.001	2000-2007	0.0% (−1.0, 1.1)	.96	2000-2003	4.9% (−1.2, 11.3)	.11
					2015-2019	2.8% (0.5-5.1)	.020	2007-2011	−4.7% (−8.1, −1.2)	.013	2001-2012	−1.6% (−2.7, −0.6)	.005
								2011-2019	0.8% (0.1, 1.6)	.032	2012-2019	0.8% (−0.3, 1.9)	.13
	High	2000-2007	1.4% (0.1-2.7)	.036	2000-2002	2.6% (−3.0, 8.5)	.34	2000-2002	1.7% (−0.7, 4.1)	.15	2000-2002	4.0% (−0.7, 8.9)	.287
		2007-2012	−2.7% (−5.5, 0.3)	.072	2002-2014	−1.5% (−1.9, −1.2)	<.001	2002-2013	−4.5% (−4.6, −4.3)	<.001	2002-2014	−2.5% (−2.8, −2.3)	<.001
		2012-2019	1.2% (−0.1, 2.6)	.063	2014-2019	1.5% (0.4-2.7)	.015	2013-2019	−1.2% (−1.7, −0.8)	<.001	2014-2019	−0.5% (−1.3, 0.4)	.23
Aortic dissection	Middle	2000-2019	3.7% (2.9, 4.5)	<.001	2000-2013	−1.5% (−2.2, −0.8)	<.001	2000-2002	7.6% (−7.8, 25.6)	.32	2000-2019	−0.2% (−0.8, 0.5)	.59
					2013-2019	2.4% (0.4-4.5)	.021	2002-2012	−2.7% (−3.9, −1.4)	<.001			
								2012-2019	2.3% (0.7, 3.9)	.008			
	High	2000-2007	2.6% (0.8-4.3)	.008	2000-2005	2.1% (0.4- 3.8)	.021	2000-2013	−0.6% (−1.0, −0.3)	.002	2000-2012	1.4% (0.8- 2.0)	<.001
		2007-2012	−2.0% (−5.7, 1.9)	.28	2005-2013	−0.4% (−1.3, 0.5)	.34	2013-2019	2.9% (1.9-4.0)	<.001	2012-2019	4.3% (3.3-5.4)	<.001
		2012-2019	2.0% (0.3-3.7)	.022	2013-2019	3.4% (2.3-4.5)	<.001						
Aortic aneurysm	Middle	2000-2019	1.0% (0.3-1.6)	.010	2000-2015	−1.6% (−1.9, −1.2)	<.001	2000-2007	0.1% (−0.9, 1.1)	.81	2000-2005	2.3% (−0.4, 5.1)	.089
					2015-2019	2.0% (−0.3, 4.3)	.087	2007-2011	−5.0% (−8.0, −1.8)	.006	2005-2010	−2.9% (−6.0, 0.2)	.065
								2011-2019	0.4% (−0.3, 1.0)	.27	2010-2019	0.3% (−0.5, 1.1)	.39
	High	2000-2019	−1.9% (−2.5, −1.3)	<.001	2000-2003	−0.5% (−3.1, 2.1)	.68	2000-2002	1.7% (−1.1, 4.6)	.21	2000-2002	4.0% (−1.5, 9.7)	.15
					2003-2014	−3.5% (−3.9, −3.1)	<.001	2002-2014	−5.7% (−5.9, −5.5)	<.001	2002-2019	−3.5% (−3.7, −3.3)	<.001
					2014-2019	−2.0% (−3.3, −0.7)	.005	2014-2019	−3.5% (−4.2, −2.7)	<.001			

CI, Confidence interval.