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Trends in cardiovascular disease mortality and burden in Albania, 1990-2023: a comparison with Southeastern European countries

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Abstract

Cardiovascular Diseases (CVDs) remain the leading cause of mortality and morbidity worldwide. We analyzed long-term trends in CVD mortality and disease burden in Albania between 1990 and 2023, using data from the Global Burden of Disease (GBD) Study 2023, and compared Albania’s profile with six other Southeastern European (SEE) countries. Crude CVD mortality and Disability-Adjusted Life Years (DALY) rates in Albania increased markedly over the study period, reflecting demographic ageing, whereas age-standardized rates declined substantially, indicating improvements in prevention, diagnosis, and treatment. The proportion of deaths and DALYs attributable to CVDs increased significantly, highlighting the growing dominance of these chronic conditions within the Albanian national health profile. Comparative analysis revealed persistent disparities across SEE countries: Slovenia achieved the lowest age-standardized mortality and DALY rates by 2023, whereas Serbia continued to exhibit the highest burden. Albania ranked intermediate, with reductions evident but still above global averages. Overall, findings from this analysis emphasize the

urgent need for coordinated regional strategies to reduce CVD risk factors, strengthen preventive services, and improve equity in healthcare outcomes across SEE countries.

Introduction

Cardiovascular Diseases (CVDs) are the leading cause of mortality and morbidity worldwide, constituting one of the greatest public health challenges of the twenty-first century.¹⁻³

According to the Global Burden of Disease (GBD) 2023 Study, CVDs accounted for about 19.2 million deaths and 437 million Disability-Adjusted Life Years (DALYs) worldwide in 2023,¹ comprising around one-third of all global deaths.¹ In 1990, the global number of CVD deaths was 13.1 million.^{1,3} Along with the increase in the number of deaths, there has been also an increase in the global prevalence of CVDs from 311 million cases in 1990 to 626 million cases in 2023, attributable to population growth and ageing.^{1,3} Projections suggest that by 2050, CVD-related deaths will total 35.6 million annually, accompanied by a global prevalence of 1.14 billion cases.³ These figures indicate clearly the indicating growing healthcare burden imposed by CVDs worldwide.

However, the age-standardized mortality and burden of CVDs have decreased considerably in the past three decades in most countries worldwide, reflecting advances in prevention, diagnosis, and treatment.^{4,5} Notably though, the burden of CVD is unequally distributed across countries, with the highest age-standardized mortality and DALY rates observed in low- and middle-sociodemographic settings,^{1,3,6} reflecting disparities in exposure to modifiable risk factors, access to preventive services, and quality of healthcare.^{1,3,6}

Approximately 80% of the global CVD burden is attributable to modifiable risk factors, including systolic blood pressure, dietary risks, high low-density lipoprotein cholesterol, and air pollution.¹ An authoritative meta-analysis pooling data from 112 cohort studies (about 1.5 million participants) quantified the global population-attributable fraction of CVD incidence due to modifiable risk factors, confirming their overwhelming impact.⁷ More than half of incident CVD cases and about one-fifth of all-cause deaths have been linked to five modifiable risk factors such as body mass index, systolic blood pressure, non-high-density lipoprotein cholesterol, current smoking, and diabetes.⁷

Europe continues to experience one of the largest burdens of CVDs despite substantial progress in prevention and management.² The latest European Society of Cardiology (ESC) statistics indicate that nearly 121 million people are living with CVD across European

countries, with more than three million CVD deaths and approximately 68 million DALYs occurring annually.² CVDs remain the leading cause of death in Europe, accounting for around 39% and 34% of female and male deaths, respectively.² Thus, notwithstanding the progress in prevention and management, Europe still faces one of the largest global CVD burdens, with marked disparities between high- and middle-income countries.^{2,8}

Importantly, considerable inequalities persist across Europe,^{2,9,10} with high-income Western European countries experiencing reductions of more than 50% in age-standardized CVD mortality since 1990, but with considerably smaller declines in middle-income countries of Central, Eastern, and Southeastern Europe, resulting in persistent regional disparities in CVD health outcomes.^{2,9,10} Premature deaths from ischemic heart disease only remain up to three times higher in Central and Southeastern Europe compared with Western Europe.⁹

Southeastern European (SEE) countries continue to bear a disproportionately high burden of CVDs compared with Western Europe.^{2,9,11} Differences in CVD mortality across the SEE region reflect variations in population ageing, prevalence of hypertension, tobacco use, obesity, diabetes, dietary patterns, socioeconomic development, and the organization and effectiveness of healthcare systems.^{2,9,12} In particular, hypertension, tobacco use, obesity, diabetes, and adverse dietary patterns are disproportionately prevalent in SEE populations, contributing to higher rates of premature acute coronary syndromes compared with Western Europe.¹²

Albania, a small country in the Western Balkans, has undergone profound political, demographic, socioeconomic, and epidemiological transitions during the past three decades,^{13,14} accompanied by substantial changes in the profile of non-communicable diseases including CVDs.^{13,14} As a matter of fact, CVDs have emerged as the dominant contributor to mortality and overall disease burden in the Albanian population.^{13,14}

Nevertheless, comprehensive assessments describing long-term CVD trends and comparing Albania with other SEE countries remain rather limited. Most previous studies have focused either on broader non-communicable disease patterns or on individual CVDs,¹² without providing an integrated regional perspective on CVD mortality and burden.

In this framework, the aim of this analysis was to assess temporal trends in CVD mortality and burden in Albania between 1990 and 2023 and to compare these trends with those observed in the other SEE countries. Monitoring long-term trends and benchmarking national performance against neighbouring countries are essential tools for evaluating progress and identifying priorities for CVD prevention and control in transitional Albania.

Materials and Methods

This was an ecologic analysis employing secondary data from the GBD 2023 study,¹⁵ which is coordinated by the Institute for Health Metrics and Evaluation (IHME: <https://www.healthdata.org/>).

Data on cause-specific mortality and disease burden (DALYs) attributable to CVDs were retrieved from the GBD database.¹⁵ The GBD study provides standardized estimates of mortality and morbidity across countries, enabling valid temporal and cross-national comparisons.^{15,16}

Three sets of indicators were analysed for Albania during the period 1990-2023: i) mortality rates: crude CVD death rates (CDR) and age-standardized CVD death rates (SDR), both expressed as number of deaths per 100,000 population;¹⁵ ii) burden of disease: crude DALY rate and age-standardized DALY rate (both expressed per 100,000) attributable to CVDs;¹⁵ iii) proportional measures: crude proportion of CVD deaths (proportional mortality) and crude proportion of DALYs (proportional burden) attributable to CVDs.¹⁵

For the regional comparisons, age-standardized mortality rates and burden of disease rates attributable to CVDs were analysed for the years 1990 (breakdown of the socialist regime in SEE countries) and 2023 (most recent estimates available).¹⁵ Age-standardized CVD indicators for Albania were compared with the following six SEE countries: Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia, and Slovenia.¹⁵

Results

Figure 1 presents trends in crude and age-standardized CVD mortality rates in Albania between 1990 and 2023, revealing contrasting patterns. The crude CVD mortality rate (CDR) increased substantially over the study period, rising from 227 deaths per 100,000 population in 1990 to 437 per 100,000 in 2023, representing an overall increase of approximately 93%. After a slight decline between 1990 and 1995, the crude mortality rate increased steadily, peaking at 455 deaths per 100,000 in 2020, before declining modestly in 2023. In contrast, the age-standardized CVD mortality rate (SDR) showed a continuous downward trend throughout the study period, decreasing from 401 deaths per 100,000 population in 1990 to 250 per 100,000 in 2023, corresponding to an overall reduction of approximately 38%. The decline was gradual during the 1990s and early 2000s, followed by a more pronounced reduction after 2005.

Figure 2 presents the trends in crude and age-standardized burden of disease (DALYs per 100,000) attributable to CVDs in Albania between 1990 and 2023. The crude DALY rate

exhibited an overall upward trend during the study period, increasing from 4,971 per 100,000 in 1990 to 7,789 per 100,000 in 2023, corresponding to an overall increase of about 57%. Following a slight decline between 1990 and 1995, the crude DALY rate rose steadily in 2000 and in 2005. Although a small decrease was observed in 2010, the crude DALYs subsequently increased in 2015 and peaked at 8,212 per 100,000 in 2020, before declining modestly in 2023. In contrast, the age-standardized DALY rate exhibited a consistent downward trend throughout the study period, decreasing from 7,646 per 100,000 in 1990 to 4,476 per 100,000 in 2023, representing an overall reduction of about 42%. The decline was gradual during the 1990s and early 2000s, followed by a more pronounced decrease thereafter.

Figure 3 exhibits the temporal trends in the crude proportional mortality and proportional burden of disease (DALYs) attributable to CVDs in Albania between 1990 and 2023. The proportion of all deaths attributable to CVDs increased markedly over the study period, rising from 39% in 1990 to about 50% in 2023, with an overall increase of around 11 percentage points (approximately 29% relative increase). The proportion increased steadily throughout the 1990s and 2000s, reaching around 47% in 2000, 53% in 2005, and peaking at 55% in 2010. It remained relatively stable in 2015 (55%), followed by a notable decline to 42% in 2020, before increasing again to 50% in 2023. A similar pattern was observed for the proportion of total DALYs attributable to CVDs. CVDs accounted for about 15% of all DALYs in 1990, increasing progressively to 20% in 2000, 24% in 2005, and 25% in 2010. The highest proportion was recorded in 2015 (27%), after which it declined to 24% in 2020, before rising again to 26% in 2023. Overall, the proportion of DALYs attributable to CVDs increased by about 10 percentage points between 1990 and 2023, representing an approximate 67% relative increase.

Table 1 compares the age-standardized CVD mortality rates and DALY rates across seven SEE countries in 1990 and 2023, demonstrating substantial reductions in CVD burden over the past three decades, although marked inter-country differences persist. In 1990, Serbia had the highest age-standardized CVD mortality rate (727 deaths per 100,000 population), whereas Slovenia had the lowest rate in the region (388 deaths per 100,000 population). By 2023, all countries had experienced considerable declines in mortality. Slovenia recorded the lowest mortality rate (129 deaths per 100,000), followed by Croatia and Albania. In contrast, Serbia continued to have the highest CVD mortality rate (421 deaths per 100,000 population). A similar regional pattern was observed for the age-standardized DALY rates attributable to CVDs. In 1990, DALY rates ranged from about 7,030 per 100,000 in Slovenia to 12,630 per

100,000 in Serbia, with Albania recording around 7,650 per 100,000, the second-lowest burden. By 2023, substantial reductions were evident in all countries. Slovenia again had the lowest DALY rate (approximately 2,270 per 100,000), followed by Croatia and Albania. Conversely, Serbia continued to experience the highest burden of CVDs, with about than 6,730 DALYs per 100,000 (Table 1).

Discussion

Overall, this analysis indicates that CVDs have become an increasingly dominant contributor to both mortality and the overall burden of disease in Albania over the past three decades. The diverging trends in mortality and disease burden are consistent with population ageing in Albania, whereby improvements in CVD prevention and treatment have reduced age-specific mortality and disease burden risks, but demographic ageing has led to a growing number of CVD deaths and burden in the Albanian population. Despite the temporary decline observed in 2020 due to COVID-19 pandemic, CVDs remained responsible for one in every two deaths and approximately one-quarter of all DALYs in 2023, highlighting their continued prominence as the leading cause of health loss in the Albanian population.

At a SEE level, this analysis indicates marked improvements in CVD health across all SEE countries between 1990 and 2023. Nevertheless, substantial regional disparities remain. Slovenia consistently demonstrated the most favourable CVD health profile, with the lowest age-standardized mortality and disease burden at both time points (1990 and 2023), whereas Serbia and North Macedonia experienced the highest burden throughout the study period. Albania ranked among the better-performing countries, exhibiting lower age-standardized mortality and DALY rates than Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia in both 1990 and 2023, but less favourable than the two European Union (EU) countries (Croatia and especially Slovenia).

At a broader regional perspective, CVD mortality has decreased in Eastern Europe by approximately 24% from 1990 to 2022.¹⁷ However, out of 21 worldwide regions, Eastern Europe ranked 1st in both 1990 and 2022 for age-standardized CVD mortality.¹⁷ Among all risks, high systolic blood pressure accounted for the largest number of attributable age-standardized CVD DALYs in 2022.¹⁷

In contrast with Eastern Europe, of 21 regions worldwide, age-standardized CVD mortality rates in Western Europe ranked 15th in 1990 and 19th in 2022.¹⁷ Yet, likewise Eastern Europe, high systolic blood pressure had the largest number of attributable age-standardized CVD DALYs in Western European countries.¹⁷

Regarding the main modifiable CVD risk factors, it has been reported that effective blood pressure control is achieved in fewer than 10% of hypertensive adults in Albania, whereas the situation in the other SEE countries is more favourable.² At a larger level, there are notable gaps in the treatment and control of hypertension in the European region.¹⁸ On the other hand, in 2022, the energy delivered from consumption of sugar and sweeteners was estimated at <250 kcal/capita/day in Albania and Serbia, whereas the median value in European countries was 336 (IQR 291-381) kcal/capita/day.² Conversely, the 2023 WHO report has indicated that, in 2019, dietary sodium intake in Albania exceeded 5 g/day, whereas the median value for ECS member countries was estimated at 3.3 (IQR 3.0-3.8) g/day.² Notably, such an excess dietary sodium intake (>5 g/day) has been also reported in the other SEE countries including Bosnia and Herzegovina, Croatia, North Macedonia, Serbia, and Slovenia.² Albania, in particular, was ranked among countries with the lowest level of implementation of sodium reduction policies and measures.² Regarding air pollution, there are no reliable estimates for Albania, whereas CVD mortality related to air pollution has been reported at nearly 20% in some Eastern European countries including North Macedonia, a country which along with Bosnia and Herzegovina has annual population-weighted PM_{2.5} exposure above 25 µg/m³.² Smoking levels are also high in many SEE countries, exceeding a prevalence of 30% in Bosnia and Herzegovina and North Macedonia.²

This analysis has several limitations, mainly its reliance on secondary data from the GBD study, which, despite being the most comprehensive source available, is subject to modelling assumptions, potential misclassification of causes of death, and variability in data quality across countries.¹ In Albania and some other SEE countries, incomplete vital registration systems and underreporting of non-communicable diseases may affect the accuracy of estimates. Furthermore, this analysis does not account for the complex interplay of socioeconomic, behavioural, and health system determinants underlying observed trends, limiting causal inference. Also, while comparisons across SEE countries highlight regional disparities, the absence of integrated, country-level longitudinal datasets constrains the ability to fully capture heterogeneity in CVD outcomes.^{12,19}

Limitations aside, this analysis provides useful evidence on the CVD trends in SEE countries, a region which has been characterized by intensive transformations in the past few decades which have inevitably affected also the CVD health.

At a broader regional level, there have been convincingly documented pronounced variations in CVD mortality and morbidity rates across Eastern European countries with a remarkably high disease burden in the North-Eastern Europe.¹⁹ Significant differences in access and

delivery to healthcare and unmet healthcare needs are also reported in this region.¹⁹ Based on this situation, addressing the CVD determinants and reducing health disparities in its many dimensions has long been a priority of the European Parliament's work through resolutions and by financing pilot projects.¹⁹ Notwithstanding these efforts, only few large-scale studies have been conducted to assess the feasibility of reducing CVD disparities in Eastern Europe.¹⁹ Hence, it has been convincingly argued that there is an urgent need for improved data, measurements, reporting and comparisons, and for dedicated collaborative research.¹⁹

Conclusion

This analysis indicates that the (age-standardized) CVD mortality and burden rates in SEE region remain higher than global averages,¹ despite overall declines since 1990. SEE countries which are EU members (Slovenia and Croatia) have CVD rates that are closer to high-income European levels,¹ whereas countries like Serbia and Bosnia and Herzegovina continue to experience substantially higher mortality and DALY rates compared with global benchmarks.¹

Therefore, considering the persistently high CVD toll in SEE region compared with global averages, and the slower declines observed in countries such as Serbia, Bosnia and Herzegovina, and Albania, urgent and coordinated regional strategies are needed to tackle CVDs through strengthened prevention, equitable healthcare access, and effective control of the main risk factors.^{1,2,19}

References

1. Global Burden of Cardiovascular Diseases and Risks 2023 Collaborators. Global, Regional, and National Burden of Cardiovascular Diseases and Risk Factors in 204 Countries and Territories, 1990-2023. *J Am Coll Cardiol* 2025;86:2167-243.
2. Timmis A, Petersen SE, Van Belle E, et al. European Society of Cardiology: cardiovascular disease statistics 2025. *Eur Heart J* 2026;47:3499-543.
3. Naeem U, Deo S, Sahebkar A, et al. Global burden of cardiovascular disease: what should be expected in the next 25 years? *Curr Cardiol Rep* 2026;28:31.
4. Goff Jr DC, Khan SS, Lloyd-Jones D, et al. Bending the curve in cardiovascular disease mortality: Bethesda + 40 and beyond. *Circulation* 2021;143:837-51

5. Dattani S. Death rates from cardiovascular disease have fallen dramatically — what were the breakthroughs behind this? Published online at OurWorldinData.org; 2025. Accessed on June 22, 2026. Available from: <https://archive.ourworldindata.org/20260622-080904/cardiovascular-deaths-decline.html>
6. Tan SCW, Zheng BB, Tang ML, et al. Global Burden of Cardiovascular Diseases and its Risk Factors, 1990-2021: A Systematic Analysis for the Global Burden of Disease Study 2021. *QJM* 2025;118:411-22.
7. Global Cardiovascular Risk Consortium; Magnussen C, Ojeda FM, et al. Global effect of modifiable risk factors on cardiovascular disease and mortality. *N Engl J Med* 2023;389:1273-85.
8. The Lancet Public Health. Strengthening cardiovascular disease prevention in Europe. *Lancet Public Health* 2026;11:e69.
9. Bugiardini R, Manfrini O, Cenko E. Unequal access to cardiovascular care: learning from European experience. *Eur Heart J* 2026;ehaf1106.
10. Di Girolamo C, Nusselder WJ, Bopp M, et al. Progress in reducing inequalities in cardiovascular disease mortality in Europe. *Heart* 2020;106:40-9.
11. Timmis A, Kazakiewicz D, Torbica A, et al. Cardiovascular disease care and outcomes in West and South European countries. *Lancet Reg Health Eur* 2023;33:100718.
12. Bugiardini R, Cenko E, Yoon J, et al. Traditional risk factors and premature acute coronary syndromes in South Eastern Europe: a multinational cohort study. *Lancet Reg Health Eur* 2024;38:100824.
13. Czabanowski W, Mone I, Burazeri G. Health status in selected post-communist European countries: a comparative study between Poland and Albania. *Cent Eur J Public Health* 2024;32:63-7.
14. Burazeri G, Stroni C, Draçini X, et al. May Measurement Month 2023: results of an opportunistic blood pressure screening campaign in Albania. *Eur Heart J Suppl* 2026;suag064.
15. Institute for Health Metrics and Evaluation (IHME). Global Burden of Disease estimates. Accessed: 17 July 2026. Available from: <https://vizhub.healthdata.org/gbd-results/>
16. Institute for Health Metrics and Evaluation (IHME). Global Health Data Exchange. Accessed: 17 July 2026. Available from: https://ghdx.healthdata.org/ihme_data
17. Mensah GA, Fuster V, Murray CJL, et al. Global burden of cardiovascular diseases and risks, 1990-2022. *J Am Coll Cardiol* 2023;82:2350-73.

18. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet* 2021;398:957-80.
19. Cenko E, Manfrini O, Fabin N, et al. Clinical determinants of ischemic heart disease in Eastern Europe. *Lancet Reg Health Eur* 2023;33:100698.

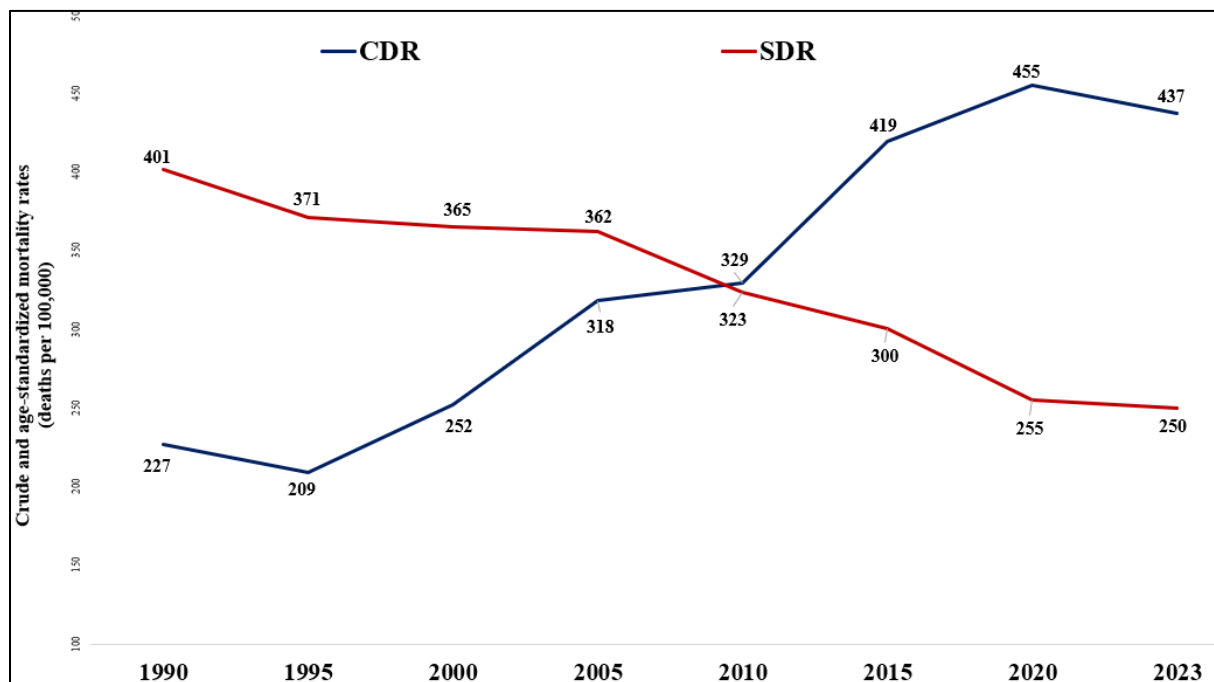


Figure 1. Crude and age-standardized mortality rates (deaths per 100,000 population) from cardiovascular diseases in the Albanian population during 1990-2023. Figure based on the data from the Institute for Health Metrics and Evaluation.¹⁵

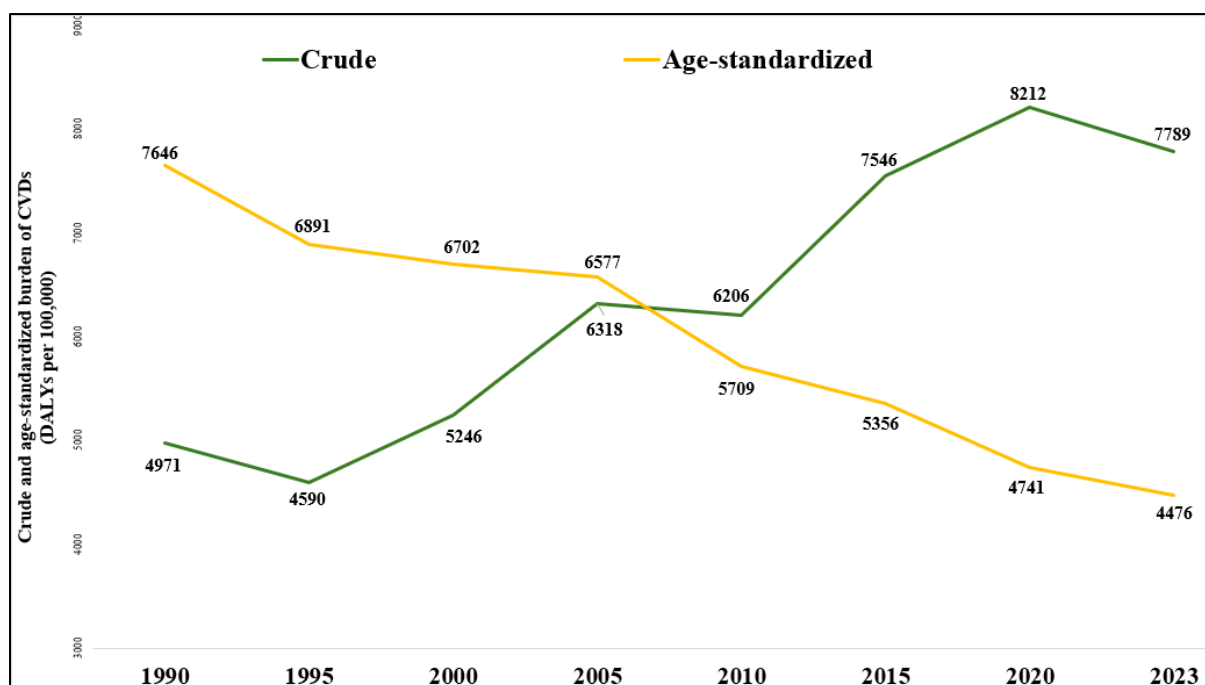


Figure 2. Crude and age-standardized burden of cardiovascular diseases (DALYs per 100,000) in the Albanian population, 1990-2023. Figure based on the data from the Institute for Health Metrics and Evaluation.¹⁵

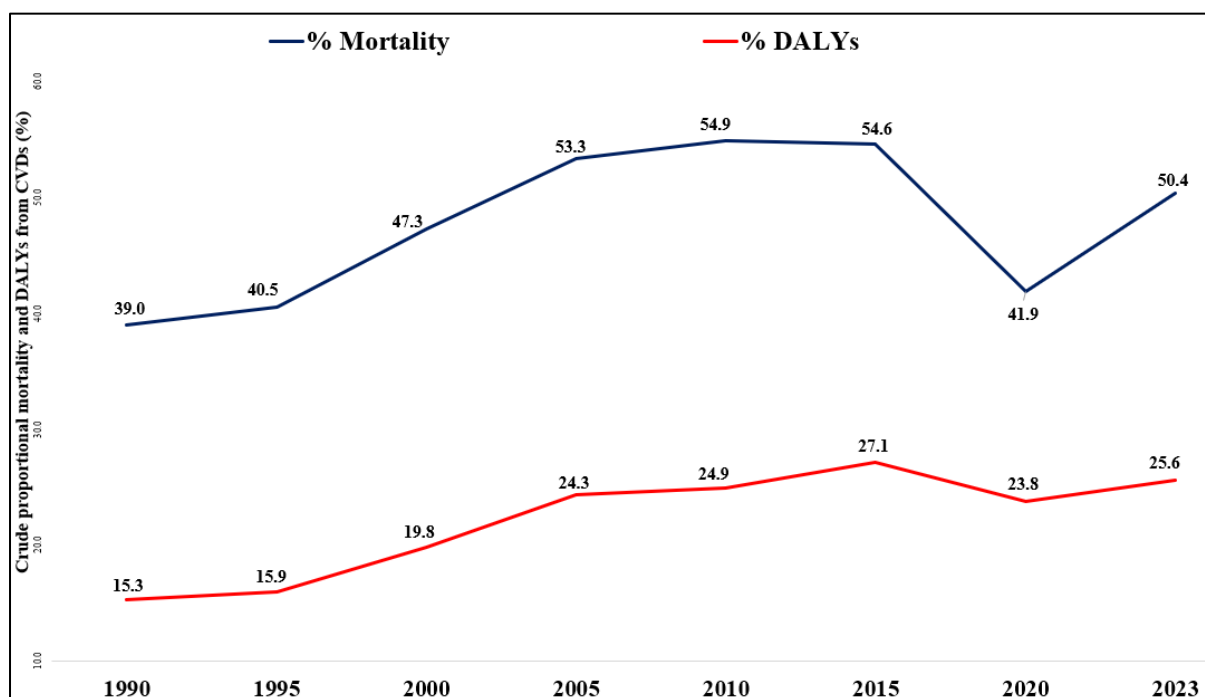


Figure 3. Crude proportional mortality and proportional burden (%) of cardiovascular diseases in the Albanian population, 1990-2023. Figure based on the data from the Institute for Health Metrics and Evaluation.¹⁵

Table 1. Age-standardized mortality and burden of cardiovascular diseases in Southeastern European countries in 1990 to 2023¹⁵

Country	Mortality rate (deaths per 100,000)		Burden of disease (DALYs per 100,000)	
	1990	2023	1990	2023
Albania	401	250	7646	4476
Bosnia and Herzegovina	476	295	9225	5475
Croatia	486	221	8729	3827
Montenegro	509	331	9522	6097
North Macedonia	595	370	10980	6345
Serbia	727	421	12633	6734
Slovenia	388	129	7031	2272

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