Spatial and Temporal Patterns of Disease Burden attributable to High Body Mass Index in Belt and Road Initiative Countries, 1990-2019

Yaxin Xu [1,2†], Qizhe Wang [1†], Tao Yu[3], Yan Han[1], Wei Dai[1], Sunfang Jiang[1,2*], Xiaopan Li [1*]

[1]Department of Health Management Centre, Zhongshan Hospital, Fudan University, Shanghai, 200032, China

[2]Department of General Practice, Zhongshan Hospital, Fudan University, Shanghai, 200032, China

[3] School of Public Health, Fudan University, Shanghai, 200032, China

***Correspondence to:** Xiao-Pan Li, Zhongshan Hospital, No. 180 Fenglin Rd., Xuhui, Shanghai 200032, China. E-mail: xiaopanli0224@126.com. Tel: +86-21-64038038; Sunfang Jiang, Zhongshan Hospital, No. 180 Fenglin Rd., Xuhui, Shanghai 200032, China. E-mail: jiang.sunfang@zs-hospital.sh.cn. Tel: +86-13817597264;

†These authors have contributed equally to this work

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Email addresses:

Yaxin Xu: Email: xuyaxin20@fudan.edu.cn

Qizhe Wang: Email: qizhewang@163.com

Tao Yu: Email: yutaoevan@163.com

Yan Han： sissihy2009@163.com

Wei Dai: Email: dai.wei@zs-hospital.sh.cn

Sunfang Jiang: Email: zsjkglzx@163.com

Xiaopan Li: Email: xiaopanli0224@126.com

Short title: high BMI induced burden in BRI countries

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Abstract

Objective: This study aimed to analyze the spatial and temporal patterns of disease burden attributed to high body mass index (DB-hBMI) from 1990 to 2019 in Belt and Road Initiative (BRI) countries, in light of increasing hBMI prevalence worldwide.

Design: The study was a secondary analysis of global burden of disease 2019 (GBD 2019) that analyzed (using Joinpoint regression analysis) numbers and the age-standardized rate of mortality and disability-adjusted life years (DALYs) of hBMI-induced diseases and their trends from 1990 to 2019 and in the final decade.

Setting: GBD 2019 study data for BRI countries were categorized by country, age, gender, and disease.

Participants: GBD 2019 data were used to analyze DB-hBMI in BRI countries.

Results: In 2019, China, India, and Russia reported the highest mortality and DALYs among BRI countries. From 1990 to 2019, the age-standardized DALYs increased in Southeast Asia and South Asia, whereas many European countries saw declines. Notably, Bangladesh, Nepal, and Vietnam showed the steepest increases, with AAPC values of 4.42%, 4.19%, and 4.28%, respectively (all $P<0.05$). In contrast, Israel, Slovenia, and Poland experienced significant reductions, with APCC values of -1.70%, -1.63%, and -1.58%, respectively (all $P<0.05$). The most rapid increases among males were seen in Vietnam, Nepal, and Bangladesh, while Jordan, Poland, and Slovenia recorded the fastest declines among females. Across most BRI countries, the burden of diabetes and kidney diseases related to hBMI showed a significant uptrend.

Conclusion: DB-hBMI varies significantly by region, age, gender, and disease type across BRI countries. It can pose a substantial threat to public health.

Keywords: Belt and Road Initiative countries; Burden of disease; High body mass index; Disability-adjusted life years; Average annual percent change; Trend analysis

Introduction

China's Belt and Road Initiative (BRI) extends beyond geographical and political boundaries to enhance connections between countries in Asia, Europe, and Africa [(1)]. While BRI countries share huge economic opportunities and potential, they also share some common publish health threats, such as obesity and related disease burdens [(2, 3)].

Obesity, a condition influenced by genetics, environment, and lifestyle factors, significantly elevates the risk of chronic diseases, including type 2 diabetes, heart diseases, certain cancers, and bone and joint disorders[(4-6)]. High body mass index (hBMI), defined as a BMI greater than 25 kg/m^2 (which signifies overweight and obesity), has rapidly emerged as a global health crisis over the past few decades [(7)]. This global health challenge extends across borders, impacting populations worldwide.

Worldwide studies have highlighted the link between hBMI and higher rates of sickness and death [(8, 9)]. In BRI countries, an alarming increase in obesity rates is seen, influenced by diverse cultural, dietary, and socioeconomic landscapes [(7,10)]. Moreover, the simultaneous occurrence of undernutrition and obesity, known as the "double burden of malnutrition," presents a unique challenge in these regions [(11)]. This paradox highlights the multifaceted nature of nutritional issues faced by BRI countries.

While considering the intricate relationship between hBMI and disease burden in BRI countries, this study sought to analyze the disease burden attributable to hBMI (DB-hBMI) in BRI countries from 1990 to 2019. Knowledge of these dynamics is crucial for public health policymakers, healthcare providers, and researchers, as it could inform evidence-based interventions and policies to mitigate health risks associated with obesity.

Methods

Data sources and definitions

This study was conducted using Global Burden of Disease 2019 (GBD 2019) study data obtained from the Institute for Health Metrics and Evaluation (IHME) website. All data for this study were obtained from the IHME website (https://www.healthdata.org/data-tools-practices/data-sources). The detailed methodology has

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been published elsewhere[12, 13].

Mortality, years lived with disability (YLDs), years of life lost (YLLs), and disability-adjusted life years (DALYs) were recorded in this study. Age-standardized rates for mortality, YLDs, YLLs, and DALYs were calculated according to global age structure from 2019. The age-standardized rates were corrected by direct method and the world standard population in order to account for differences in population age structure. Our study followed the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) to ensure its transparency and replicability (Table S1).

Our study focused on the BRI region with 66 participating member states, as detailed elsewhere [14]. The selection of BRI countries aligns with the GBD's categorization of global regions and international political and economic organizations. Additionally, we adopted two other key regional concepts: the World Bank region and the Socio-demographic Index (SDI) region. The SDI, developed in 2015, provides a comprehensive measure of a country or region's development status by considering socioeconomic factors. This index addresses the limitations of other indicators that solely reflect economic and developmental disparities among countries[15]. The World Bank classifies global economies into four income groups: low, lower–middle, upper–middle, and high. Typically, low- and middle-income countries are considered developing, while high-income countries are classified as developed[16].

Statistical analysis

To quantify the DB-hBMI, we calculated age-standardized mortality, YLDs, YLLs, and DALYs for the BRI countries, stratified by gender, age, and disease categories. Age-standardized estimates were adjusted to account for variations in the age distribution of populations, enabling meaningful comparisons across member states. We categorized age using three age groups: 15–49 years, 50–74 years, and ≥75 years. Results of mortality, YLDs, YLLs and DALYs are presented in absolute numbers and age-standardized rates per 100,000 population, along with their respective 95% uncertainty intervals (UIs)[17].

To assess trends in DB-hBMI from 1990 to 2019, we employed the average annual percentage change (AAPC), determined using the Joinpoint Regression Program (version

4.0.4, released May, 2013) [18]. Each estimated metric was accompanied by a 95% confidence interval (CI), providing a measure of statistical uncertainty. Statistical significance was defined as $P<0.05$[19].

Results

The absolute numbers of age-standardized mortality, YLDs, YLLs, and DALYs in 2019 attributed to hBMI within BRI countries are presented in Table 1. In 2019, China reported 764,698.05 cases (95% UI: 333,163.43–1,310,557.19) of deaths and 24.83 million cases (95% UI: 11.79–40.55) of DALYs attributed to hBMI.

As for SDI levels, the regions with the highest mortality rates attributed to hBMI were the high SDI regions and the low SDI regions, with 901,712.38 (95% UI: 573,461.92–1,289,615.62) and 285,467.84 cases (95% UI: 162,714.06–429,330.36), respectively, while the country with the highest DALYs was in the middle SDI region, at 55.46 million cases (95% UI: 36.11–75.81).

Interestingly, significant geographic disparities were observed in the mortality and DALYs attributed to hBMI across member countries. In 2019, the three countries with the highest mortality and DALYs attributed to hBMI were China, India, and the Russian Federation. Based on DALYs, the top three countries in Central Asia with the highest burden attributed to hBMI were Uzbekistan, Kazakhstan, and Azerbaijan. In Central Europe, Poland, Romania, and Bulgaria ranked highest. In Eastern Europe, the countries with the highest DALYs were the Russian Federation, Ukraine, and Belarus. In North Africa and the Middle East, Egypt, Turkey, and Iran exhibited the highest DALYs. Finally, in Southeast Asia, the leading countries were Indonesia, the Philippines, and Thailand.

Figure 1 shows the age-standardized mortality, YLDs, YLLs, and DALYs attributed to hBMI in BRI countries during 1990 and 2019. In 1990, regions with higher mortality, YLDs, YLLs, and DALYs attributed to hBMI were primarily concentrated in North Africa and the Middle East and Central Europe. In BRI countries, countries in North Africa and Middle East with the highest DALYs attributed to hBMI were the United Arab Emirates (5,877.80 per 100,000 population), Qatar (5,514.94 per 100,000 population), and Iraq (5,512.65 per 100,000 population). Conversely, the lowest DALYs were reported by the United Arab Emirates (5,877.80 per 100,000 population), Qatar (5,514.94 per 100,000 population), and Iraq (5,512.65 per 100,000 population) in Asia. In 2019, compared to 1990, most member countries of the BRI experienced either stable or increased DALYs attributed to hBMI. Notably, higher rates were still concentrated in North Africa, the Middle East, Central Europe, and Central Asia. For more detailed information, refer to Supplementary Table S2.

Figure 2 illustrates the temporal trends of age-standardized mortality and DALYs attributed to hBMI in BRI countries from 1990 to 2019 and 2010 to 2019. Between 1990 and 2019, there were distinctive trends in age-standardized mortality and DALYs attributed to hBMI observed among the BRI countries. Notably, Southeast Asian and South Asian nations generally exhibited an upward trajectory in both mortality and DALYs, whereas most European countries experienced a significant decline. In particular, South Asian countries, including Bangladesh and Nepal, along with the Southeast Asian nation Vietnam, demonstrated the most significant increases in DALYs, with AAPC values of 4.42% (95% CI: 4.00% to 4.83%), 4.19% (95% CI: 3.97% to 4.41%), and 4.28% (95% CI: 3.92% to 4.64%), respectively.

Conversely, Israel, together with Slovenia and Poland, saw notable decreases in DALYs, with APCC values of -1.70% (95% CI: -1.85% to -1.55%), -1.63% (95% CI: -1.77% to -1.48%), and -1.58% (95% CI: -1.71% to -1.45%), respectively. While some countries experienced a rising or stable trend in DALYs from 1990 to 2019, a downward trend emerged in the period from 2010 to 2019 for nations such as Oman, Mongolia, and the Russian Federation, with APCC values of -1.94% (95% CI: -2.33% to -1.56%), -1.09% (95% CI: -1.63% to -0.55%), and -2.25% (95% CI: -2.77% to -1.72%), respectively. See Supplementary Table S3 for more details.

Figure 3 depicts the trend changes in age-standardized DALYs for males and females in BRI countries. In South Asia and Southeast Asia, except for Maldives, both males and females witnessed an increasing trend in DALYs (all $P<0.05$). For males, most countries in East Asia, South Asia, Southeast Asia, and Central Asia, except for Georgia, Kazakhstan, and Kyrgyzstan, showed an upward trend in DALYs (all $P<0.05$).

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Among these countries, Vietnam, Bangladesh, and Nepal exhibited the most rapid increases, with AAPC values of 5.10% (95% CI: 4.73% to 5.47%), 4.79% (95% CI: 4.60% to 4.97%), and 4.61% (95% CI: 4.20% to 5.01%), respectively. Conversely, the most significant reductions were noted in Israel, Slovenia, and Czechia, with their AAPC values being -1.75% (95% CI: -1.91% to -1.58%), -1.65% (95% CI: -1.78% to -1.52%), and -1.63% (95% CI: -1.83% to -1.43%), respectively. Unlike males, females in Central Asia (Mongolia and Kazakhstan), Southeast Asia (Maldives), North Africa and the Middle East (Iran, Kuwait, Lebanon, Palestine, Syrian Arab Republic), Central Europe (Macedonia), and Eastern Europe (Belarus, Moldova, Lithuania, Russian Federation) showed a decreasing trend in DALYs (all $P<0.05$).

In female populations, Jordan (North Africa and the Middle East) along with Poland and Slovenia (Central Europe) experienced the most notable declines, with their AAPC values being -0.18% (95% CI: -0.27% to -0.08%), -1.53% (95% CI: -1.67% to -1.40%), and -1.63% (95% CI: -1.83% to -1.43%), respectively (Supplementary Table S4).

Figure 4 depicts the trend changes in age-standardized DALYs across different age groups within BRI countries. Over this period, there was a notable increase in DALYs across all age groups in China, South Asia, and Central Asia, except for Turkmenistan (all $P<0.05$). Individuals aged 20–54 years in most countries in North Africa and the Middle East, Central Europe, Eastern Europe, and Western Europe saw declines in DALYs. In the 50–74-year age group, most countries in Central Asia, North Africa and the Middle East, and Europe experienced a decrease in DALYs. For those aged 75 years and above, Nepal, Vietnam, and Uzbekistan exhibited the most significant increases in DALYs, with AAPC values of 4.16% (95% CI: 3.97% to 4.36%), 4.09% (95% CI: 3.81% to 4.36%), and 3.97% (95% CI: 3.42% to 4.53%), respectively (Supplementary Table S5).

Figure 5 depicts the temporal trends of age-standardized DALYs of hBMI attributed to various diseases. From 1990 to 2019, most BRI countries witnessed a significant increase in DALYs for diabetes and kidney diseases, musculoskeletal disorders, neoplasms, neurological disorders, and sensory organ diseases due to hBMI. Regarding DALYs attributed to hBMI-related cardiovascular diseases, those countries experiencing increased DALYs were

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predominantly in East Asia, South Asia, and Southeast Asia, while those BRI countries showing a decline were mainly in Europe. In terms of DALYs attributed to hBMI-related chronic respiratory diseases, countries such as India, Nepal, Maldives, Sri Lanka, Thailand, Oman, Bosnia and Herzegovina, and Montenegro exhibited an upward trend (all $P<0.05$), while other BRI countries demonstrated a decrease or stability. For DALYs attributed to hBMI-related diabetes and kidney diseases, only Mongolia and Cyprus displayed a downward trend (all $P<0.05$) whereas other BRI countries showed an upward or stable pattern.

In the category of DALYs attributed to hBMI-related digestive diseases, an upward trend was noted in regions such as East Asia (particularly in China), South Asia, Southeast Asia, High-income Asia Pacific, and some European countries. Conversely, most countries showed a decline or remained stable in this aspect. In particular, Bahrain, Mongolia, and Poland experienced significant decreases, with AAPC values of -2.62% (95% CI: -2.94% to -2.30%), -1.96% (95% CI: -2.18% to -1.74%), and -1.73% (95% CI: -1.97% to -1.50%), respectively (Supplementary Table S6).

As for DALYs attributed to hBMI-related neoplasms, only Kazakhstan, Kyrgyzstan, Bahrain, Czechia, Hungary, and Israel demonstrated a decreasing trend (all $P<0.05$), while other BRI countries showed an upward or stable pattern. In the case of DALYs attributed to hBMI-related sensory organ diseases, the majority of countries in North Africa and the Middle East displayed a downward trend, while other BRI countries exhibited an upward or stable trend.

Discussion

In this study, we aimed to investigate the trends and patterns of DB-hBMI across BRI member countries from 1990 to 2019. Our analysis provides valuable insights into the evolving landscape of hBMI-induced diseases in these countries.

Between 1990 and 2019, notable disparities in the trends of DALYs due to hBMI were seen among countries in North Africa, the Middle East, Europe, and Asia. By 1990, regions such as North Africa, the Middle East, and Europe were already facing significant health burdens

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due to hBMI; this was largely attributable to early adoption of Western dietary patterns, sedentary lifestyles, and urbanization. However, in the following years, there was a marked decrease in DALYs caused by hBMI, reflecting joint efforts towards enhancing public health awareness and implementing intervention measures[20, 21]. This decline also highlights the value of Europe's long-term investments in healthcare infrastructure, systems, and public health initiatives [22, 23]. Despite these positive developments, absolute numbers of DALYs attributed to hBMI remain high in North Africa, the Middle East, and Europe, underscoring the necessity to continue and intensify efforts to address the increasing prevalence of hBMI, especially in populous countries. In stark contrast to the downward trends observed in North Africa and the Middle East, South Asia and Southeast Asia have seen an upward trajectory in age-standardized DALYs associated with hBMI. Countries like India, Nepal, and Bangladesh have experienced significant increases in health burdens related to hBMI. These trends are likely influenced by a complex interplay of factors, including rapid urbanization, shifts in dietary patterns, and variations in healthcare accessibility [24]. Addressing the rising health burdens in these regions poses a formidable challenge.

In our analysis, we observed distinct trends in age-standardized DALYs due to hBMI across different regions and genders. For males, there has been a notable increase in DALYs across East Asia, South Asia, Southeast Asia, and Central Asia, suggesting a rising health impact of hBMI. Southeast Asia and South Asia, particularly countries like Vietnam, Nepal, and Bangladesh, has seen the sharpest increases, likely reflecting poor nutritional habits, low physical activity levels, and unhealthy lifestyle choices prevalent in these regions[25]. In contrast, females in certain areas such as North Africa, the Middle East, and parts of Europe, including Eastern and Central Europe, have experienced a decrease in age-standardized DALYs related to hBMI. This gender difference might be attributed to factors like body fat distribution, with females generally having fat stored in less metabolically risky areas compared to males who generally store more abdominal or visceral fat than females[26]. Additionally, the level of physical activity among women in different regions is significantly influenced by cultural and social norms. In some underdeveloped areas of Asia and Africa, restrictions on women's participation in sports and exercise may increase their susceptibility

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to health risks associated with hBMI[27]. In contrast, European regions actively encourage female participation in physical activities, which supports healthier lifestyle choices and contributes to lower BMI levels[27]. These observations underline the complex interplay of dietary habits, lifestyle choices, and sociocultural factors in shaping the health outcomes related to hBMI[28]. Moreover, it highlights the necessity for gender-sensitive and region-specific public health strategies to effectively address the challenges posed by hBMI.

Between 1990 and 2019, China and South Asia experienced a significant rise in DALYs due to hBMI, signaling a health crisis across various age groups. This surge is particularly alarming among youth aged 20–54 years; the increased DALYs among youth underscore the escalating obesity epidemic and its health consequences. The primary drivers of this trend include sedentary lifestyles, unhealthy dietary habits, and restricted healthcare access, further aggravated by the rapid pace of urbanization[29, 30]. The growing prevalence of obesity among the youth not only poses immediate health risks but also threatens long-term economic stability and healthcare system sustainability. Among older adults aged 50–74 years, the increased DALYs reflect the compounded effects of chronic diseases associated with hBMI, such as diabetes and cardiovascular conditions[31]. Aging increases vulnerability to these conditions, underscoring the critical need for effective preventive healthcare measures and robust healthcare infrastructure to mitigate this burden. For those aged 75 years and above, the rise in DALYs is influenced by the general demographic trend towards an older population structure in developed and developing countries. Indeed, advances in healthcare and living standards have led to longer life expectancies, thereby increasing the proportion of elderly individuals in populations[32]. This shift emphasizes the aging society as a key factor in the growing DALYs related to hBMI, as older adults are more prone to the adverse health impacts of hBMI due to age-related metabolic changes[32]. The observed increase in DALYs across all age groups in China and South Asia highlights the urgent need for adaptable healthcare strategies tailored to the region’s evolving demographic profile.

The significant increase in age-standardized DALYs attributed to hBMI from 1990 to 2019 across various disease categories, including diabetes and kidney diseases, musculoskeletal disorders, cancer, neurological disorders, and sensory organ diseases, in most BRI countries,

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reflects the comprehensive impact of hBMI on health. Firstly, hBMI is closely linked to diabetes and kidney diseases(33). It leads to insulin resistance and impaired pancreatic function, increasing the risk of diabetes(4). Diabetes, in turn, can damage kidney function, so hBMI indirectly contributes to kidney diseases. These two conditions interact, making it easier for individuals with hBMI to develop kidney-related complications(34). Secondly, hBMI negatively affects the musculoskeletal system. Excessive weight or obesity places greater stress on joints, leading to joint pain, fractures, and other musculoskeletal issues(35). These problems can limit mobility, further exacerbating the health burden in hBMI individuals. Thirdly, hBMI significantly raises the risk of cancer. Obesity is associated with various cancers, including breast cancer, endometrial cancer, and colorectal cancer. This association may be due to the presence of adipose tissue, which can trigger chronic inflammation and hormonal imbalances, promoting the growth of cancer cells(5). Finally, hBMI has adverse effects on the neurological system and sensory organs. Obesity is linked to neurological disorders like Parkinson’s disease and sensory issues such as vision impairment and hearing loss. Factors such as inflammation, metabolic disruptions, and lipid deposits may contribute to the development of these neurological and sensory problems(36). hBMI not only impacts one system or organ; it triggers chronic diseases through multiple pathways(37). These include chronic inflammation, metabolic disturbances, hormonal imbalances, among others, which interact to promote the development of various diseases(37). Consequently, developing comprehensive public health policies and individual health management plans to address the multifaceted impact of hBMI on health is essential.

The BRI encompasses a vast and geographically diverse part of the world, and, as evidenced by the study results, there are notable disparities among BRI countries in terms of the impact of hBMI on various diseases. These regional variations stem from a complex interplay of socioeconomic, cultural, and healthcare infrastructure factors. Addressing the public health challenges posed by hBMI in BRI countries necessitates robust international collaboration(2). Such collaboration should extend beyond borders and encompass a range of strategies. Firstly, countries within the BRI should establish formal mechanisms for sharing best practices and lessons learned in managing and preventing hBMI-related diseases. This could involve

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regular conferences, workshops, and knowledge-sharing platforms where experts and policymakers come together to exchange insights. Secondly, collaborative epidemiological studies can provide a more comprehensive understanding of the factors contributing to hBMI and its health impacts across the BRI countries. These studies can help identify common trends and shared risk factors, which can inform the development of region-specific preventive measures. Furthermore, pooling resources and expertise for healthcare infrastructure development can address healthcare accessibility issues, particularly in less developed regions of the BRI. International funding and support can play a pivotal role in upgrading healthcare facilities and training healthcare professionals.

This study also has several limitations. Firstly, the analysis relies primarily on data from the GBD study, which compiles data from various sources, including surveys, censuses, and hospital records. While the GBD study is a valuable resource, it may still be subject to data inaccuracies, misreporting, or underreporting in some regions, potentially affecting the accuracy of our findings. Secondly, the study focuses on BRI countries that have a wide range of economic, cultural, and geographical differences. While we have attempted to provide a comprehensive analysis, there may be nuances within individual countries or sub-regions that our study may not have fully captured. Sub-national variations in disease prevalence, healthcare infrastructure, and public health policies could impact the overall trends observed. Nonetheless, we believe that this study provides valuable insights into the relationship between hBMI and disease burden, offering valuable information for future public health policies and interventions.

Conclusions

Our study spanning BRI countries from 1990 to 2019 reveals a concerning trend in DB-hBMI. While some countries have experienced declining trends in DALYs from hBMI, others, particularly in South Asia and Southeast Asia, have seen an alarming rise. This calls for targeted interventions to address the multifaceted impact of hBMI on health. Tailoring healthcare strategies to the unique challenges faced by each region is essential, considering sociocultural and economic factors that contribute to these disparities. Therefore, collaboration among BRI countries is essential to devise and enact effective measures aimed

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at alleviating the impact of hBMI-induced diseases.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authorship: XL conceived and designed the study, TY,YX,QW and XL analyzed the data, QW, XL and SJ provided significant advice and consultation. YX wrote the manuscript. All authors read and approved the submitted manuscript.

Ethical Standards Disclosure: This study relied on publicly available data from the Global Burden of Disease (GBD) database. Since the study involved secondary data analysis and did not directly involve human subjects, patient data, or interventions, it was exempt from institutional ethical review board approval.

Data Availability Statement

To download the data used in these analyses, please visit the Global Health Data Exchange GBD 2019 website.

References

1. Tambo E, Khayeka-Wandabwa C, Muchiri GW *et al.* (2019) China's Belt and Road Initiative: Incorporating public health measures toward global economic growth and shared prosperity. *Glob Health J* 3, 46-49.
2. Tang K, Li Z, Li W *et al.* (2017) China's Silk Road and global health. *Lancet* 390, 2595-2601.
3. The Lancet Gastroenterology H (2021). Obesity: another ongoing pandemic. *Lancet Gastroenterol Hepatol* 6, 411.
4. Piché ME, Tchernof A Després JP (2020) Obesity Phenotypes, Diabetes, and Cardiovascular Diseases. *Circ Res* 126, 1477-1500.
5. Avgerinos KI, Spyrou N, Mantzoros CS *et al.* (2019) Obesity and cancer risk: Emerging biological mechanisms and perspectives. *Metabolism* 92, 121-135.
6. Wearing SC, Hennig EM, Byrne NM *et al.* (2006) Musculoskeletal disorders associated with obesity: a biomechanical perspective. *Obes Rev* 7, 239-250.
7. Blüher M (2019) Obesity: global epidemiology and pathogenesis. *Nat Rev Endocrinol* 15, 288-298.
8. Abdelaal M, le Roux CW Docherty NG (2017) Morbidity and mortality associated with obesity. *Ann Transl Med* 5, 161.
9. Kivimäki M, Strandberg T, Pentti J *et al.* (2022) Body-mass index and risk of obesity-related complex multimorbidity: an observational multicohort study. *Lancet Diabetes Endocrinol* 10, 253-263.
10. Jia P & Wang Y (2019) Global health efforts and opportunities related to the Belt and Road Initiative. *Lancet Glob Health* 7, e703-e705.
11. Popkin, B. M., Corvalan, C., & Grummer-Strawn, L. M. (2020). Dynamics of the double burden of malnutrition and the changing nutrition reality. *Lancet* 395, 65-74.
12. GBD 2019 Diseases and Injuries Collaborators (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 396, 1204-1222.

https://doi.org/10.1017/S1368980024001253 Published online by Cambridge University Press

13. GBD 2019 Meningitis Antimicrobial Resistance Collaborators (2023). Global, regional, and national burden of meningitis and its aetiologies, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Neurol* 22, 685-711.

14. Zhang Y, Luo Z, Yi J *et al.* (2023) Burden and trends of stroke attributable to dietary risk factors from 1990 to 2019 in the Belt and Road Initiative countries: an analysis from the global burden of disease study 2019. *Front Nutr* 10, 1235271.

15. Andersen LB (2007) Physical activity and health. *BMJ (Clinical research ed)* 334, 1173.

16. How does the World Bank divide economies' income levels. http://www.stats.gov.cn/zsk/snapshoot?reference=33e2b9cdb6391521c53328be6244e40b_E6DA54C3D7C349E7DA6040449FF84CE7&siteCode=tjzsk (accessed 2023-01-01

17. Roth GA, Mensah GA, Johnson CO *et al.* (2020) Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. *J Am Coll Cardiol* 76, 2982-3021.

18. Clegg LX, Hankey BF, Tiwari R *et al.* (2009) Estimating average annual per cent change in trend analysis. *Statistics in medicine* 28, 3670-3682.

19. GBD 2019 Stroke Collaborators (2021) Global, regional, and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology* 20, 795-820.

20. Shibli H, Aharonson-Daniel L Feder-Bubis P (2021) Perceptions about the accessibility of healthcare services among ethnic minority women: a qualitative study among Arab Bedouins in Israel. *Int J Equity Health* 20, 117.

21. Mannucci PM & Peyvandi F (2023) Air pollution and cardiovascular health in Middle East and North Africa: many shadows but some light. *Eur J Prev Cardiol* 30, 254-255.

22. Stenzinger A, Moltzen EK, Winkler E *et al.* (2023) Implementation of precision medicine in healthcare-A European perspective. *J Intern Med* 294, 437-454.

https://doi.org/10.1017/S1368980024001253 Published online by Cambridge University Press

23. Greer SL, Hervey TK, Mackenbach JP *et al.* (2013) Health law and policy in the European Union. *Lancet* 381, 1135-1144.

24. Ng MFleming TRobinson M *et al.* (2014) Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 384, 766-781.

25. Khandelwal S & Reddy KS (2013) Eliciting a policy response for the rising epidemic of overweight-obesity in India. *Obes Rev* 14 Suppl 2, 114-125.

26. Karastergiou K, Smith SR, Greenberg AS *et al.* (2012) Sex differences in human adipose tissues - the biology of pear shape. *Biol Sex Differ* 3, 13.

27. Coleman L, Cox L Roker D (2008) Girls and young women's participation in physical activity: psychological and social influences. *Health Educ Res* 23, 633-647.

28. Zaragoza J, Generelo E, Julián JA *et al.* (2011) Barriers to adolescent girls' participation in physical activity defined by physical activity levels. *J Sports Med Phys Fitness* 51, 128-135.

29. Gore FM, Bloem PJ, Patton GC *et al.* (2011) Global burden of disease in young people aged 10-24 years: a systematic analysis. *Lancet* 377, 2093-2102.

30. Powell-Wiley TM, Poirier P, Burke LE *et al.* (2021) Obesity and Cardiovascular Disease: A Scientific Statement From the American Heart Association. *Circulation* 143, e984-e1010.

31. Palmer AK & Jensen MD (2022) Metabolic changes in aging humans: current evidence and therapeutic strategies. *J Clin Invest* 132.

32. Bloom DE & Luca DL (2016) Chapter 1 - The Global Demography of Aging: Facts, Explanations, Future. In *Handbook of the Economics of Population Aging*, vol. 1, pp. 3-56 [J Piggott and A Woodland, editors]: North-Holland.

33. Larsson SC & Burgess S (2021) Causal role of high body mass index in multiple chronic diseases: a systematic review and meta-analysis of Mendelian randomization studies. *BMC Med* 19, 320.

34. Kjaergaard AD, Teumer A, Witte DR *et al.* (2022) Obesity and Kidney Function: A Two-Sample Mendelian Randomization Study. *Clin Chem* 68, 461-472.

https://doi.org/10.1017/S1368980024001253 Published online by Cambridge University Press

35. Anandacoomarasamy A, Caterson I, Sambrook P *et al.* (2008) The impact of obesity on the musculoskeletal system. *Int J Obes (Lond)* 32, 211-222.

36. O'Brien PD, Hinder LM, Callaghan BC *et al.* (2017) Neurological consequences of obesity. *Lancet Neurol* 16, 465-477.

37. Larsson SC & Burgess S (2021) Causal role of high body mass index in multiple chronic diseases: a systematic review and meta-analysis of Mendelian randomization studies. *BMC Medicine* 19, 320.

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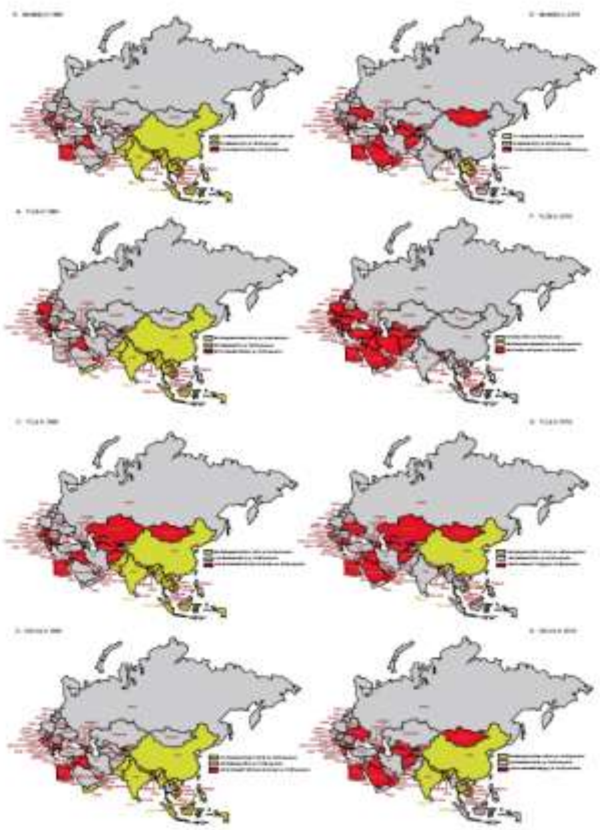

Figure 1. Age-standardized mortality, YLDs, YLLs, and DALYs attributed to hBMI for BRI countries in 1990 and 2019

(A) Age-standardized mortality in 1990. (B) Age-standardized YLDs in 1990. (C) Age-standardized YLLs in 1990. (D) Age-standardized DALYs in 1990. (E) Age-standardized mortality in 2019. (F) Age-standardized YLDs in 2019. (G) Age-standardized YLLs in 2019. (H) Age-standardized DALYs in 2019.

(YLDs, years lived with disability; YLLs, years of life lost; DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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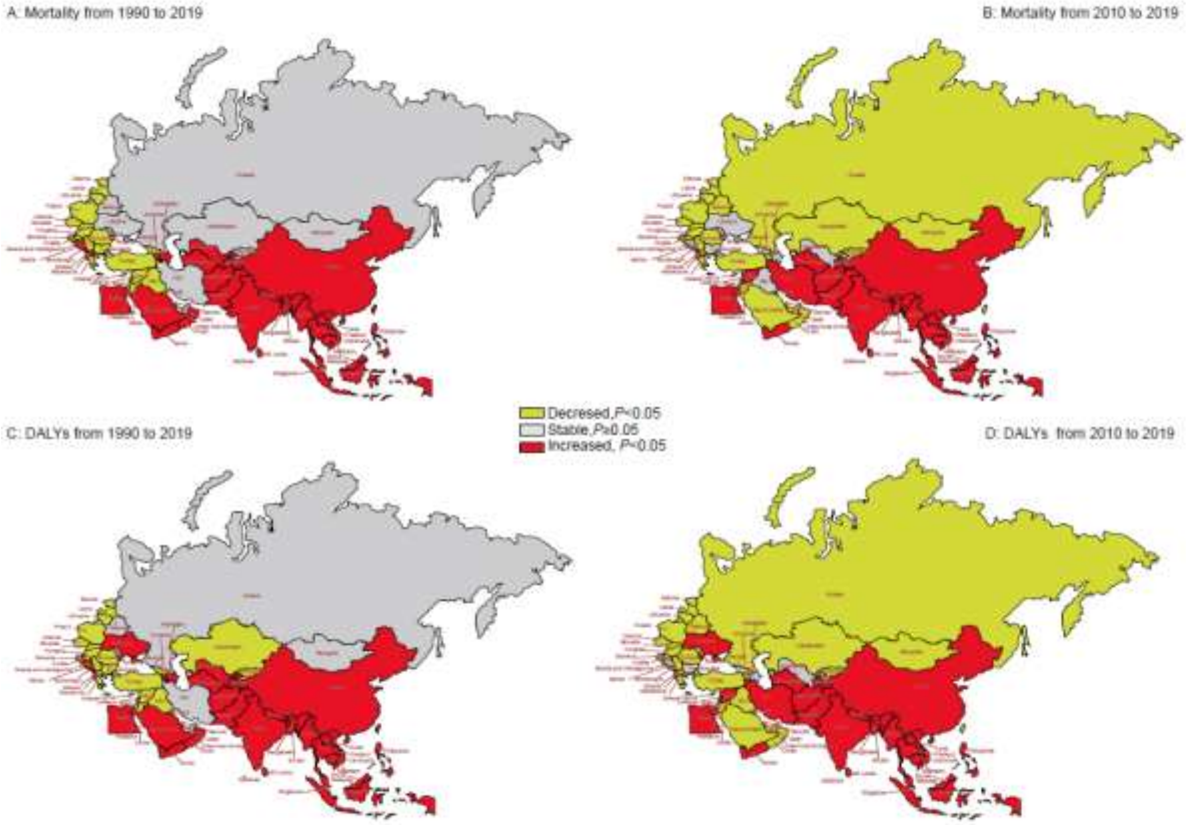

Figure 2. The temporal trend in the age-standardized mortality and DALYs rate attributed to hBMI for 1990–2019 and 2010–2019 in BRI countries

(A) The AAPC of age-standardized mortality rate from 1990 to 2019. (B) The AAPC of age-standardized mortality rate from 2010 to 2019. (C) The AAPC of age-standardized DALYs rate from 1990 to 2019. (D) The AAPC of age-standardized DALYs rate from 2010 to 2019.

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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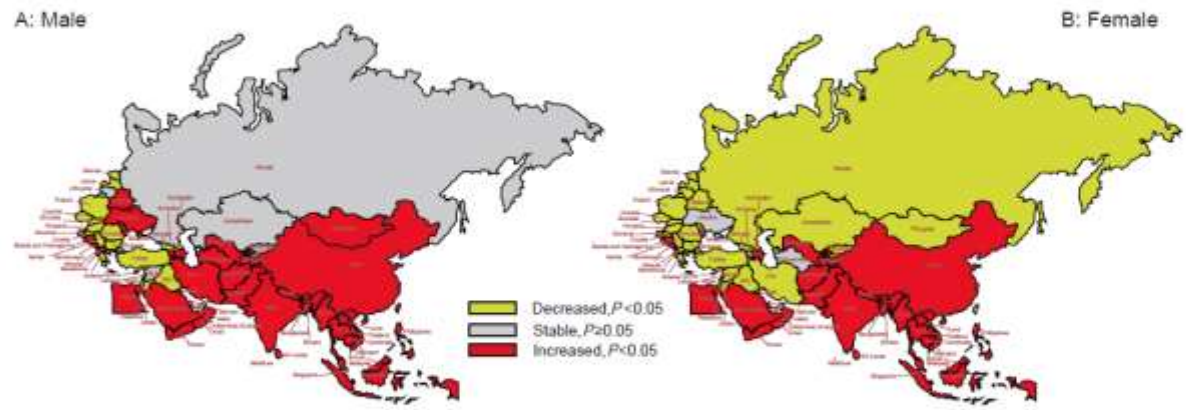

Figure 3. The temporal trend in the age-standardized DALYs rate attributed to hBMI, stratified by gender for 1990–2019 in BRI countries

(A) The AAPC of age-standardized DALYs rate in males. (B) The AAPC of age-standardized DALYs rate in females.

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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Figure 4. The temporal trend in the DALYs rate attributed to hBMI, stratified by age for 1990–2019 in BRI countries

(A) The AAPC of DALYs rate in people aged 20–54 years. (B) The AAPC of DALYs rate in people aged 50–74 years. (C) The AAPC of DALYs rate in people aged ≥75 years.

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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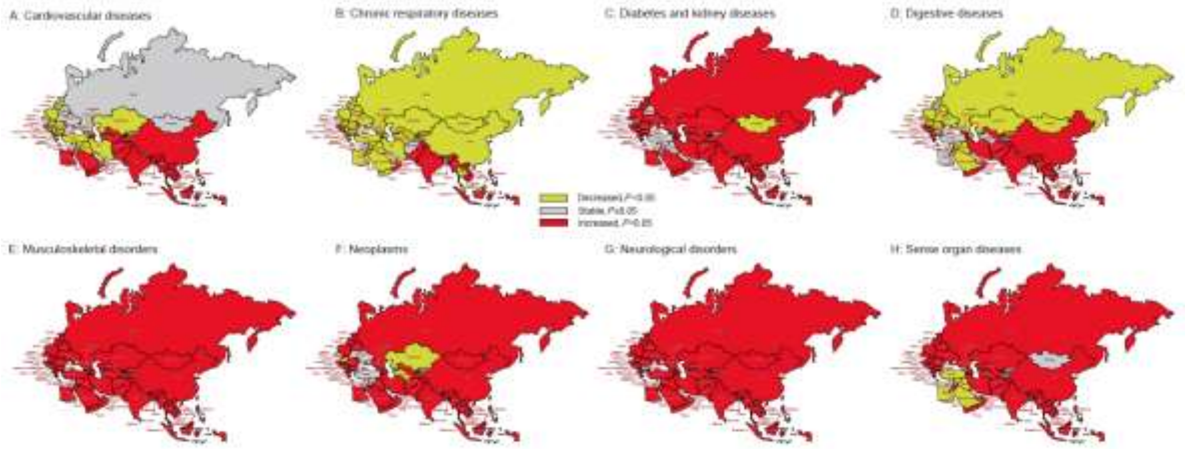

Figure 5. The temporal trend in the DALYs rate of attributed to hBMI, stratified by disease for 1990–2019 in the BRI countries

(A) Cardiovascular diseases. (B) Chronic respiratory diseases. (C) Diabetes and kidney diseases. *(D) Digestive diseases. (E) Musculoskeletal disorders. (F) Neoplasms. (G) Neurological disorders. (H) Sensory organ diseases.*

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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Supplementary Table Legends

Table S1. GATHER checklist of information included in reports of global health estimates

(GATHER, the Guidelines for Accurate and Transparent Health Estimates Reporting)

Table S2. The age-standardized mortality, YLDs, YLLs, and DALYs attributed to hBMI for the BRI countries in 1990 and 2019

(YLDs, years lived with disability; YLLs, years of life lost; DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

Table S3. The average annual percentage change (AAPC) of mortality and DALY rates attributed to hBMI for 1990–2019 and 2010–2019 in the BRI countries

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

Table S4. The average annual percentage change (AAPC) of mortality and DALY rates attributed to hBMI, stratified by gender for 1990–2019 in the BRI countries

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

Table S5. The average annual percentage change (AAPC) of DALY rates attributed to hBMI, stratified by age for 1990–2019 in the BRI countries

(DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

Table S6. The average annual percentage change (AAPC) of age-standardized rates for DALYs attributed to hBMI, stratified by disease for 1990–2019 in the BRI countries (DALYs, disability-adjusted life-years; BMI, body mass index; BRI, Belt and Road Initiative)

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Table 1. The absolute number of mortalities, YLDs, YLLs, and DALYs attributed to hBMI in the BRI countries in 2019

	Mortality		**YLDs**		**YLLs**		**DALYs**	
Countries	**N**	***95%UI***	**N**	***95%UI***	**N**	***95%UI***	**Number**	***95%UI***
Global	5019360	3223363.53 to 7110735.87	40881595.32	24508834.36 to 60876504.10	119383762.2	79596109.62 to 163875518.20	160265357.5	105969034.16 to 218870439.29
SDI levels								
High SDI	901712.4	573461.92 to 1289615.62	10122478.78	6183273.93 to 15026786.57	16686601.34	11174552.43 to 22544644.27	26809080.12	18213630.98 to 36348663.17
High–middle SDI	1376628	877166.34 to 1953868.91	10150023.08	5993344.26 to 15279099.81	29437622.11	19353854.52 to 40659948.15	39587645.2	26141026.08 to 54009606.73
Middle SDI	1647281	1051541.86 to 2333137.27	12878701.91	7720777.62 to 19263210.75	42587187.55	28028288.41 to 58701677.59	55465889.46	36710764.42 to 75810217.60
Low–middle SDI	804748.2	490929.88 to 1158653.50	5809393.79	3370046.12 to 8900243.99	22197728.4	13841015.51 to 31191364.79	28007122.19	17469918.70 to 39227161.94
Low SDI	285467.8	162714.06 to 429330.36	1892548.01	1038467.39 to 2966649.54	8384282.2	4913688.72 to 12264607.41	10276830.2	6088925.88 to 14897026.50
World Bank income levels								
World Bank high income	1129489	717022.29 to 1615082.54	12122739.9	7399228.01 to 18044607.41	20392869.11	13681655.56 to 27577282.04	32515609.01	22039488.01 to 44079689.44
World Bank upper middle income	2031572	1233150.71 to 2979293.52	16184636.63	9326744.34 to 24873884.73	47170541.45	29510961.20 to 67439620.77	63355178.09	40093386.51 to 89552347.54

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World Bank lower middle income	1669245	1086415.68 to 2312343.75	11395503.53	6967229.61 to 16881143.26	46346137.12	30995385.44 to 63110831.84	57741640.65	38606805.99 to 78205714.84
World Bank low income	185479.5	105038.11 to 280056.57	1149894.67	639316.73 to 1807604.74	5382606.31	3104278.18 to 7936760.36	6532500.97	3837450.86 to 9557327.37
East Asia								
China	########	333163.43 to 1310557.19	6510941.31	3083112.91 to 11058881.54	18319099.53	30510023.55 to 24830040.84	24830040.84	11788975.74 to 40545898.53
Central Asia								
Armenia	4463.21	2959.97 to 6240.38	27873.24	17666.62 to 40410.59	95240.40	128725.91 to 123113.64	123113.64	84876.53 to 164797.14
Azerbaijan	14333.01	9223.45 to 19680.47	75219.13	46891.19 to 110178.82	363690.87	494292.42 to 438910.00	438910.00	293225.69 to 593146.72
Georgia	8567.96	5519.09 to 12100.70	38701.64	24341.68 to 56287.53	173252.07	238906.06 to 211953.72	211953.72	143543.74 to 286655.30
Kazakhstan	22827.82	15045.94 to 31139.90	150158.69	96890.86 to 213937.70	553272.98	746472.36 to 703431.67	703431.67	497832.89 to 927382.70
Kyrgyzstan	4479.05	2793.69 to 6450.32	24732.29	15209.14 to 36568.75	115394.31	160893.13 to 140126.60	140126.60	92915.24 to 194284.43
Mongolia	3587.19	2098.96 to 5337.78	12481.38	7606.87 to 18468.79	110954.50	163502.00 to 123435.89	123435.89	75315.71 to 178620.74
Tajikistan	4664.91	2471.86 to 7338.73	25960.95	14161.60 to 40696.54	128625.55	200399.21 to 154586.49	154586.49	85771.98 to 235092.75
Turkmenistan	6872.24	4363.52 to 9710.85	32228.70	20536.76 to 46176.75	189614.55	263560.55 to 221843.25	221843.25	148726.97 to 300074.53
Uzbekistan	39316.78	25080.74 to 54534.60	180824.06	115156.35 to 259026.04	1114001.31	1533237.08 to 1294825.38	1294825.38	863510.18 to 1750811.30
South Asia								
Bangladesh	43802.93	20447.04 to 73149.96	340251.30	171650.52 to 561284.35	1301880.22	2095983.68 to 1642131.52	1642131.52	857456.29 to 2597199.37

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Bhutan	307.48	161.64 to 480.54	2482.77	1421.54 to 3811.27	8149.80	12576.99 to 10632.58	10632.58	6026.86 to 15900.92
India	########	341683.75 to 846048.17	4827871.52	2831223.38 to 7331446.69	16189972.68	23404901.37 to 21017844.19	21017844.19	12727180.45 to 29671449.31
Nepal	9144.73	4420.22 to 14940.66	77979.31	40458.34 to 123854.21	250463.03	402269.66 to 328442.34	328442.34	173959.80 to 516118.00
Pakistan	########	56802.53 to 153679.14	600428.34	332474.30 to 932230.44	3016768.66	4606869.10 to 3617197.00	3617197.00	2090693.61 to 5436223.22
Maldives	109.96	59.14 to 172.55	1603.81	909.34 to 2452.44	3202.72	4774.29 to 4806.53	4806.53	
Sri Lanka	15935.90	8843.09 to 24990.29	171687.76	95793.21 to 257545.93	362422.31	565471.79 to 534110.08	534110.08	
Southeast Asia								
Cambodia	5254.57	2525.39 to 8866.85	39309.82	18150.19 to 67442.06	148853.67	247761.99 to 188163.49	188163.49	93724.42 to 309928.53
Indonesia	########	112309.32 to 272996.00	1196991.13	720884.19 to 1756171.36	5811306.16	8338420.10 to 7008297.29	7008297.29	4470008.57 to 9865705.66
Laos	3528.84	1849.51 to 5366.94	24020.87	13194.31 to 36930.80	108226.22	164146.61 to 132247.09	132247.09	72428.35 to 195894.35
Malaysia	19105.03	11616.16 to 27845.81	194827.05	123825.15 to 278615.47	517055.96	741489.84 to 711883.01	711883.01	465516.28 to 993156.27
Burma	31197.40	16303.88 to 48521.18	198790.88	106909.24 to 309890.01	915657.36	1402511.33 to 1114448.24	1114448.24	610636.78 to 1666872.20
Philippines	65200.21	37358.30 to 95326.11	386556.97	219368.75 to 576478.26	1945079.53	2811972.97 to 2331636.50	2331636.50	1391216.62 to 3317185.97
Thailand	43872.58	24367.01 to 69412.87	478633.24	281990.39 to 726328.32	1142279.10	1785790.28 to 1620912.34	1620912.34	991658.49 to 2418563.97
Vietnam	37980.53	17910.55 to 65256.40	261562.50	117509.20 to 443908.36	985802.71	1672072.00 to 1247365.21	1247365.21	595339.15 to 2095761.65

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High-income Asia Pacific								
Brunei	187.29	101.55 to 285.46	2557.56	1364.75 to 4106.57	5273.40	7851.49 to 7830.96	7830.96	4423.20 to 11522.95
Singapore	1777.38	1001.16 to 2668.95	36424.06	21063.45 to 54891.14	40055.19	56932.96 to 76479.25	76479.25	47104.42 to 109578.70
North Africa and Middle East								
Afghanistan	22048.09	13613.48 to 32635.06	108823.13	67800.92 to 160469.75	682610.47	1020105.19 to 791433.60	791433.60	500584.75 to 1153715.64
Bahrain	1126.95	767.90 to 1503.63	18465.20	11931.59 to 26085.71	30513.61	40473.18 to 48978.81	48978.81	35007.29 to 63283.96
Egypt	########	83823.59 to 184740.86	633650.17	410033.95 to 916343.20	3583715.25	5089023.38 to 4217365.43	4217365.43	2842298.41 to 5775491.54
Iran	61415.08	43342.06 to 81357.86	582597.88	376877.74 to 826857.99	1406859.13	1817253.28 to 1989457.00	1989457.00	1441099.58 to 2561405.68
Iraq	36481.23	23495.51 to 51145.91	261872.54	167171.35 to 376816.77	974924.10	1381835.36 to 1236796.63	1236796.63	841165.94 to 1672505.65
Jordan	7548.11	5303.12 to 9857.36	78149.50	51585.64 to 110102.96	184468.48	239622.49 to 262617.97	262617.97	190314.45 to 340017.08
Kuwait	2316.51	1595.66 to 3014.26	44045.57	29428.61 to 61010.72	64611.72	83443.92 to 108657.29	108657.29	80241.70 to 137858.51
Lebanon	6164.95	3950.62 to 8492.61	48424.62	30222.97 to 70218.53	133535.19	181964.63 to 181959.81	181959.81	122434.44 to 242467.98
Oman	2416.72	1677.12 to 3161.99	26302.56	17036.92 to 37533.75	66723.75	87112.01 to 93026.30	93026.30	67425.26 to 119734.19
Palestine	2815.67	1805.51 to 3959.70	23036.11	14227.18 to 33460.54	72268.80	98502.43 to 95304.92	95304.92	65962.55 to 127229.67
Qatar	962.61	649.13 to 1306.75	28982.95	19066.28 to 40285.98	28411.82	39348.33 to	57394.76	42382.33 to

						57394.76		74978.11
Saudi Arabia	28038.52	18986.99 to 37000.77	290906.48	195678.51 to 403655.05	892913.40	1195029.50 to 1183819.88	1183819.88	845228.87 to 1535554.66
Syrian Arab Republic	16053.71	9631.36 to 24011.73	102104.73	63864.13 to 149477.96	423161.11	630618.50 to 525265.85	525265.85	332188.15 to 746285.31
Turkey	80117.91	50253.04 to 114778.60	713462.88	446590.60 to 1041038.19	1667604.17	2344485.72 to 2381067.06	2381067.06	1609700.55 to 3206363.48
United Arab Emirates	7622.57	5210.04 to 10334.73	98110.40	66380.41 to 135590.14	275109.96	379385.57 to 373220.36	373220.36	272001.78 to 487534.07
Yemen	11780.35	6337.49 to 19074.88	64341.61	35581.51 to 99114.85	346538.97	559857.31 to 410880.59	410880.59	228750.66 to 650581.28
Israel	5134.26	3040.91 to 7427.71	54105.21	31047.62 to 83803.78	83727.08	117508.00 to 137832.30	137832.30	
Central Europe								
Albania	3119.74	1771.99 to 4890.07	21037.60	12573.34 to 32032.64	60890.43	94100.50 to 81928.02	81928.02	50720.29 to 121076.57
Bosnia and Herzegovina	5845.16	3631.55 to 8459.47	46588.37	28319.46 to 68851.71	115407.29	166818.02 to 161995.66	161995.66	107608.59 to 225464.06
Bulgaria	22741.70	13987.43 to 32959.61	93586.73	57589.47 to 137908.49	459445.83	657461.12 to 553032.56	553032.56	366222.08 to 772293.38
Croatia	7659.50	4642.90 to 11205.63	57876.02	36060.65 to 84398.16	131667.87	189789.86 to 189543.89	189543.89	125153.53 to 261698.93
Czechia	17453.23	10756.18 to 25049.05	182785.02	115412.55 to 266537.04	300269.94	424258.01 to 483054.97	483054.97	326404.84 to 656158.20
Hungary	20489.59	13428.82 to 28601.44	139455.45	88413.83 to 203187.10	379007.22	522943.52 to 518462.67	518462.67	363144.51 to 698750.50
Monteneg	1218.46	778.91 to 1721.66	8220.78	5247.38 to 11923.12	25328.04	34446.86 to 33548.82	33548.82	22998.93 to 44631.55

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ro								
Macedonia	4675.73	2957.17 to 6678.19	29253.70	18063.55 to 42628.84	98102.17	139373.03 to 127355.88	127355.88	86767.61 to 175118.53
Poland	57514.19	35751.18 to 80008.25	494078.46	311598.07 to 703927.33	1067673.36	1460769.23 to 1561751.82	1561751.82	1058385.20 to 2102608.24
Romania	42107.26	28402.21 to 58166.69	233598.11	151896.32 to 335404.70	796408.40	1074964.28 to 1030006.51	1030006.51	732868.09 to 1367060.48
Serbia	19160.86	11645.68 to 27428.88	122263.38	75648.20 to 178318.38	366452.32	518561.73 to 488715.70	488715.70	320977.58 to 666842.70
Slovakia	8778.55	5525.45 to 12672.95	62246.72	38927.63 to 90058.16	167724.22	243127.87 to 229970.94	229970.94	153796.83 to 317478.25
Slovenia	2604.75	1576.28 to 3873.45	25155.15	15781.18 to 36673.05	40448.95	58985.79 to 65604.10	65604.10	43097.10 to 91626.50
Eastern Europe								
Belarus	19271.67	11336.13 to 28420.28	82251.65	50538.67 to 120496.06	399760.47	584567.95 to 482012.11	482012.11	303184.03 to 687250.79
Estonia	3026.34	1887.18 to 4308.64	14269.70	8985.93 to 20594.03	48212.35	68064.42 to 62482.05	62482.05	42458.25 to 84970.24
Latvia	4365.93	2770.38 to 6275.45	22452.74	13966.74 to 32569.89	78309.53	109973.23 to 100762.27	100762.27	68570.41 to 139321.56
Lithuania	5806.73	3515.30 to 8376.72	28271.80	17061.07 to 42087.05	101158.35	142431.48 to 129430.15	129430.15	83345.01 to 178820.38
Moldova	6769.34	4403.72 to 9460.36	35672.98	22313.45 to 52438.92	142063.68	193438.61 to 177736.66	177736.66	121238.99 to 239858.64
Russian Federation	########	181342.97 to 390743.23	1304994.87	816177.97 to 1879125.33	6041881.25	8251349.57 to 7346876.11	7346876.11	4996033.55 to 9880900.57
Ukraine	########	75556.85 to 161688.65	416151.97	262157.25 to 600340.27	2484521.23	3427283.26 to 2900673.21	2900673.21	1963237.07 to 3932560.85
Western								

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Europe								
Cyprus	802.42	470.88 to 1191.83	8715.50	4989.62 to 13585.94	14546.90	21105.25 to 23262.41	23262.41	14076.63 to 33600.71
Greece	13079.97	7306.49 to 19659.05	93876.55	53840.69 to 147851.13	209409.98	301688.48 to 303286.53	303286.53	182982.32 to 431464.30

(YLDs, years lived with disability; YLLs, years of life lost; DALYs, disability-adjusted life-years; UI, uncertainty interval; BMI, body mass index; BRI, Belt and Road Initiative)

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