Article

Mapping drivers of life expectancy change in Asia from 1990 to 2023

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Life expectancy is a key indicator of population health and an important guide for health policy[1,2]. Although Asia represents approximately 60% of the global population, studies of longitudinal trends in life expectancy and their underlying drivers across Asian countries remain limited, with most previous research focused on western or high-income settings[3–6]. Here we provide a comprehensive analysis of life expectancy, cause-specific mortality and risk factors in 1990–2023 across 34 Asian countries and territories, utilizing data from the Global Burden of Disease Study 2023[1,7]. Life expectancy increased in all countries and territories between 1990 and 2023, with the largest annual gains observed in South Asia and the smallest annual gains in high-income Asia Pacific countries and territories. Reductions in cardiovascular disease mortality were the primary contributors to life expectancy gains in Central Asia, East Asia and high-income Asia Pacific, whereas declines in diarrhoeal diseases and tuberculosis contributed most in South and Southeast Asia. In 2019–2023, life expectancy declined in several Asian regions, largely driven by the COVID-19 pandemic, with a nearly two-year loss in the first year of the pandemic. The causes of changes in life expectancy and the contributing risk factors varied across regions and countries/territories. Therefore, under the principles of proportional universalism, proactive and effective policies at both regional and national levels are essential to reduce premature mortality and reduce life expectancy inequalities across Asia.

The Global Burden of Disease Study (GBD) has systematically and comprehensively recorded and analysed causes of death and life expectancy stratified by age, sex and time globally[1]. This information has been used to guide policy solutions, reduce modifiable risk factors, monitor and evaluate global, regional and national health interventions, and ultimately improve health recommendations[7]; therefore, comprehensive, comparable and timely estimates of life expectancy and causes of death are essential for evaluating, understanding and addressing trends in population health. However, life expectancy is not uniformly distributed but varies significantly due to socioeconomical and geographical disparities, which include access to and quality of health-care infrastructure, timeliness of health-care responses, and exposure to region-specific causes or risk factors[7,8].

Overall, global trends in life expectancy have shown gradually increasing trends from 1990 to 2021 (ref. 7). However, there are significant differences in the absolute values and rates of increase in life expectancy among regions, sexes and countries/territories. Most studies on life expectancy have predominantly focused on western countries or high-income countries (HICs)[3–6], whereas research on Asian countries/territories or low-income and middle-income countries (LMICs) remains limited. In addition, disparities in life expectancy have become more pronounced following global health challenges or pandemics such as COVID-19 (refs. 9–11). Although some regions have successfully implemented measures such as pandemic preparedness, targeted and population-based public health interventions and resilient health-care systems, leading to stable life expectancy, others have experienced significant declines[12,13]. GBD 2023 builds on but goes beyond the scope of recent GBD 2021 capstone studies[1,2,7] by providing more in-depth, cause-specific estimates of mortality and life expectancy for all 34 Asian countries and territories, including China and India[7,9]. Unlike the global perspectives, we further identify the top ten positive and negative contributors to life expectancy in each Asian country or territory, offering regional and country/territory-specific evidence to guide the targeting of policy interventions[7,9].

Over the past three decades, many causes of death have declined, with some becoming geographically concentrated in smaller areas, such as acute diarrhoeal infection (for example, cholera)[7]. Although some causes, such as the COVID-19 pandemic, have worldwide impacts, most of the contributors to life expectancy vary substantially by region and country/territory. For instance, in South Korea, life loss attributed to self-harm or suicide is a critical health issue[14], whereas in India, deaths from diarrhoeal diseases due to unsafe water are more prevalent[15]. Therefore, understanding regional and national contributors to life expectancy is crucial for addressing disparities in Asia. The observed trends in life expectancy probably result from various factors, and the GBD database, which provides longstanding internationally comparable estimates of mortality, life expectancy, morbidity and associated risk factors, enables comprehensive analysis[7,8].

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This study aimed to identify the largest contributors to changes in life expectancy, pinpoint regions with concentrated preventable deaths, and assess the effect of pandemics such as COVID-19 on overall mortality and disease burden. We utilized GBD 2023 data to provide insights into regional and national trends in life expectancy, causes of death and risk factors across 34 Asian countries and territories, informing effective intervention strategies for improving life expectancy.

Changes in life expectancy 1990–2023

Overall, in all 34 Asian countries and territories from 1990 to 2023, increasing trends in life expectancy at birth were observed (Fig. 1 and Supplementary Table 1). Among the subdivided GBD regions, the largest annualized increase was observed in South Asia, where life expectancy increased from 58.6 years (95% uncertainty interval (UI) 58.2–59.0) in 1990 to 71.2 years (95% UI 70.5–71.9) in 2023, with an annual percentage change (APC) of 0.59%. HICs in Asia Pacific had the smallest annualized increase, with life expectancy rising from 77.5 years (95% UI 77.5–77.6) in 1990 to 84.1 years (95% UI 84.0–84.1) in 2023, an APC of 0.25%. In terms of absolute gain in life expectancy, East Asia showed the largest increase from 1990 to 2023 (13.0 years), and Central Asia showed the smallest increase (6.3 years). Until 2019, all 34 countries and territories in Asia showed increasing life expectancy. However, following the COVID-19 pandemic (2019–2023), some regions reported decreasing life expectancy. The largest overall reductions in life expectancy at birth were observed in HICs in Asia Pacific (−0.09% APC), whereas Central Asia (0.28%), South Asia (0.22%) and Southeast Asia (0.01%) showed increasing trends during the COVID-19 pandemic (Supplementary Table 1). These changes were observed in both male and female individuals (Extended Data Fig. 1 and Supplementary Tables 2 and 3).

The overall life expectancy at birth was consistently higher in female than in male individuals from 1990 to 2023 across all regions of Asia (Fig. 2). Through all observation periods, the HICs in the Asia Pacific had the highest life expectancy at birth (in years) from 1990 to 2023 (Supplementary Table 1). For each sex, the highest life expectancy was observed in HICs in Asia Pacific from 1990 (80.8 years (95% UI 80.7–80.9) for female individuals; 74.1 years (95% UI 74.0–74.2) for male individuals) to 2023 (87.1 years (95% UI 87.0–87.1) for female individuals; 81.0 years (95% UI 81.0–81.1) for male individuals), with higher life expectancy in female than in male individuals (Supplementary Tables 2 and 3). By contrast, South Asia consistently reported the lowest life expectancy at birth from 1990 (59.0 years (95% UI 58.4–59.6) for female individuals; 58.3 years (95% UI 57.7–58.9) for male individuals) to 2023 (72.4 years (95% UI 71.5–73.3) for female individuals; 70.1 years (95% UI 69.1–71.0) for male individuals; Supplementary Tables 2 and 3).

In Fig. 2, most countries and territories showed increasing life expectancy between 1990 and 2023, with the largest annual elevation in Lao People's Democratic Republic (0.80% APC), Nepal (0.71%), Cambodia (0.69%), Bangladesh (0.67%), India (0.61%) and Bhutan (0.61%) for both sexes, particularly those located in South Asia and Southeast Asia (Supplementary Tables 1–3). Although female individuals generally had a higher life expectancy than male individuals across countries and territories, the overall patterns of trends in life expectancy were similar for both sexes (Fig. 2).

Life expectancy at birth in the Democratic People's Republic of Korea showed a notable reduction in its mid-1990s trajectory during the 1995–2002 period, with estimates of 65.3 years (95% UI 60.4–68.5) in 1995 and 69.2 years (66.9–70.6) in 2002 for both sexes (Fig. 2 and Supplementary Tables 4–6). In Myanmar, life expectancy at birth fell significantly in 2008, dropping to 56.2 years (95% UI 55.5–56.8). Sri Lanka experienced a temporary decrease in life expectancy in 2004 (68.2 years (95% UI 67.8–68.7)), and Timor-Leste showed dampened life expectancy in 1999 (56.7 years (95% UI 55.9–57.4)). In 2023, the life expectancy at birth had significant associations with socio-demographic index (SDI) across countries and territories, with a regression coefficient of $\beta = 54.6$ (95% confidence interval (CI) 49.3–59.9) and $P < 0.001$ (Extended Data Fig. 2). Between 1990 and 2023, the number of deaths declined substantially among children under 5 years of age across Asian regions, with the largest decrease observed in South Asia, followed by East Asia and Southeast Asia (Extended Data Fig. 3). By contrast, deaths among older adults (especially those 65 years of age or older) increased significantly in East Asia and South Asia, reflecting population ageing and shifting disease burdens.

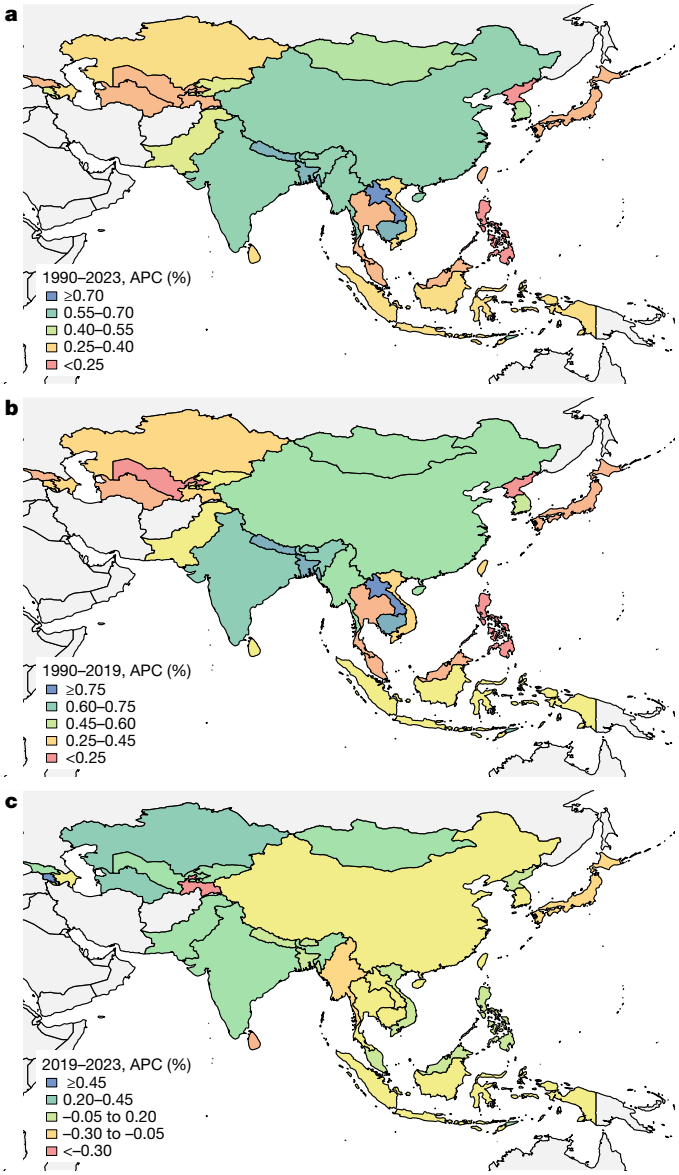


Fig. 1 | Changes in life expectancy at birth in Asia for 34 countries and territories during 1990–2023, 1990–2019 and 2019–2023. a, Changes in life expectancy at birth from 1990 to 2023. **b**, Changes in life expectancy at birth from 1990 to 2019. **c**, Changes in life expectancy at birth from 2019 to 2023. Out-of-scope countries are shown in grey.

Life expectancy decomposition

Life expectancy decomposition showed improvements in 2023 compared with 1990 in all 34 Asian countries and territories (Fig. 3). Significant gains in life expectancy across several subdivided GBD regions, including Central Asia, East Asia and HICs in Asia Pacific, were primarily attributed to improvements in cardiovascular disease outcomes. In

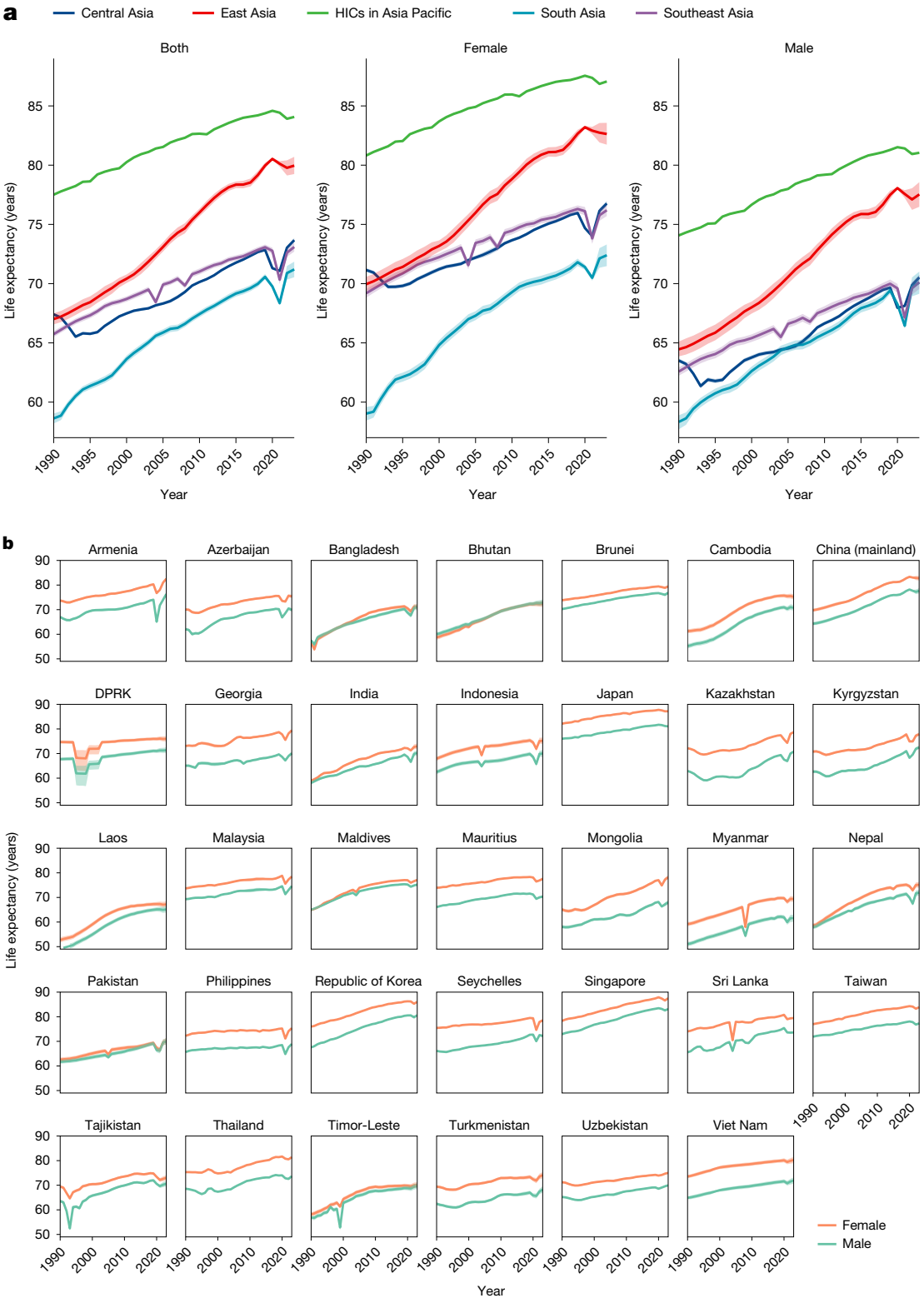


Fig. 2 | Trends in life expectancy at birth in Asian regions and 34 countries and territories by sex, 1990–2023. a, Trends in life expectancy at birth across Asian regions. **b**, Trends in life expectancy at birth in 34 Asian countries and territories. The lines denote point estimates, with shaded ribbons indicating 95% UIs. Brunei, Brunei Darussalam; DPRK, Democratic People's Republic of Korea; Laos, Lao People's Democratic Republic.

addition, in South Asia and Southeast Asia, a significant gain in life expectancy was largely driven by improvements in enteric infections, respiratory infections and tuberculosis.

Across the 34 Asian countries and territories, the total gain in life expectancy was primarily driven by a reduction in deaths from cardiovascular disease and enteric infections, which were the largest contributors to the level 2 cause-specific life expectancy gains (Extended Data Fig. 4). However, several regions experienced a considerable mortality burden from certain causes, which mitigated the overall gains in life expectancy. Of note, neoplasms (particularly in

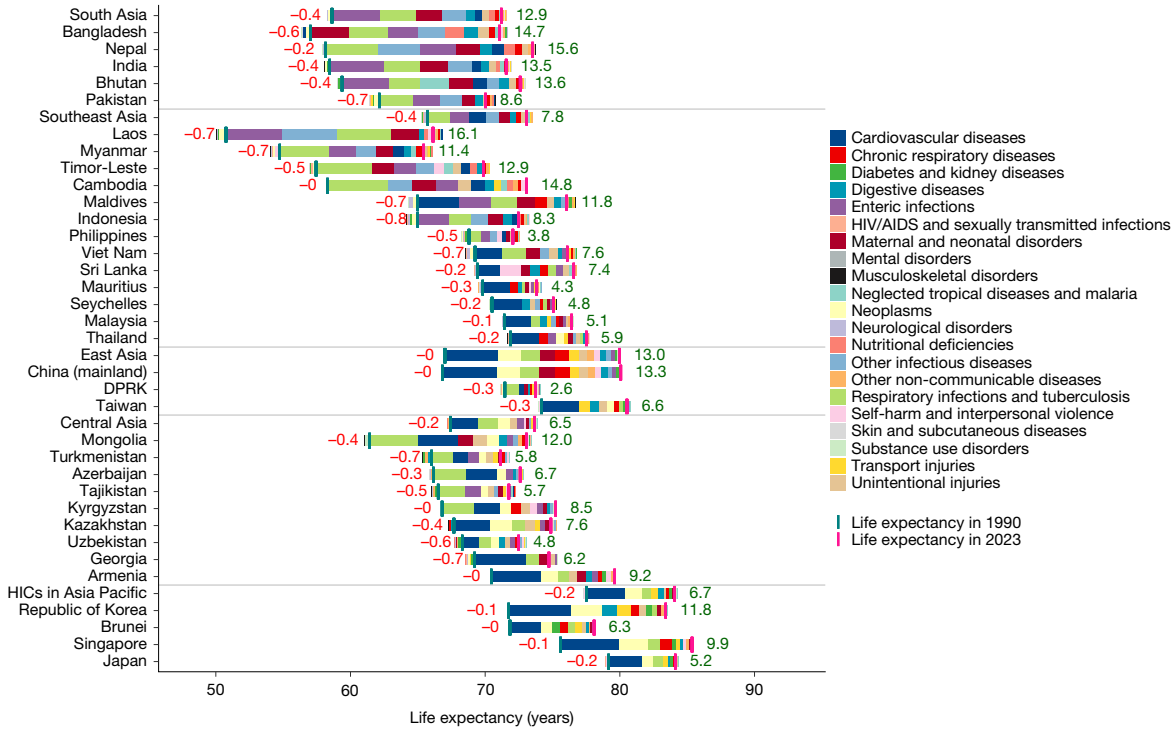


Fig. 3 | Decomposition of changes in life expectancy at birth by disease and injury across 34 Asian countries/territories and five Asian regions, 1990–2023. The figure shows the decomposition of change in life expectancy under GBD level 2 causes of death groups for both sexes. For each country or territory, the green and red vertical lines indicate life expectancy in 1990 and 2023, respectively. The numerical values displayed at the ends of the bars represent the summed contributions to changes in life expectancy (in years) between 1990 and 2023, with positive (green) and negative (red) contributions.

Southeast Asia), diabetes and kidney disease (particularly in Central Asia, South Asia and Southeast Asia), neurological disorders (particularly in Southeast Asia), HIV/AIDS and sexually transmitted infections (particularly in Southeast Asia) and other non-communicable diseases (particularly in Central Asia) continued to significantly impact mortality and limit the potential gains in life expectancy.

The top five level 2 GBD-specific positive and negative contributors to changes in life expectancy at birth were identified (Extended Data Fig. 5). Figure 4 shows the top ten level 3 causes of death with a positive total effect on changes in life expectancy from 1990 to 2023 in the subdivided GBD Asian regions and in 34 countries and territories. In Central Asia, gains in life expectancy were primarily attributed to a reduction in deaths from ischaemic heart disease (total gain was 1.217 years for both sexes), lower respiratory infections (1.111 years) and stroke (0.876 years). In East Asia, improvements in deaths from stroke (2.843 years), lower respiratory infections (1.303 years) and neonatal disorders (1.106 years) positively contributed to increased life expectancy (Supplementary Table 7). In HICs in Asia Pacific, improvements in deaths from stroke (1.788 years), ischaemic heart disease (0.852 years) and stomach cancer (0.665 years) induced gains in life expectancy. In both South Asia and Southeast Asia, reductions in deaths from diarrhoeal diseases (3.154 years in South Asia and 1.244 years in Southeast Asia) and tuberculosis (1.620 years in South Asia and 1.293 years in Southeast Asia) were the largest positive contributors to increased life expectancy. Figure 4 shows distinct regional patterns of preventable deaths across Asian regions. As a sensitivity analysis, we conducted period-specific analyses using alternative time partitions, examining disease and injury causes with positive contributions to life expectancy change (Extended Data Fig. 6).

Conversely, Fig. 5 presents the top ten level 3 causes with a negative total effect on changes in life expectancy in the subdivided GBD Asian regions and in 34 countries and territories. Across these regions, in East Asia and Southeast Asia, COVID-19 had the most substantial negative effect on life expectancy, leading to a noticeable decline from 2019 to 2023. In particular, Southeast Asia (total effect was −0.327 years for both sexes) and East Asia (−0.275 years) experienced a loss in life expectancy attributed to COVID-19, with the negative contribution reaching nearly 2 years in the first year of the COVID-19 pandemic (Supplementary Table 8). We further conducted period-specific analyses using alternative time partitions to examine disease and injury causes with negative contributions to life expectancy change (Extended Data Fig. 7).

Major risk factors contributing to the negative changes in life expectancy

In 2023, high systolic blood pressure, dietary risks, air pollution, tobacco use and high fasting plasma glucose were the top five risk factors for the negative contributors to changes in life expectancy at birth across 34 Asian countries and territories, significantly increasing the age-standardized rates of deaths per 100,000 population (Extended Data Fig. 8). The negative impact of high systolic blood pressure, dietary risks and air pollution is particularly evident in cardiovascular diseases. In addition, the impact of tobacco use is particularly evident in cardiovascular diseases, neoplasms and chronic respiratory diseases. Other significant risk factors include high fasting plasma glucose, which is especially linked to increased deaths from diabetes and kidney diseases and cardiovascular diseases. These risk factors collectively contributed to increased age-standardized rates of all-cause deaths, negatively contributing to changes in life expectancy across Asian regions in 2023.

Across the five Asian regions, these five leading risk factors showed high summary exposure values (SEVs), although their rankings varied across regions and time points (Extended Data Fig. 9). Over this observation period from 1990 to 2023, several of these factors showed a steady decline in SEVs, indicating a reduction in exposure of the population to these risks.

In Central Asia, the SEVs for high systolic blood pressure increased from 38.3 (95% UI 19.1–63.1) in 1990 to 40.9 (95% UI 33.2–48.2) in 2023,

	Top 10 positive contributors to changes in life expectancy									
Regions	1	2	3	4	5	6	7	8	9	10
Central Asia	Ischaemic heart disease	Lower respiratory infections	Stroke	Diarrhoeal diseases	Tracheal, bronchial and lung cancers	Stomach cancer	Tuberculosis	Drowning	Road injuries	Neonatal disorders
Armenia	Ischaemic heart disease	Stroke	Neonatal disorders	Lower respiratory infections	Diarrhoeal diseases	Chronic obstructive pulmonary disease	Diabetes mellitus	Cirrhosis and other chronic liver diseases	Tracheal, bronchial and lung cancers	Stomach cancer
Azerbaijan	Lower respiratory infections	Ischaemic heart disease	Stroke	Diarrhoeal diseases	Tuberculosis	Interpersonal violence	Cirrhosis and other chronic liver diseases	Stomach cancer	Tracheal, bronchial and lung cancers	Pertussis
Georgia	Ischaemic heart disease	Stroke	Neonatal disorders	Lower respiratory infections	Drowning	Diarrhoeal diseases	Tuberculosis	COVID-19	Fire, heat and hot substances	Stomach cancer
Kazakhstan	Ischaemic heart disease	Stroke	Lower respiratory infections	Tracheal, bronchial and lung cancers	Road injuries	Diarrhoeal diseases	Stomach cancer	Neonatal disorders	Drowning	Tuberculosis
Kyrgyzstan	Lower respiratory infections	Stroke	Chronic obstructive pulmonary disease	COVID-19	Diarrhoeal diseases	Ischaemic heart disease	Drowning	Interpersonal violence	Stomach cancer	Neonatal disorders
Mongolia	Lower respiratory infections	Ischaemic heart disease	Tuberculosis	Stroke	Neonatal disorders	Cirrhosis and other chronic liver diseases	Diarrhoeal diseases	Stomach cancer	Poisonings	Drowning
Tajikistan	Lower respiratory infections	Diarrhoeal diseases	Tuberculosis	Neonatal disorders	Road injuries	Stroke	Drowning	Meningitis	Stomach cancer	Interpersonal violence
Turkmenistan	Lower respiratory infections	Ischaemic heart disease	Diarrhoeal diseases	Road injuries	Oesophageal cancer	Neonatal disorders	Drowning	Chronic obstructive pulmonary disease	Stomach cancer	Tuberculosis
Uzbekistan	Stroke	Lower respiratory infections	Ischaemic heart disease	Diarrhoeal diseases	Cirrhosis and other chronic liver diseases	Stomach cancer	Tuberculosis	Oesophageal cancer	Drowning	Chronic obstructive pulmonary disease
East Asia	Stroke	Lower respiratory infections	Neonatal disorders	Chronic obstructive pulmonary disease	Road injuries	Stomach cancer	Ischaemic heart disease	Congenital birth defects	Self-harm	Tuberculosis
China (mainland)	Stroke	Lower respiratory infections	Neonatal disorders	Chronic obstructive pulmonary disease	Road injuries	Stomach cancer	Ischaemic heart disease	Congenital birth defects	Self-harm	Hypertensive heart disease
DPRK	Tuberculosis	Stroke	Lower respiratory infections	Neonatal disorders	Chronic obstructive pulmonary disease	Road injuries	Cirrhosis and other chronic liver diseases	Drowning	Protein–energy malnutrition	Pertussis
Taiwan	Stroke	Road injuries	Ischaemic heart disease	Stomach cancer	Cirrhosis and other chronic liver diseases	Tuberculosis	Diabetes mellitus	Asthma	Drowning	Chronic obstructive pulmonary disease
HICs in Asia Pacific	Stroke	Ischaemic heart disease	Stomach cancer	Lower respiratory infections	Road injuries	Cirrhosis and other chronic liver diseases	Liver cancer	Neonatal disorders	Tuberculosis	Congenital birth defects
Brunei Darussalam	Stroke	Ischaemic heart disease	Road injuries	Diabetes mellitus	Chronic obstructive pulmonary disease	Tuberculosis	Lower respiratory infections	Stomach cancer	Tracheal, bronchial and lung cancers	Chronic kidney disease
Japan	Stroke	Ischaemic heart disease	Lower respiratory infections	Stomach cancer	Road injuries	Liver cancer	Cirrhosis and other chronic liver diseases	Chronic kidney disease	Hypertensive heart disease	Tracheal, bronchial and lung cancers
Republic of Korea	Stroke	Stomach cancer	Cirrhosis and other chronic liver diseases	Road injuries	Ischaemic heart disease	Tuberculosis	Liver cancer	Asthma	Neonatal disorders	Diabetes mellitus
Singapore	Ischaemic heart disease	Stroke	Lower respiratory infections	Tracheal, bronchial and lung cancers	Chronic obstructive pulmonary disease	Stomach cancer	Diabetes mellitus	Colon and rectal cancers	Road injuries	Hypertensive heart disease
South Asia	Diarrhoeal diseases	Tuberculosis	Neonatal disorders	Lower respiratory infections	Measles	Typhoid and paratyphoid	Protein–energy malnutrition	Maternal disorders	Tetanus	Cirrhosis and other chronic liver diseases
Bangladesh	Neonatal disorders	Diarrhoeal diseases	Tuberculosis	Lower respiratory infections	Protein–energy malnutrition	Measles	Maternal disorders	Cirrhosis and other chronic liver diseases	Drowning	Tetanus
Bhutan	Diarrhoeal diseases	Malaria	Neonatal disorders	Tuberculosis	Lower respiratory infections	Typhoid and paratyphoid	Stroke	Ischaemic heart disease	Maternal disorders	Upper digestive system diseases
India	Diarrhoeal diseases	Neonatal disorders	Tuberculosis	Lower respiratory infections	Measles	Typhoid and paratyphoid	Maternal disorders	Tetanus	Ischaemic heart disease	Rheumatic heart disease
Nepal	Diarrhoeal diseases	Lower respiratory infections	Tuberculosis	Measles	Neonatal disorders	Tetanus	Protein–energy malnutrition	Maternal disorders	Typhoid and paratyphoid	Upper digestive system diseases
Pakistan	Diarrhoeal diseases	Tuberculosis	Lower respiratory infections	Neonatal disorders	Measles	Meningitis	Tetanus	Cirrhosis and other chronic liver diseases	Maternal disorders	Upper digestive system diseases
Southeast Asia	Tuberculosis	Diarrhoeal diseases	Stroke	Neonatal disorders	Lower respiratory infections	Measles	Cirrhosis and other chronic liver diseases	Chronic obstructive pulmonary disease	Tetanus	Typhoid and paratyphoid
Cambodia	Lower respiratory infections	Tuberculosis	Diarrhoeal diseases	Neonatal disorders	Stroke	Tetanus	Maternal disorders	Road injuries	Drowning	Malaria
Indonesia	Diarrhoeal diseases	Tuberculosis	Neonatal disorders	Stroke	Lower respiratory infections	Cirrhosis and other chronic liver diseases	Typhoid and paratyphoid	Measles	Tetanus	Meningitis
Laos	Diarrhoeal diseases	Lower respiratory infections	Tetanus	Neonatal disorders	Tuberculosis	Measles	Maternal disorders	Meningitis	Stroke	Pertussis
Malaysia	Stroke	Ischaemic heart disease	Tuberculosis	Lower respiratory infections	Road injuries	Cirrhosis and other chronic liver diseases	Chronic obstructive pulmonary disease	Neonatal disorders	Diarrhoeal diseases	Measles
Maldives	Stroke	Diarrhoeal diseases	Tuberculosis	Lower respiratory infections	Neonatal disorders	Chronic obstructive pulmonary disease	Maternal disorders	Ischaemic heart disease	Drowning	Cirrhosis and other chronic liver diseases
Mauritius	Ischaemic heart disease	Stroke	Asthma	Lower respiratory infections	Chronic obstructive pulmonary disease	Hypertensive heart disease	Neonatal disorders	Cirrhosis and other chronic liver diseases	Diarrhoeal diseases	Self-harm
Myanmar	Tuberculosis	Diarrhoeal diseases	Lower respiratory infections	Neonatal disorders	Measles	Stroke	Malaria	Meningitis	Tetanus	Upper digestive system diseases
Philippines	Diarrhoeal diseases	Tuberculosis	Lower respiratory infections	Interpersonal violence	Measles	Stroke	Neonatal disorders	Exposure to forces of nature	Upper digestive system diseases	Cirrhosis and other chronic liver diseases
Seychelles	Ischaemic heart disease	Stroke	Hypertensive heart disease	Lower respiratory infections	Cirrhosis and other chronic liver diseases	Meningitis	Upper digestive system diseases	Neonatal disorders	Drowning	Chronic obstructive pulmonary disease
Sri Lanka	Stroke	Conflict and terrorism	Neonatal disorders	Self-harm	Cirrhosis and other chronic liver diseases	Diarrhoeal diseases	Asthma	Lower respiratory infections	Tuberculosis	Ischaemic heart disease
Thailand	Stroke	Ischaemic heart disease	Diarrhoeal diseases	Chronic obstructive pulmonary disease	Tuberculosis	Road injuries	Neonatal disorders	Tracheal, bronchial and lung cancers	Measles	Drowning
Timor-Leste	Lower respiratory infections	Tuberculosis	Diarrhoeal diseases	Neonatal disorders	Maternal disorders	Conflict and terrorism	Malaria	Tetanus	Stroke	Protein–energy malnutrition
Viet Nam	Stroke	Tuberculosis	Neonatal disorders	Lower respiratory infections	Measles	Drowning	Road injuries	Cirrhosis and other chronic liver diseases	Diarrhoeal diseases	Maternal disorders

Fig. 4 | Top ten disease and injury contributors to positive changes in life expectancy at birth in 34 Asian countries and territories, 1990–2023. Estimation decomposed for GBD level 3 cause of death groups for both sexes, with contributions ranging from 0.07 to 4.2 years. The darker shading on the heatmap corresponds to higher values.

	Top 10 negative contributors to changes in life expectancy									
Regions	1	2	3	4	5	6	7	8	9	10
Central Asia	Diabetes mellitus	Cardiomyopathy and myocarditis	Urinary diseases and male infertility	Other unspecified infectious diseases	Brain and central nervous system cancers	Endocrine, metabolic, blood and immune disorders	Chronic kidney disease	Other neurological disorders	Congenital birth defects	Pancreatic cancer
Armenia	Urinary diseases and male infertility	Other neurological disorders	Other neoplasms	HIV/AIDS	Non-rheumatic valvular heart disease	Atrial fibrillation and flutter	Soft tissue and other extraosseous sarcomas	Multiple myeloma	Other musculoskeletal disorders	Bacterial skin diseases
Azerbaijan	Congenital birth defects	Conflict and terrorism	Foreign body	Endocrine, metabolic, blood and immune disorders	Alzheimer's disease and other dementias	Neonatal disorders	Diabetes mellitus	Pancreatic cancer	Measles	Brain and central nervous system cancers
Georgia	Hypertensive heart disease	Diabetes mellitus	Road injuries	Chronic kidney disease	Chronic obstructive pulmonary disease	Brain and central nervous system cancers	Prostate cancer	Pancreatic cancer	Ovarian cancer	Non-rheumatic valvular heart disease
Kazakhstan	Cirrhosis and other chronic liver diseases	Cardiomyopathy and myocarditis	Chronic obstructive pulmonary disease	Chronic kidney disease	Interstitial lung disease and pulmonary sarcoidosis	Endocrine, metabolic, blood and immune disorders	Other unspecified infectious diseases	Other digestive diseases	Bacterial skin diseases	Urinary diseases and male infertility
Kyrgyzstan	Cardiomyopathy and myocarditis	Other unspecified infectious diseases	Hypertensive heart disease	Congenital birth defects	Other musculoskeletal disorders	Other neurological disorders	Non-melanoma skin cancer	Bacterial skin diseases	Liver cancer	Pancreatic cancer
Mongolia	Alcohol use disorders	Pancreatic cancer	Brain and central nervous system cancers	Other neurological disorders	Bacterial skin diseases	Diabetes mellitus	COVID-19	Other musculoskeletal disorders	Drug use disorders	Non-melanoma skin cancer
Tajikistan	Diabetes mellitus	COVID-19	Urinary diseases and male infertility	Hypertensive heart disease	Alzheimer's disease and other dementias	Ischaemic heart disease	Parkinson's disease	Brain and central nervous system cancers	Liver cancer	Interstitial lung disease and pulmonary sarcoidosis
Turkmenistan	Cirrhosis and other chronic liver diseases	Diabetes mellitus	Stroke	Urinary diseases and male infertility	Brain and central nervous system cancers	Congenital birth defects	Chronic kidney disease	Pancreatic cancer	Drug use disorders	Kidney cancer
Uzbekistan	Diabetes mellitus	Neonatal disorders	Congenital birth defects	Hypertensive heart disease	Other unspecified infectious diseases	Brain and central nervous system cancers	COVID-19	Other neurological disorders	Other cardiovascular and circulatory diseases	Pancreatic cancer
East Asia	COVID-19	HIV/AIDS	Other neurological disorders	Malignant neoplasm of bone and articular cartilage	Multiple myeloma	Interstitial lung disease and pulmonary sarcoidosis	Neuroblastoma and other peripheral nervous cell tumours	Gynaecological diseases	Other skin and subcutaneous diseases	Eating disorders
China (mainland)	COVID-19	HIV/AIDS	Other neurological disorders	Malignant neoplasm of bone and articular cartilage	Multiple myeloma	Interstitial lung disease and pulmonary sarcoidosis	Decubitus ulcer	Neuroblastoma and other peripheral nervous cell tumours	Other skin and subcutaneous diseases	Gynaecological diseases
DPRK	Ischaemic heart disease	Tracheal, bronchial and lung cancers	Breast cancer	COVID-19	Colon and rectal cancers	HIV/AIDS	Hypertensive heart disease	Falls	Foreign body	Cervical cancer
Taiwan	Urinary diseases and male infertility	Alzheimer's disease and other dementias	Liver cancer	Self-harm	Lip and oral cavity cancers	COVID-19	Kidney cancer	Breast cancer	Breast cancer	Endocarditis
HICs in Asia Pacific	Alzheimer's disease and other dementias	Interstitial lung disease and pulmonary sarcoidosis	Self-harm	Pancreatic cancer	Urinary diseases and male infertility	Other neurological disorders	Breast cancer	Parkinson's disease	Other pharynx cancer	Prostate cancer
Brunei Darussalam	Breast cancer	Alzheimer's disease and other dementias	COVID-19	Urinary diseases and male infertility	HIV/AIDS	Bacterial skin diseases	Other digestive diseases	Ovarian cancer	Motor neuron disease	Pancreatic cancer
Japan	Interstitial lung disease and pulmonary sarcoidosis	Pancreatic cancer	Alzheimer's disease and other dementias	Breast cancer	Other neurological disorders	Self-harm	Urinary diseases and male infertility	Parkinson's disease	Brain and central nervous system cancers	Other pharynx cancer
Republic of Korea	Lower respiratory infections	Self-harm	Alzheimer's disease and other dementias	Urinary diseases and male infertility	Interstitial lung disease and pulmonary sarcoidosis	Other neurological disorders	Prostate cancer	Motor neuron disease	Multiple myeloma	Parkinson's disease
Singapore	Alzheimer's disease and other dementias	Other neurological disorders	Bacterial skin diseases	Interstitial lung disease and pulmonary sarcoidosis	COVID-19	Brain and central nervous system cancers	Idiopathic epilepsy	Other pharynx cancer	Vascular intestinal disorders	Pancreatic cancer
South Asia	Diabetes mellitus	Breast cancer	Oesophageal cancer	COVID-19	Tracheal, bronchial and lung cancers	Ovarian cancer	Alzheimer's disease and other dementias	Hypertensive heart disease	Dengue	Other pharynx cancer
Bangladesh	Ischaemic heart disease	Hypertensive heart disease	Breast cancer	Tracheal, bronchial and lung cancers	Oesophageal cancer	Colon and rectal cancers	Cardiomyopathy and myocarditis	Other cardiovascular and circulatory diseases	Ovarian cancer	Other pharynx cancer
Bhutan	Diabetes mellitus	Breast cancer	HIV/AIDS	Tracheal, bronchial and lung cancers	COVID-19	Ovarian cancer	Oesophageal cancer	Alzheimer's disease and other dementias	Colon and rectal cancers	Interstitial lung disease and pulmonary sarcoidosis
India	Diabetes mellitus	Oesophageal cancer	Breast cancer	Tracheal, bronchial and lung cancers	HIV/AIDS	Dengue	Alzheimer's disease and other dementias	Ovarian cancer	Other pharynx cancer	Interstitial lung disease and pulmonary sarcoidosis
Nepal	Diabetes mellitus	Exposure to forces of nature	Breast cancer	Alzheimer's disease and other dementias	Road injuries	Tracheal, bronchial and lung cancers	Ovarian cancer	HIV/AIDS	Oesophageal cancer	Colon and rectal cancers
Pakistan	Breast cancer	Diabetes mellitus	Road injuries	HIV/AIDS	Ischaemic heart disease	Ovarian cancer	Lip and oral cavity cancers	Colon and rectal cancers	Cervical cancer	Tracheal, bronchial and lung cancers
Southeast Asia	COVID-19	Breast cancer	Colon and rectal cancers	HIV/AIDS	Diabetes mellitus	Alzheimer's disease and other dementias	Other neurological disorders	Tracheal, bronchial and lung cancers	Pancreatic cancer	Ovarian cancer
Cambodia	COVID-19	Ischaemic heart disease	Breast cancer	Alzheimer's disease and other dementias	Colon and rectal cancers	Ovarian cancer	Tracheal, bronchial and lung cancers	Diabetes mellitus	Pancreatic cancer	Atrial fibrillation and flutter
Indonesia	COVID-19	Ischaemic heart disease	Diabetes mellitus	Tracheal, bronchial and lung cancers	Breast cancer	Colon and rectal cancers	Alzheimer's disease and other dementias	Chronic kidney disease	Road injuries	HIV/AIDS
Laos	Ischaemic heart disease	Breast cancer	COVID-19	Tracheal, bronchial and lung cancers	Colon and rectal cancers	HIV/AIDS	Chronic kidney disease	Hypertensive heart disease	Ovarian cancer	Diabetes mellitus
Malaysia	COVID-19	Breast cancer	Colon and rectal cancers	Bacterial skin diseases	Decubitus ulcer	Pancreatic cancer	Other neurological disorders	Endocrine, metabolic, blood and immune disorders	Prostate cancer	Ovarian cancer
Maldives	COVID-19	Alzheimer's disease and other dementias	Tracheal, bronchial and lung cancers	Colon and rectal cancers	Parkinson's disease	Endocrine, metabolic, blood and immune disorders	Atrial fibrillation and flutter	Prostate cancer	Pancreatic cancer	Breast cancer
Mauritius	COVID-19	HIV/AIDS	Breast cancer	Colon and rectal cancers	Diabetes mellitus	Urinary diseases and male infertility	Drug use disorders	Interstitial lung disease and pulmonary sarcoidosis	Falls	Bacterial skin diseases
Myanmar	Conflict and terrorism	HIV/AIDS	COVID-19	Breast cancer	Other unspecified infectious diseases	Colon and rectal cancers	Ovarian cancer	Liver cancer	Pancreatic cancer	Tracheal, bronchial and lung cancers
Philippines	COVID-19	Diabetes mellitus	Chronic kidney disease	HIV/AIDS	Breast cancer	Alzheimer's disease and other dementias	Colon and rectal cancers	Bacterial skin diseases	Ischaemic heart disease	Ovarian cancer
Seychelles	COVID-19	Urinary diseases and male infertility	Colon and rectal cancers	HIV/AIDS	Prostate cancer	Chronic kidney disease	Breast cancer	Other unspecified infectious diseases	Pancreatic cancer	Lip and oral cavity cancers
Sri Lanka	COVID-19	Urinary diseases and male infertility	Diabetes mellitus	Breast cancer	Tracheal, bronchial and lung cancers	Colon and rectal cancers	Lip and oral cavity cancers	Pancreatic cancer	Ovarian cancer	Alzheimer's disease and other dementias
Thailand	Lower respiratory infections	Other neurological disorders	COVID-19	HIV/AIDS	Self-harm	Bacterial skin diseases	Upper digestive system diseases	Alcohol use disorders	Other neoplasms	Decubitus ulcer
Timor-Leste	HIV/AIDS	COVID-19	Ischaemic heart disease	Breast cancer	Diabetes mellitus	Colon and rectal cancers	Alzheimer's disease and other dementias	Tracheal, bronchial and lung cancers	Ovarian cancer	Cervical cancer
Viet Nam	Alzheimer's disease and other dementias	Colon and rectal cancers	Tracheal, bronchial and lung cancers	Diabetes mellitus	HIV/AIDS	COVID-19	Breast cancer	Pancreatic cancer	Ovarian cancer	Atrial fibrillation and flutter

Fig. 5 | Top ten disease and injury contributors to negative changes in life expectancy at birth in 34 Asian countries and territories, 1990–2023. Estimation decomposed for GBD level 3 cause of death groups for both sexes, with contributions ranging from −0.61 to 0 years. The darker shading on the heatmap corresponds to lower values.

reflecting an APC of 0.2%. Similarly, high fasting plasma glucose SEVs also increased from 10.7 (95% UI 7.6–15.4) in 1990 to 13.6 (95% UI 10.5–17.8) in 2023, with an APC of 0.7% APC. In East Asia, increases in SEVs for high systolic blood pressure (1.5% APC) emerged as significant risk factors affecting life expectancy from 1990 to 2023. South Asia also showed growing SEVs for high fasting plasma glucose (1.1% APC) and high systolic blood pressure (0.1% APC), indicating an increasing effect on life expectancy. In Southeast Asia, SEVs for high systolic blood pressure (0.1% APC) and high fasting plasma glucose (0.6% APC) showed notable increases, further influencing changes in life expectancy.

In HICs in Asia Pacific, the top three causes contributing to changes in life expectancy at level 2 of the GBD cause-classification hierarchy (including dietary risks, tobacco use and high systolic blood pressure) remained similar in 2023 compared with 1990, with each showing a steady decline in SEVs. However, in HICs, there is an increase in SEVs for high fasting plasma glucose (0.1% APC) from 1990 to 2023.

Discussion

Main findings and possible explanations

The overall upwards trends in the estimated life expectancy across Asia from 1990 to 2023 in our study align with previous findings indicating an increase in global life expectancy since 1990 up to 2021 (ref. 7). These gains in life expectancy over time are likely to be due to improvements in health-care infrastructure, increased access to medical services, development of new drugs and vaccines, enhanced public health policies, fiscal solvency of social security or health insurance, and socioeconomic development[16]. However, these improvements varied significantly across Asian regions.

South Asia had the greatest annual increase in life expectancy at birth, increasing from 58.6 years in 1990 to 71.2 years in 2023. By contrast, HICs in Asia Pacific showed the highest life expectancy throughout the overall observation period, increasing from 77.5 years in 1990 to 84.1 years in 2023. Although the annual relative gain in HICs was more modest, the consistently superior life expectancy observed in HICs is probably attributable to better health-care systems, higher socioeconomic status, more health-care expenditure, better accessibility to health-care services and effective public health policies[17]. Conversely, many other regions in Asia continue to face challenges such as poverty, limited health-care access and high prevalence of infectious diseases[18,19]. Across Asia, the substantial heterogeneity in life expectancy underscores the need to prioritize a multisectoral total population strategy to reduce major risk factors across the life course (for example, reducing tobacco use, improving air quality and promoting healthier dietary patterns). Strengthening universal health coverage for Sustainable Development Goal (SDG)-related conditions, along with investments in high-quality health systems, has the potential to significantly increase life expectancy in LMICs in Asia and avert millions of preventable deaths annually, thereby reducing persistent health disparities[19]. This inequity in life expectancy across Asian regions provides strong evidence for an urgent and effective need for enhanced public health measures.

The disparities in life expectancy across Asia were associated with the SDI of each country/territory. Higher socioeconomic status was associated with better accessibility to health-care services, higher health expenditure and improved living conditions, such as sanitation, water management, occupational environments and air quality, all potentially contributing to increased life expectancy[17]. Significant sex differences in life expectancy were observed, with female individuals having higher life expectancy than male individuals across all regions of Asia. These findings are consistent with previous studies on global life expectancy[7]. Although biological factors such as genetic and hormonal differences may contribute[20], behavioural factors, including lower rates of risky behaviours (for example, smoking and alcohol consumption) in female individuals and better health-seeking behaviour, probably have a dominant role in explaining these differences[21,22]. Otherwise, in countries or territories with lower SDI and among LMICs, certain nations, such as Lao People's Democratic Republic, Bangladesh, Cambodia and Bhutan, achieved substantial improvements in life expectancy between 1990 and 2023. These gains were driven by effective policy implementation and alignment with SDG 6, which improved sanitation and access to safe drinking water, thereby reducing the risk of diarrhoea[23]. Therefore, particularly in countries and territories with lower SDI and LMICs, developing and prioritizing policies that target preventable causes of death and key risk factors is essential for improving life expectancy.

Notable country/territory-specific trends in life expectancy were observed, owing to various events. Political instability, economic crises and natural disasters (for example, famines and cyclones) in countries such as the Democratic People's Republic of Korea, Myanmar, Sri Lanka and Timor-Leste led to temporary reductions in life expectancy[24]. For instance, 'the great famine' in the Democratic People's Republic of Korea, which began in the mid-1990s, resulted in significant mortality and a reduction in life expectancy[25]. This crisis has been attributed to the loss of economic and logistical support following the collapse of the Soviet Union in 1991, a series of natural disasters in the 1990s and prolonged economic sanctions[26]. Similarly, cyclone Nargis in Myanmar (2008), the Indian Ocean earthquake and tsunami in Sri Lanka (2004) and the East Timorese crisis in Timor-Leste (1999) resulted in sudden falls in life expectancy in these countries/territories[27–29].

The level 3 GBD-specific causes of death that contributed to gains in life expectancy varied regionally and nationally. In Central Asia, improvements in managing infectious diseases such as lower respiratory infections and chronic diseases such as ischaemic heart disease and stroke contributed significantly to increased life expectancy[30]. In East Asia, advanced medical technology and health-care systems contributed to the effective management of lower respiratory infections and stroke, whereas public health initiatives and pollution control measures reduced respiratory infections[7,31]. Specifically, China's medium-to-long term plan for the prevention and treatment of chronic diseases (2017–2025), which aligns with the objectives of the World Health Organization (WHO) global action plan for the prevention and control of noncommunicable diseases, appears to be associated with upwards trends in life expectancy[32]. The management of cardiovascular diseases, such as stroke and ischaemic heart disease, requires not only acute diagnosis and treatment but also long-term rehabilitation and management[33]. Therefore, the high levels of health-care expenditure and infrastructure in HICs were critical in driving gains in life expectancy in these countries and territories[34].

In South Asia and Southeast Asia, improvements in sanitation, vaccination and health-care access significantly reduced the prevalence of diarrhoeal diseases and tuberculosis[23]. International health programmes and local public health initiatives had crucial roles[35]. The Expanded Programme on Immunization (EPI), one of the initiatives of the WHO, along with the Southeast Asia regional vaccine action plan 2016–2020, aimed to achieve significant reductions in vaccine-preventable diseases[36,37]. This increased diphtheria–pertussis–tetanus vaccine coverage from 82% in 2000 to 88% in 2016, substantially decreasing the associated disease burdens[38]. Countries and territories such as India, Bangladesh and Indonesia have implemented extensive vaccination programs targeting diseases such as polio, measles and tuberculosis, primarily facilitated by the WHO and UNICEF, demonstrating considerable effectiveness. The initial focus of the EPI was on protecting children against six major vaccine-preventable diseases, including Bacillus Calmette–Guérin, diphtheria, pertussis, tetanus, polio and measles[36]. The observed substantial reductions in mortality among those younger than 5 years of age across East Asia, South Asia and Southeast Asia over the past three decades suggest that the EPI has been highly successful and effective. Although the programme has since expanded to include additional vaccines, continued efforts

are still needed to eliminate zero-dose children, particularly in underserved Asian regions. In parallel, sanitation initiatives such as India's Swachh Bharat Abhiyan (Clean India Mission), which aimed to improve hygiene infrastructure and eliminate open defecation, seems to have contributed to a reduction in diarrhoeal diseases and tuberculosis[39]. Similar total sanitation campaigns in South and Southeast Asia have also contributed to reducing diarrhoeal diseases and tuberculosis, thereby effectively enhancing life expectancy[40].

During the COVID-19 pandemic, East Asia and Southeast Asia emerged as regions where preventable deaths were particularly concentrated. In East Asia, particularly China, strict containment policies, including total isolation and city-wide lockdowns, were implemented to mitigate the immediate impact of the pandemic[41]. However, as the country where the pandemic was first discovered, China was unable to fully prevent loss of life expectancy. In addition, during the pandemic, Southeast Asia experienced significant reductions in life expectancy due to high population density, limited health-care resources and economic challenges that exacerbated the impact of the COVID-19 pandemic[42]. For example, in 2016, although the global average health spending per capita was US$1,077 with 18.6% of out-of-pocket expenditure per total health spending, South Asia had the lowest health spending per capita at US$59 and the highest proportion of out-of-pocket expenditure at 65.2%[43]. Central Asia and Southeast Asia similarly show critical health-care financing gaps[43]. Of note, Myanmar recorded the lowest health spending per capita globally, only US$5 in 2016 (ref. 43), and the Myanmar government allocated only 3% of its total government budget to health care[44]. These structural constraints led to overwhelmed health-care systems and delays in treating other conditions, compounding the negative effects of the pandemic on life expectancy[45].

Policy implications

Effective public health policies are critical in reducing exposure to risk factors and improving life expectancy. Governments should implement anti-smoking campaigns, air quality improvement programmes and initiatives that promote healthy dietary behaviours. These policies should be detailed and adjusted to the specific needs and challenges of each region and country or territory, with policymakers developing targeted strategies accordingly. For instance, in Central Asia, focusing on managing chronic diseases and improving access to health care could significantly impact life expectancy[46]. By contrast, addressing infectious diseases through improvements in sanitation, vaccination, health-care access and water resources is critical in South Asia[23,35]. Moreover, capturing and addressing inequities and disparities in health care and infrastructure across regions and countries/territories in Asia is essential for developing effective policies[47]. This underscores the need for accurate and updated data, which this study aims to serve.

For non-communicable diseases (NCDs), systematic screening and early detection are vital for reducing disease burden and increasing life expectancy. Recently, the WHO has recommended a framework of evidence-based policy options known as 'best buys' and other effective interventions to prevent and manage NCDs[48,49]. This guidance is embedded in the Global Monitoring Framework for NCDs, which includes 25 key indicators to track progress at the country/territory level[48,49]. It emphasizes both surveillance of behavioural risk factors, such as tobacco use, unhealthy diet and physical inactivity, and monitoring of NCD morbidity and cause-specific mortality[48,49]. Enhanced monitoring and surveillance systems not only help to reduce disease burden but also contribute to extending life expectancy by addressing negative contributors and risk factors. However, although many countries and territories have adopted best buy-aligned tobacco control measures, such as those reflected in the WHO Framework Convention on Tobacco Control, gaps between policy adoption and effective implementation remain common, probably owing to limited enforcement capacity and competing policy priorities. To maximize effectiveness, population-wide strategies aimed at reducing risk factor exposure should be implemented alongside targeted approaches that focus on intensive management of high-risk groups[50].

In countries with limited health-care infrastructure, addressing unmet health-care needs, shortages in human resources, essential medicines, technologies and dedicated financing are critical[51]. Strategies such as expanding telemedicine and fostering health-care partnerships with neighbouring HICs or nations with well-developed medical systems should be considered. Sustained and coordinated improvements in disease surveillance, case definitions and reporting mechanisms will ensure that public health interventions are based on reliable information. Regular surveys and a robust reporting system are necessary to resolve data heterogeneity and enhance data accuracy and reliability. However, some Asian countries, such as the Democratic People's Republic of Korea, the Lao People's Democratic Republic and Myanmar, face inherently low data availability owing to political instability, suboptimal health-care infrastructure, geographical barriers and economic difficulties. In Myanmar, although the digital health information system 2 has been implemented nationwide since 2017, its effective use has been substantially constrained by ongoing civil conflict, limited internet coverage, low IT literacy and the absence of standardized data practices[52]. In these settings, efforts by governments, researchers and non-governmental organizations to provide new data, improve data quality, and establish or strengthen health registries could have a crucial role in closing existing information gaps and supporting more effective public health interventions.

Limitations

Although GBD 2023 achieved methodological advancements in providing cause-specific estimates of mortality and life expectancy compared with previous versions, it has several limitations. First, data scarcity or reliability issues in specific regions and periods can affect the accuracy of estimates, especially when influenced by political ideologies or socioeconomic factors. Second, the quality of cause-of-death and verbal autopsy data depends on death certificates being accurately coded according to international standards[7]. This quality can be affected by the practices of physicians and the complexity of comorbidities at the time of death, leading to inherent heterogeneity and accuracy issues[7]. Third, to provide estimates for locations with low data completeness and address reporting lags, our most recent year estimates rely heavily on modelling processes[7]. Fourth, in life expectancy decomposition analysis, small differences in all-cause mortality can introduce instability. Understanding the impact of catastrophic events such as earthquakes or conflicts is crucial when examining reductions in life expectancy. Fifth, despite efforts to standardize data integration and modelling approaches, variations in data availability and quality across regions in Asia may introduce uncertainties in the estimates of life expectancy. Consequently, although the study offers valuable insights at the regional and national levels, its utility for subtle local decision-making within countries or territories, especially those with limited data, may be restricted. Sixth, the association between SDI and life expectancy may be partly driven by the model design itself, as SDI-related components may be incorporated into the estimation of life expectancy. Therefore, this association should be interpreted with caution. Last, model-based estimates are subject to inherent uncertainty due to the assumptions embedded in the modelling framework, including covariate selection, structural specifications and data adjustment procedures applied in the presence of limited or incomplete input data. This uncertainty was reflected by reporting 95% UI alongside point estimates. However, the validity of the results may still be influenced by such assumptions, particularly in regions where measured data are scarce. Therefore, interpretation should account for these methodological and data-related constraints when drawing conclusions or informing policy decisions.

In summary, our study found persistent inequalities in life expectancy across Asia closely associated with regional economic and developmental conditions. The drivers of life expectancy gains and losses varied substantially across regions. Together, these findings highlight the urgent need to reduce inequities in longevity and provide evidence for prioritizing region-specific proactive and adaptive health policies to reduce preventable causes of death.

Online content

Any methods, additional references, Nature Portfolio reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions and competing interests; and statements of data and code availability are available at https://doi.org/10.1038/s41586-026-10739-6.

1. Schumacher, A. E. et al. Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: a demographic analysis for the Global Burden of Disease Study 2023. *Lancet* **406**, 1731–1810 (2025).
2. Hay, S. I. et al. Burden of 375 diseases and injuries, risk-attributable burden of 88 risk factors, and healthy life expectancy in 204 countries and territories, including 660 subnational locations, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* **406**, 1873–1922 (2025).
3. Woolf, S. H. & Schoomaker, H. Life expectancy and mortality rates in the United States, 1959-2017. *JAMA* **322**, 1996–2016 (2019).
4. Rashid, T. et al. Life expectancy and risk of death in 6791 communities in England from 2002 to 2019: high-resolution spatiotemporal analysis of civil registration data. *Lancet Public Health* **6**, e805–e816 (2021).
5. Kopec, J. A. et al. The impact of 51 risk factors on life expectancy in Canada: findings from a new risk prediction model based on data from the Global Burden of Disease Study. *Int. J. Environ. Res. Public Health* **19**, 8958 (2022).
6. Nordic Burden of Disease Collaborators. Life expectancy and disease burden in the Nordic countries: results from the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. *Lancet Public Health* **4**, e658–e669 (2019).
7. Naghavi, M. et al. Global burden of 292 causes of death in 204 countries and territories and 660 subnational locations, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* **406**, 1811–1872 (2025).
8. Wang, H. et al. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* **388**, 1459–1544 (2016).
9. Schumacher, A. E. et al. Global age-sex-specific mortality, life expectancy, and population estimates in 204 countries and territories and 811 subnational locations, 1950–2021, and the impact of the COVID-19 pandemic: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. *Lancet* **403**, 1989–2056 (2024).
10. Bonnet, F. et al. Spatial disparities in the mortality burden of the COVID-19 pandemic across 569 European regions (2020-2021). *Nat. Commun.* **15**, 4246 (2024).
11. World Health Organization. *World Health Statistics 2025: Monitoring Health for the SDGs, Sustainable Development Goals* (World Health Organization, 2025).
12. Steel, N. et al. Changing life expectancy in European countries 1990–2021: a subanalysis of causes and risk factors from the Global Burden of Disease Study 2021. *Lancet Public Health* **10**, e172–e188 (2025).
13. Islam, N. et al. Effects of COVID-19 pandemic on life expectancy and premature mortality in 2020: time series analysis in 37 countries. *Br. Med. J.* **375**, e066768 (2021).
14. Park, S. et al. Population health outcomes in South Korea 1990–2019, and projections up to 2040: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Public Health* **8**, e639–e650 (2023).
15. Behera, D. K. & Mishra, S. The burden of diarrhea, etiologies, and risk factors in India from 1990 to 2019: evidence from the Global Burden of Disease Study. *BMC Public Health* **22**, 92 (2022).
16. Foreman, K. J. et al. Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016-40 for 195 countries and territories. *Lancet* **392**, 2052–2090 (2018).
17. Aytemiz, L., Sart, G., Bayar, Y., Danilina, M. & Sezgin, F. H. The long-term effect of social, educational, and health expenditures on indicators of life expectancy: an empirical analysis for the OECD countries. *Front. Public Health* **12**, 1497794 (2024).
18. Ho, J. Y. & Hendi, A. S. Recent trends in life expectancy across high income countries: retrospective observational study. *Br. Med. J.* **362**, k2562 (2018).
19. Kruk, M. E. et al. Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. *Lancet* **392**, 2203–2212 (2018).
20. Zarulli, V. et al. Women live longer than men even during severe famines and epidemics. *Proc. Natl Acad. Sci. USA* **115**, E832–E840 (2018).
21. Cheong, C. et al. National trends in alcohol consumption, smoking, suicide attempts, and COVID-19 pandemic-related factors among South Korean adolescents, 2012-2022. *Asian J. Psychiatry* **97**, 104085 (2024).
22. Zeng, Y. et al. Sex differences in genetic associations with longevity. *JAMA Netw. Open* **1**, e181670 (2018).
23. Merid, M. W. et al. Impact of access to improved water and sanitation on diarrhea reduction among rural under-five children in low and middle-income countries: a propensity score matched analysis. *Trop. Med. Health* **51**, 36 (2023).
24. Leppold, C., Gibbs, L., Block, K., Reifels, L. & Quinn, P. Public health implications of multiple disaster exposures. *Lancet Public Health* **7**, e274–e286 (2022).
25. Choi, M., Sempungu, J. K., Lee, E. H. & Lee, Y. H. Changes in contributions of age- and cause-specific mortality to the widening life expectancy gap between North and South Korea, 1990-2019: an analysis of the Global Burden of Disease Study 2019. *SSM Popul. Health* **23**, 101445 (2023).
26. Chol, R. H. et al. Drivers of health transition in the DPRK. *Lancet Planet Health* **3**, e118–e119 (2019).
27. Ahmed, B. et al. Humanitarian disaster for Rohingya refugees: impending natural hazards and worsening public health crises. *Lancet Glob. Health* **6**, e487–e488 (2018).
28. Brown, H. Treating the injured and burying the dead. *Lancet* **365**, 204–205 (2005).
29. Stein, D. & Ayotte, B. East Timor: extreme deprivation of health and human rights. *Lancet* **354**, 2075 (1999).
30. Dumcheva, A., Nevalainen, J., Laatikainen, T. & Nuorti, P. How likely are eastern European and Central Asian countries to achieve global NCD targets: multi-country analysis. *BMC Public Health* **24**, 2714 (2024).
31. Choi, Y. et al. Acute and post-acute respiratory complications of SARS-CoV-2 infection: population-based cohort study in South Korea and Japan. *Nat. Commun.* **15**, 4499 (2024).
32. Kong, L. Z. China's medium-to-long term plan for the prevention and treatment of chronic diseases (2017-2025) under the healthy China initiative. *Chronic Dis. Transl. Med.* **3**, 135–137 (2017).
33. Lip, G. Y. H. et al. Integrated care for optimizing the management of stroke and associated heart disease: a position paper of the European Society of Cardiology Council on Stroke. *Eur. Heart J.* **43**, 2442–2460 (2022).
34. Kist, J. M. et al. Large health disparities in cardiovascular death in men and women, by ethnicity and socioeconomic status in an urban based population cohort. *EClinicalMedicine* **40**, 101120 (2021).
35. Mandal, S., Bhatia, V., Bhargava, A., Rijal, S. & Arinaminpathy, N. The potential impact on tuberculosis of interventions to reduce undernutrition in the WHO South-East Asian Region: a modelling analysis. *Lancet Reg. Health Southeast Asia* https://doi.org/10.1016/j.lansea.2024.100423 (2024).
36. Shattock, A. J. et al. Contribution of vaccination to improved survival and health: modelling 50 years of the expanded programme on immunization. *Lancet* **403**, 2307–2316 (2024).
37. Lindstrand, A., Cherian, T., Chang-Blanc, D., Feikin, D. & O'Brien, K. L. The world of immunization: achievements, challenges, and strategic vision for the next decade. *J. Infect. Dis.* **224**, S452–S467 (2021).
38. World Health Organization. *South-East Asia Regional Vaccine Action Plan 2016–2020* (World Health Organization, 2017).
39. Curtis, V. Explaining the outcomes of the 'Clean India' campaign: institutional behaviour and sanitation transformation in India. *BMJ Glob. Health* **4**, e001892 (2019).
40. Patil, S. R. et al. The effect of India's total sanitation campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial. *PLoS Med.* **11**, e1001709 (2014).
41. Jin, H., Li, B. & Jakovljevic, M. How China controls the COVID-19 epidemic through public health expenditure and policy? *J. Med. Econ.* **25**, 437–449 (2022).
42. Mo, Y., Feng, Q. & Gu, D. Impacts of the COVID-19 pandemic on life expectancy at birth in Asia. *BMC Public Health* **23**, 1508 (2023).
43. Chang, A. Y. et al. Past, present, and future of global health financing: a review of development assistance, government, out-of-pocket, and other private spending on health for 195 countries, 1995–2050. *Lancet* **393**, 2233–2260 (2019).
44. Han, S. M. et al. Progress towards universal health coverage in Myanmar: a national and subnational assessment. *Lancet Glob. Health* **6**, e989–e997 (2018).
45. Downey, L. E., Gadsden, T., Vilas, V. D. R., Peiris, D. & Jan, S. The impact of COVID-19 on essential health service provision for endemic infectious diseases in the South-East Asia region: a systematic review. *Lancet Reg. Health Southeast Asia* **1**, 100011 (2022).
46. Reif, L. K. et al. Models of lifelong care for children and adolescents with chronic conditions in low-income and middle-income countries: a scoping review. *BMJ Glob. Health* **7**, e007863 (2022).
47. Bennett, J. E. et al. Contributions of diseases and injuries to widening life expectancy inequalities in England from 2001 to 2016: a population-based analysis of vital registration data. *Lancet Public Health* **3**, e586–e597 (2018).
48. World Health Organization. *NCD Best Buys and Other Effective Intervention* (World Health Organization, 2018).
49. World Health Organization. *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020* (World Health Organization, 2013).
50. Feigin, V. L. et al. What is the best mix of population-wide and high-risk targeted strategies of primary stroke and cardiovascular disease prevention? *J. Am. Heart Assoc.* **9**, e014494 (2020).
51. Ahmed, S. M. et al. Delivering non-communicable disease services through primary health care in selected south Asian countries: are health systems prepared? *Lancet Glob. Health* **12**, e1706–e1719 (2024).
52. Benda, N. et al. Designing electronic data capture systems for sustainability in low-resource settings: viewpoint with lessons learned from Ethiopia and Myanmar. *JMIR Public Health Surveill.* **10**, e47703 (2024).

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Article

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Methods

Overview

The GBD 2023 systematically evaluated health loss associated with diseases, injuries and risk factors worldwide, providing mortality estimates for 292 causes of death and reporting life expectancy. Furthermore, 88 risk factors and their associations with 159 health outcomes were evaluated, with risk-specific measures such as the SEV and relative health risk[2]. The data were stratified by sex, age, year and region[1,2]. All estimates were calculated as numbers and age-standardized rates, with uncertainty quantified using 95% UIs defined by the 2.5th and 97.5th percentiles. Detailed methodology of the GBD framework, including model validation, sensitivity analyses and uncertainty calibration, has been documented in previous publications[1,7,53,54]. The study adhered to the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) in Supplementary Table 9.

In this study, we investigated changes in life expectancy in the Asia region from 1990 to 2023. This study covered 34 Asian countries and territories, categorized into five regions (Supplementary Table 10): Central Asia, East Asia, HICs of Asia Pacific, South Asia and Southeast Asia[1]. The study was divided into two main components. First, the study analysed the trends in life expectancy at birth for each country or territory. As the study period includes the recent COVID-19 pandemic (2020–2023), we analysed the change in life expectancy before and during the pandemic by comparing the 1990–2023, 1990–2019 and 2019–2023 periods, using 2019 as a reference point. We also explored the association between life expectancy and inequality using the SDI through linear regression models. Second, we examined the causes of death and attributable risk factors contributing to changes in life expectancy. To calculate the contribution of specific causes to changes in life expectancy, we used decomposition analysis and evaluated the effect of risk factors associated with causes that had a negative effect on total life expectancy gain. The SEV was used to measure changes in population exposure to risk factors related to causes of death.

Life expectancy estimation

In GBD 2023, life expectancy was estimated by constructing life tables based on age-specific all-cause mortality[1]. To obtain these mortality estimates, a wide range of data sources were utilized; comprehensive details on these sources are described in the GBD 2023 capstone publications[1,2,7]. The collected data were put through several stages of data processing to improve the accuracy of mortality estimation. For individuals younger than 15 years of age, age-specific mortality was derived from complete birth histories instead of from aggregated mortality rates for those younger than 5 years of age. For adults 15–49 years of age, sibling survival histories were used as supplementary inputs. A newly developed age–sex splitting algorithm was applied to address data imbalances and missingness, and weight adjustment and compactification techniques were used to stabilize estimates for neonate and older adult groups[1,7].

To estimate all-cause mortality, GBD 2023 used OneMod, a single statistical model, to consistently predict mortality by age, sex, year and location[1,7]. The model consists of two primary stages. The first stage involved SpXMod, a stepwise regression framework based on generalized linear modelling, which fits models incorporating covariate coefficients and dimension-specific intercepts by age and location. Five covariates were used in this stage: HIV mortality, age-standardized COVID-19 mortality, the SDI, a binary indicator of whether a location is an island, and a summary covariate representing the population-attributable fraction of all risk factors. Second, predicted values from SpXMod were refined using KReg, a non-parametric kernel regression approach. Residuals from SpXMod were smoothed based on similarities across age, time and location dimensions, allowing the model to capture additional patterns not explained by the covariates. The resulting age-specific all-cause mortality estimates produced by OneMod were then used to construct full life tables by single-year age groups. These mortality estimates were subsequently used to generate life tables for life expectancy estimation by location, sex, age group and year. After redistribution of cause-specific deaths and adjustments by age and sex, the final all-cause mortality life tables were constructed according to the standard GBD age groups. Uncertainty was propagated using 1,000 draws, from which the mean and 95% UI were calculated and applied to mortality and life expectancy estimates derived from the constructed life tables[1].

Cause of death

To estimate cause-specific mortality for 292 causes in GBD 2023, data were compiled from a wide range of sources[1,2,7]. In the GBD 2023, most causes of death for diseases and injuries were estimated using the Cause of Death Ensemble model (CODEm)[55,56]. CODEm is an ensemble model that combines multiple statistical models to enhance predictive accuracy. This model systematically tested combinations of covariates and evaluated their out-of-sample predictive validity. In addition, specialized modelling strategies were used for diseases with specific epidemiological characteristics, significant changes in reporting practices or limited data availability. All cause-specific mortality estimates included 95% UI, derived from 250 posterior draws per metric. Further details are available in the GBD 2023 capstone publications[1,2,7].

Estimation of COVID-19

To account for potential misclassification of COVID-19 deaths during the pandemic, GBD 2023 implemented a correction procedure before estimating COVID-19-specific mortality[7,53]. This process involved examining mortality data from 2020 to 2022 to identify sudden increases in cause-specific death rates that may have resulted from misattributed COVID-19 cases[7]. A support vector machine model was used to detect anomalies that deviated from expected temporal trends, and correlations with observed COVID-19 mortality were assessed to determine whether these spikes reflected misclassification or actual increases in mortality. To estimate the number of misclassified COVID-19 deaths, GBD 2023 applied two counterfactual approaches to approximate the expected number of deaths in the absence of the pandemic[7]. One of the counterfactuals projected pre-pandemic mortality trends using linear regression from 2015 to 2019, whereas the other applied a global relative mortality previously used for adjusting HIV misclassification. Excess deaths were estimated by comparing observed and expected deaths, and the portion attributed to COVID-19 was reassigned from the cause to COVID-19 based on the strength of correlation. The OneMod model was applied to estimate COVID-19 mortality based on the corrected number of deaths, with covariates including total severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections and variant prevalence, COVID-19 vaccinations, SARS-CoV-2 infection detection rate, health-care access and quality index, and prevalence of risk factors and comorbidities such as obesity, smoking, cancer, cardiovascular disease, chronic kidney disease, chronic obstructive pulmonary disease and diabetes.

Cause hierarchy

The GBD 2023 classified diseases and injuries into a four-level hierarchical structure, incorporating mortality and non-mortality causes[2,7,55]. Level 1 was divided into three major categories: communicable, maternal, neonatal and nutritional diseases; NCDs; and injuries. Level 2 further categorized diseases and injuries into 22 systems, serving as a broader concept for more detailed classifications in levels 3 and 4. This classification was further detailed into 292 fatal causes.

This study focused on the causes of death classified at levels 2 and 3 that contributed to changes in life expectancy. For mortality, level 2 categorizes diseases into 21 systems to identify the primary diseases contributing to changes in life expectancy, with a more detailed assessment of 140 causes using level 3 indicators.

SDI

The SDI served as a composite measure to evaluate the level of development in a country or territory, which is strongly associated with health outcomes[57,58]. The SDI was determined by calculating the geometric mean of three main components: the total fertility rate for individuals younger than 25 years of age (TFU25), the average education level for those 15 years of age and older (EDU15+) and lag distributed income per capita. This index ranged from 0 to 1, where an SDI of 0 signifies the lowest development level related to health, and an SDI of 1 indicates the highest. Each year, every GBD location was assigned an SDI score.

Life expectancy decomposition

Life expectancy decomposition was used to quantify the contributions of specific causes of death to changes in life expectancy[1]. The decomposition analysis involved three main stages[55,59]. First, the change in life expectancy was decomposed by age to determine the contribution of each age group. This step involved calculating differences in life expectancy across age groups using life table values and life expectancy metrics for each age group.

$$\delta_x^{2-1} = l_x^2(e_x^2 - e_x^1) - l_{x+1}^2(e_{x+1}^2 - e_{x+1}^1)$$

l_x^2 and l_{x+1}^2 denoted the proportions of the cohort surviving to age x and $x+1$ at time 2 (2023), respectively; e_x^1 and e_{x+1}^1 represent the life expectancy at age groups x and $x+1$ at time 1 (1990); e_x^2 and e_{x+1}^2 indicated the life expectancy values at time 2. δ_x^{2-1} quantified the age-specific contribution to the total change in life expectancy between two time points by comparing survival proportions and expected remaining years of life at adjacent age intervals.

Second, the contribution of each age group was further decomposed into cause–age-specific contributions. This step used the differences in life expectancy calculated in the previous stage and the age-specific mortality values for each cause.

$$\delta_{ac}^{2-1} = \delta_a^{2-1} \times \frac{mx_{ac}^2 - mx_{ac}^1}{mx_a^2 - mx_a^1}$$

δ_a^{2-1} represents the age-specific (a) decomposition of life expectancy between two time points. $mx_{ac}^2 - mx_{ac}^1$ indicates the change in the cause (c) and age-specific mortality (mx) over time, whereas $mx_a^2 - mx_a^1$ reflects the corresponding change in all-cause mortality for age group. This process enabled the identification of specific causes of death that contribute to differences in life expectancy within each age group. Third, the age-specific contributions of each cause were aggregated to calculate the overall contribution of each cause to changes in life expectancy.

$$\delta_c^{2-1} = \sum_a \delta_{ac}^{2-1}$$

The decomposition framework used in this analysis was based on the Das Gupta method, with the detailed formula for calculating life expectancy decomposition documented in previous publications[7,55,60]. The analysis allowed for identifying the gain in life expectancy attributable to each cause[55]. Positive values indicate an increase in life years resulting from a reduction in the burden of a cause, whereas negative values signify a decrease in life years due to an increased burden. The decomposition analysis provided insights into how various causes of death contribute to changes in life expectancy, offering a comprehensive understanding of factors influencing mortality trends. Calculation of decomposition analysis and visualization were conducted by using R statistical software (v4.1.2)[61].

Risk factors and exposure

Associations between 88 risk factors and 159 health outcomes were analysed in GBD 2023, resulting in 676 risk–outcome pairs being identified[2,54]. The study established the theoretical minimum risk exposure level to identify the level of exposure that would minimize health risks for each risk factor and calculated the SEV, which quantifies the population-level exposure to each risk factor on a scale of 0–100, with 0 indicating minimal risk and 100 indicating maximum risk[2].

In this study, we identified causes of death that reduced the gain in total life expectancy through decomposition analysis and investigated the risk factors associated with all causes of death[62]. Furthermore, we examined the SEVs of the top five risk factors linked to these diseases to understand the trends in exposure contributing to the negative changes in life expectancy.

Risk factor hierarchy

The GBD 2023 systematically evaluated the complex interactions and impacts of risk factors by classifying them into a four-level hierarchical structure[2,54]. Level 1 included three major categories: environmental and occupational risks, behavioural risks and metabolic risks. These level 1 categories were further divided into level 2 risk groups that included broad domains such as air pollution, tobacco use and metabolic abnormalities. This hierarchical structure continued through levels 3 and 4, which included increasingly specific subcategories, allowing for more detailed assessment of individual risk factors[2]. In this study, level 2 was used to categorize and organize the risks of diseases contributing to changes in life expectancy. This approach enabled a detailed understanding of how different risk factors influence changes in life expectancy.

Ethics statement

This study utilized secondary data from GBD 2023, which used de-identified data and was approved by the University of Washington Institutional Review Board (study #9060). This article has not been submitted for publication elsewhere, and the corresponding author approves the submission.

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

The findings from this study were produced using data available in public online repositories or in the published literature, data that are publicly available on request from the data provider, and data that are not publicly available due to restrictions by the data provider and that were used under license for the current study. Details on data sources can be found on GHDx (https://ghdx.healthdata.org/), including information about the data provider and links to where the data can be accessed or requested (where available). For detailed information on data sources and estimates, please visit Global Health Data Exchange GBD 2023 (accessed on 4 June 2025; http://ghdx.healthdata.org/gbd-2023).

Code availability

The statistical code used for data processing and analysis for the GBD 2023 is publicly available (https://ghdx.healthdata.org/gbd-2023/code). The code is also available on Zenodo[63] (https://doi.org/10.5281/zenodo.19067331).

53. GBD 2023 Lower Respiratory Infections and Antimicrobial Resistance Collaborators. Global burden of lower respiratory infections and aetiologies, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet Infect. Dis.* https://doi.org/10.1016/S1473-3099(25)00689-9 (2026).

54. Flor, L. S. et al. Disease burden attributable to intimate partner violence against females and sexual violence against children in 204 countries and territories, 1990-2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* https://doi.org/10.1016/S0140-6736(25)02503-6 (2026).
55. Naghavi, M. et al. Global burden of 288 causes of death and life expectancy decomposition in 204 countries and territories and 811 subnational locations, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet* **403**, 2100–2132 (2024).
56. Foreman, K. J., Lozano, R., Lopez, A. D. & Murray, C. J. Modeling causes of death: an integrated approach using CODEm. *Popul. Health Metr.* **10**, 1 (2012).
57. Kim, S. et al. Global, regional, and national trends in drug use disorder mortality rates across 73 countries from 1990 to 2021, with projections up to 2040: a global time-series analysis and modelling study. *EClinicalMedicine* **79**, 102985 (2025).
58. Mark, P. B. et al. Global, regional, and national burden of chronic kidney disease in adults, 1990–2023, and its attributable risk factors: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet* **406**, 2461–2482 (2025).
59. Jdanov, D. A., Shkolnikov, V. M., van Raalte, A. A. & Andreev, E. M. Decomposing current mortality differences into initial differences and differences in trends: the contour decomposition method. *Demography* **54**, 1579–1602 (2017).
60. Chevan, A. & Sutherland, M. Revisiting Das Gupta: refinement and extension of standardization and decomposition. *Demography* **46**, 429–449 (2009).
61. R Core Team. *R: A Language and Environment for Statistical Computing*. https://www.R-project.org/ (R Foundation for Statistical Computing, 2013).
62. Mackenbach, J. P. et al. Determinants of inequalities in life expectancy: an international comparative study of eight risk factors. *Lancet Public Health* **4**, e529–e537 (2019).
63. Kim, H. J. Mapping drivers of life expectancy change in Asia from 1990 to 2023 (v1.0). *Zenodo* https://doi.org/10.5281/zenodo.19067331 (2026).

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Author contributions J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. devised the conceptualization and design of the study. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. produced the methodology. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. acquired the data. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. performed the statistical analysis and curated the data. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. conducted validation. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. interpreted the data. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. performed the visualization. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. managed the estimation or publication process. J. Kang, H.J.K., M.S.K., J.I.S. and D.K.Y. prepared the original draft of the manuscript. All authors wrote, reviewed and edited the manuscript and provided critical revision to the manuscript. S.I.H., N.S., J.I.S. and D.K.Y. supervised the study. J.I.S. and D.K.Y. provided project administration. J.I.S. and D.K.Y. acquired funding. The GBD 2023 Asia Life Expectancy Collaborators provided data or critical feedback on data sources, developed methods or computational machinery, provided critical feedback on methods or results, drafted the manuscript or revised it critically for important intellectual content, and managed the estimation or publication process. Please see the Supplementary Information for more detailed information about individual author contributions to the research. Members of the core research team for this topic area had full access to the underlying data used to generate estimates presented in this study. All other authors had access to and reviewed estimates as part of the research evaluation process, which included additional stages of formal review (D.K.Y. and S.I.H.). J. Kang, H.J.K. and M.S.K. contributed equally (first). J.I.S. and D.K.Y. jointly supervised this work. S.I.H. is the principal investigator of GBD 2023 Asia Life Expectancy Collaborators. N.S. is the senior author. The corresponding author (D.K.Y.) and principal investigator (S.I.H.) had full access to the data in the study and had final responsibility for the decision to submit for publication.

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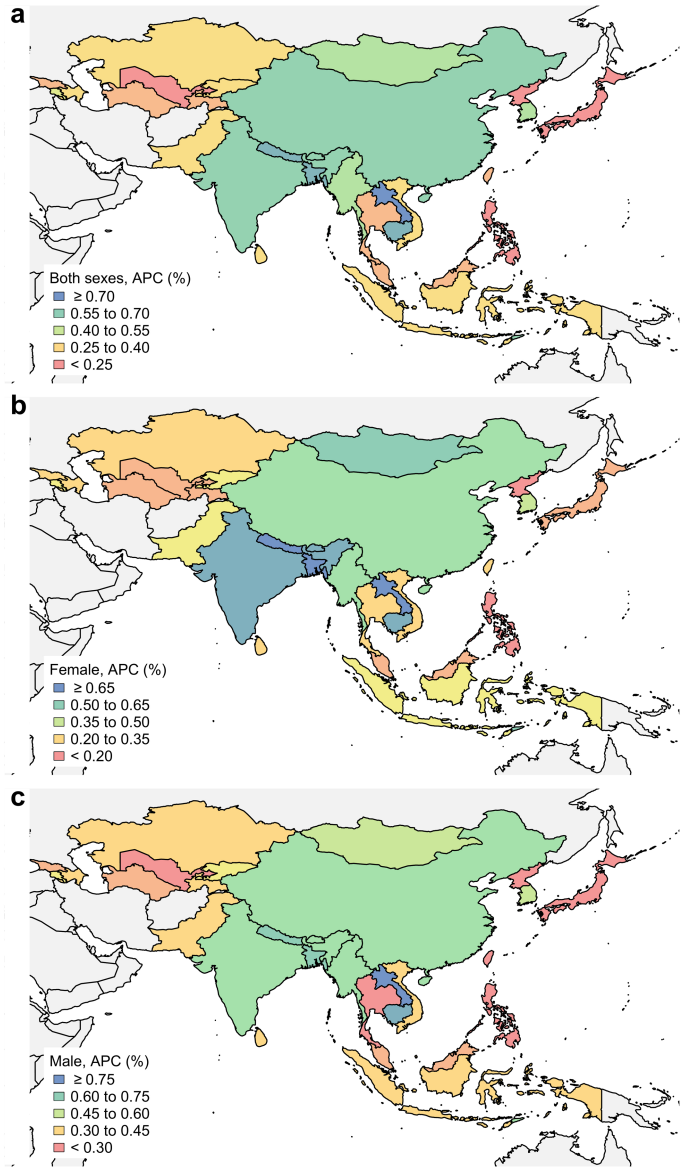
Additional information

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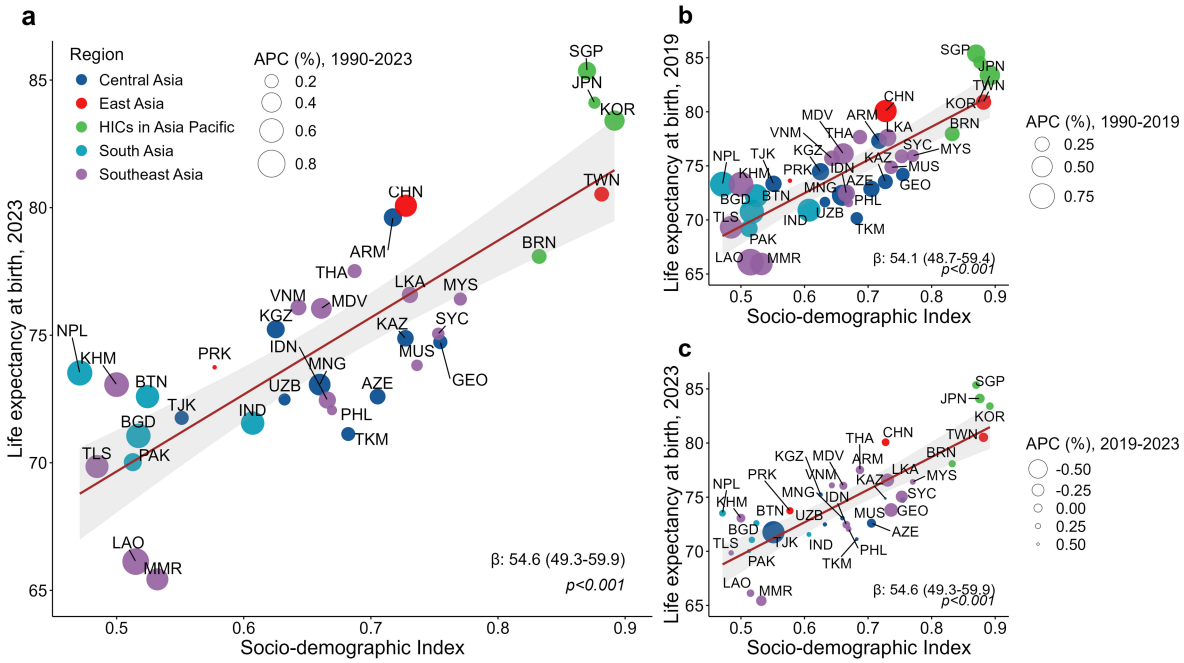
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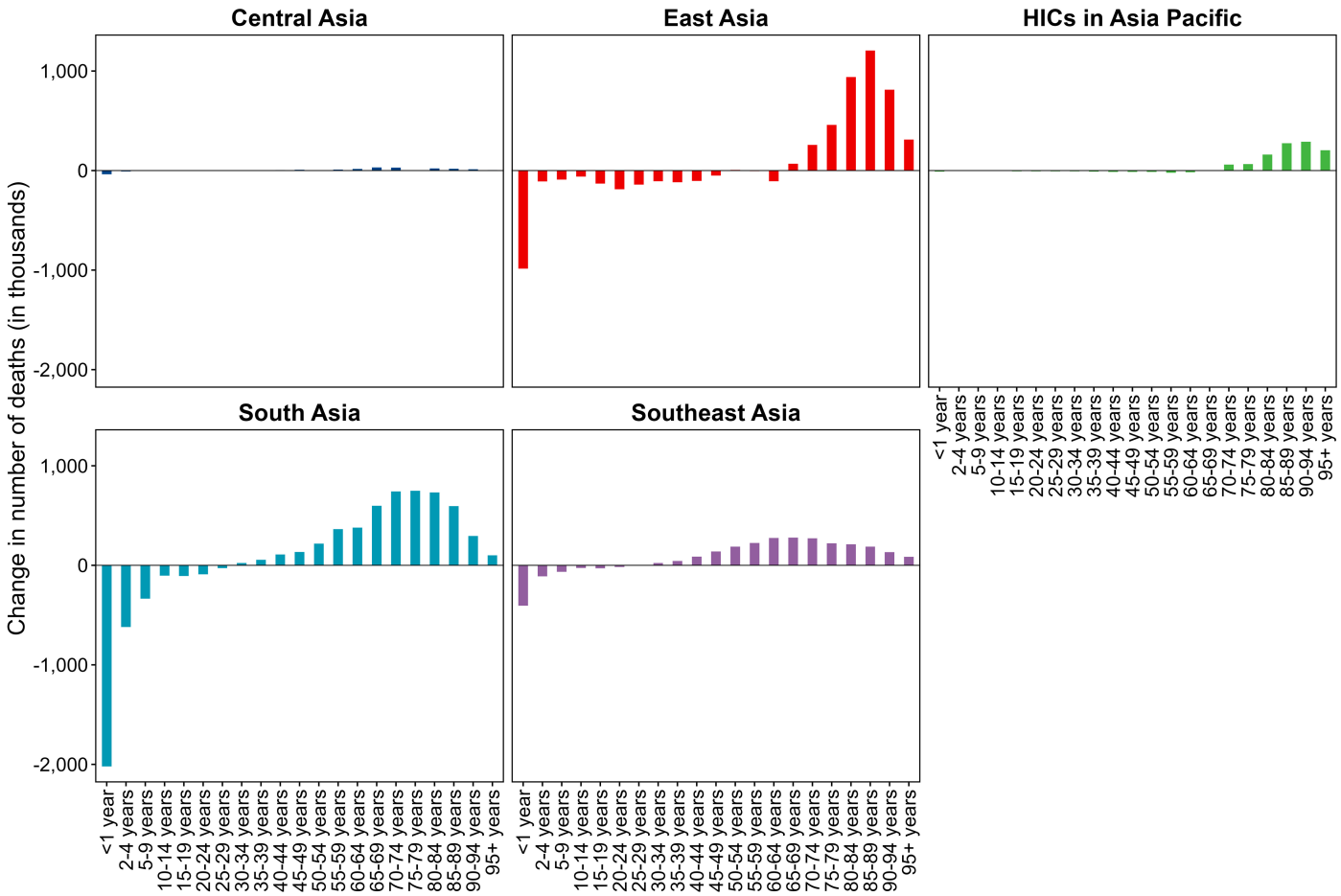
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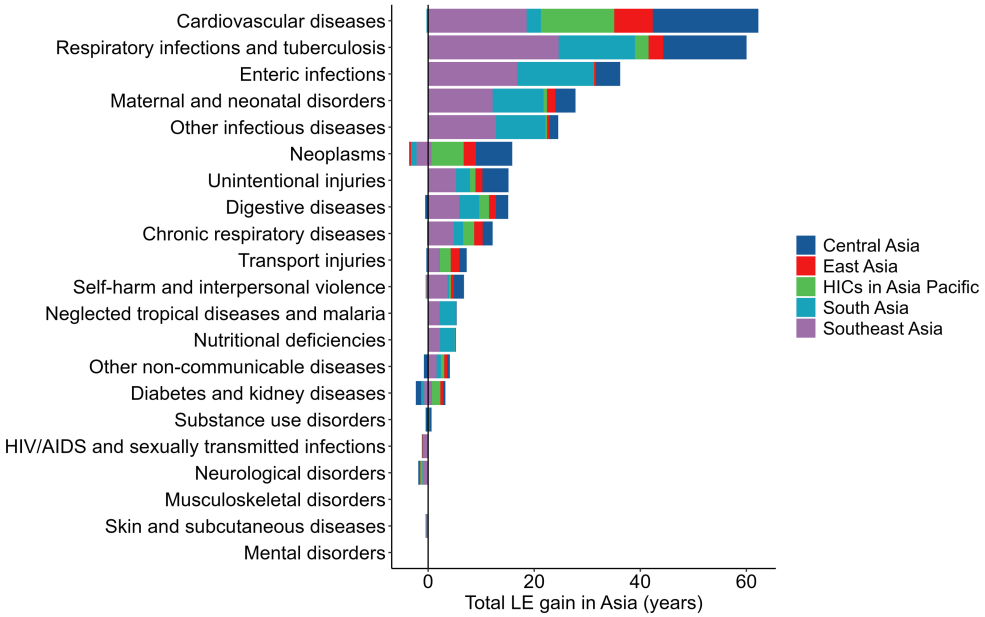
Extended Data Fig. 1 | Changes in life expectancy at birth in Asia for 34 countries and territories by sex, 1990–2023. *Abbreviation:* APC, annual percentage change. **a**, Changes in life expectancy at birth for both sexes. **b**, Changes in life expectancy at birth for females. **c**, Changes in life expectancy at birth for males. Out-of-scope countries and territories are masked in grey.



Extended Data Fig. 2 | Association between socio-demographic index and life expectancy at birth across 34 Asian countries and territories by period. *Abbreviations:* APC, annual percentage change; Brunei, Brunei Darussalam; DPRK, Democratic People's Republic of Korea; HIC, high income country; Laos, Lao People's Democratic Republic. **a**, Association between the socio-demographic index and life expectancy at birth during 1990–2023. **b**, Association between the socio-demographic index and life expectancy at birth during 1990–2019. **c**, Association between the socio-demographic index and life expectancy at birth during 2019–2023. Each point represents a country or territory, with colors indicating subregions of Asia. The size of each point reflects the APC in life expectancy from 1990 to 2023. The solid line represents the fitted linear regression, and the shaded area indicates the 95% confidence interval.



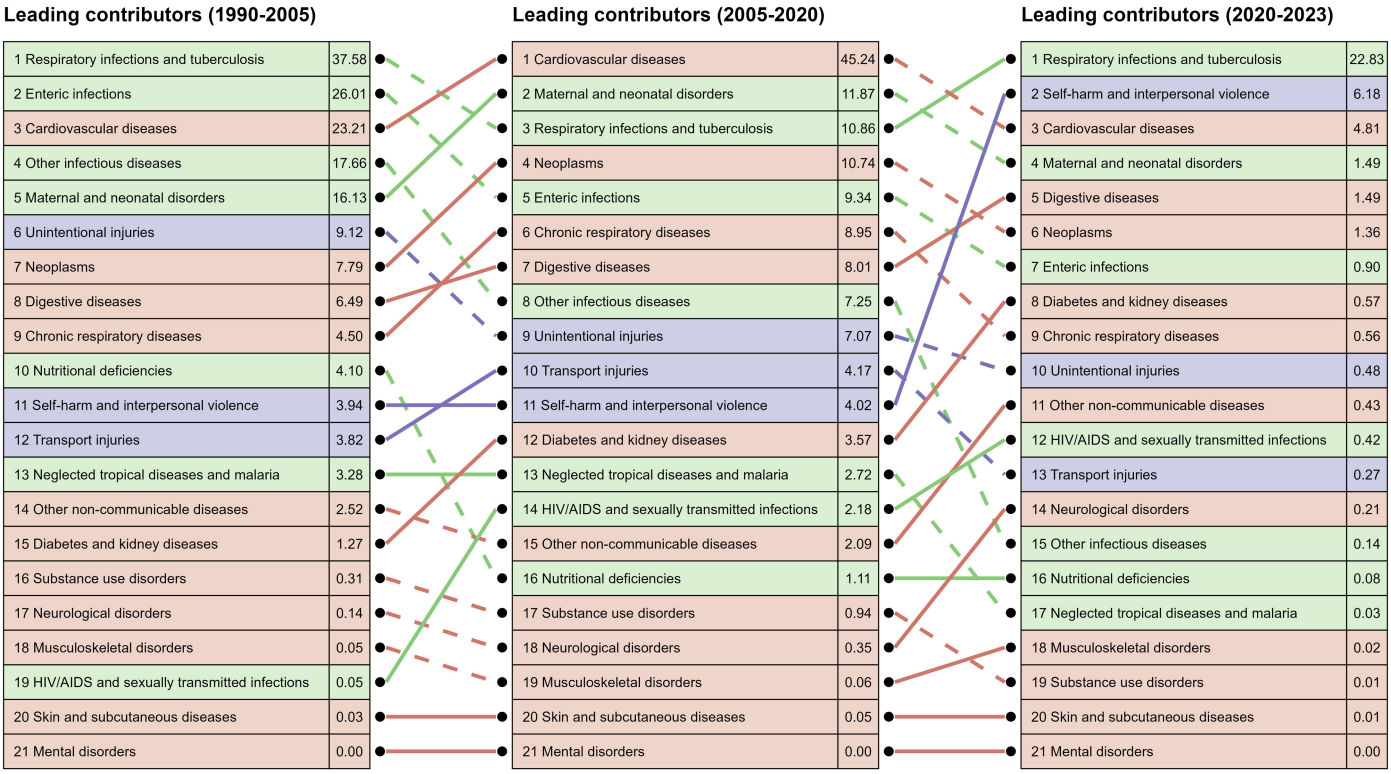
Extended Data Fig. 3 | Age-specific changes in the number of deaths between 1990 and 2023 across Asian regions. *Abbreviation:* HIC, high-income country.



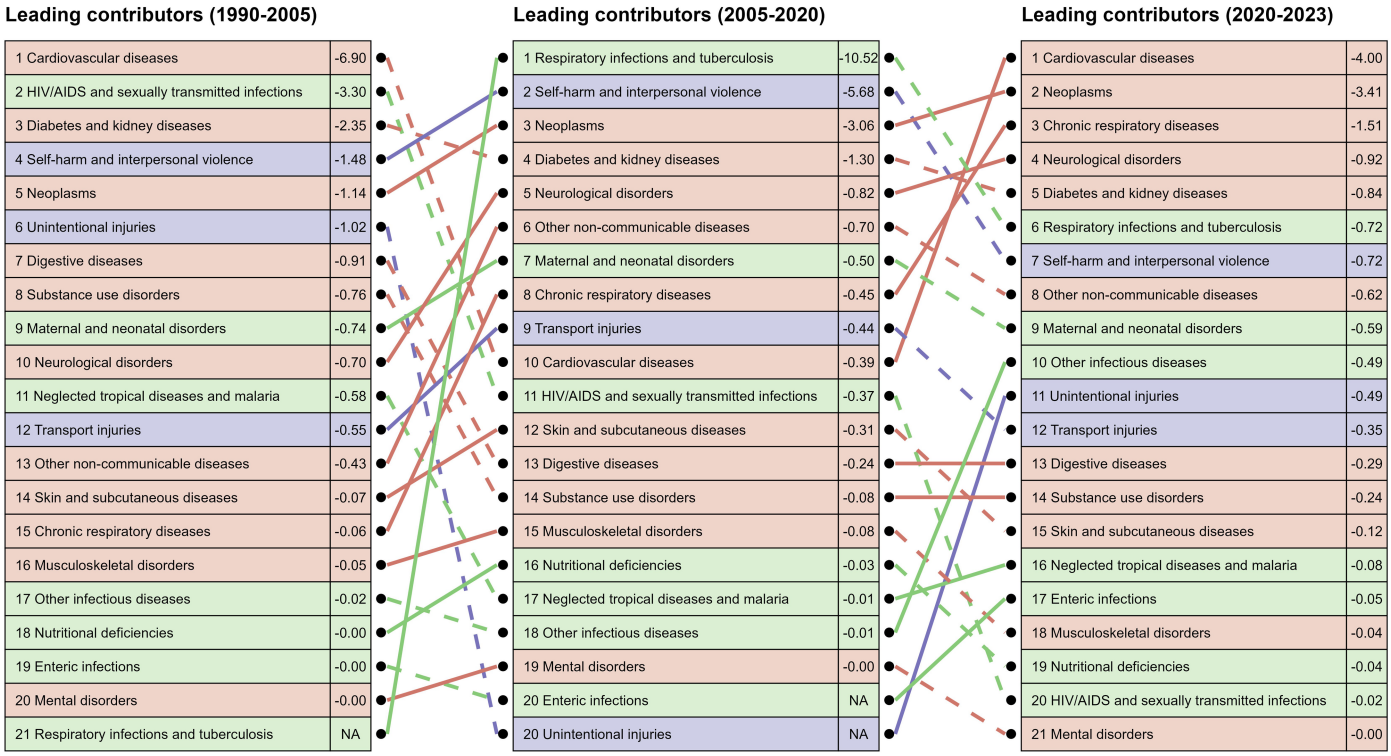
Extended Data Fig. 4 | Total gain in life expectancy by level-2 cause-group contributions across 34 Asian countries and territories, ordered by positive contributors. *Abbreviations:* HIC, high income country; LE, life expectancy. Bars represent the summed contributions (in years) of each level-2 cause group to changes in LE, aggregated across all 34 countries and territories.

	Top 5 positive contributors to changes in LE					Top 5 negative contributors to changes in LE				
	1	2	3	4	5	1	2	3	4	5
Central Asia	Cardiovascular diseases	Respiratory infections and tuberculosis	Neoplasms	Unintentional injuries	Enteric infections	Diabetes and kidney diseases	Other non-communicable diseases	Neurological disorders	Skin and subcutaneous diseases	Musculoskeletal disorders
Armenia	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Unintentional injuries	Maternal and neonatal disorders	Musculoskeletal disorders	Skin and subcutaneous diseases	HIV/AIDS and sexually transmitted	-	-
Azerbaijan	Respiratory infections and tuberculosis	Cardiovascular diseases	Neoplasms	Enteric infections	Digestive diseases	Other non-communicable diseases	Neurological disorders	Maternal and neonatal disorders	Diabetes and kidney diseases	Skin and subcutaneous diseases
Georgia	Cardiovascular diseases	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Unintentional injuries	Enteric infections	Diabetes and kidney diseases	Transport injuries	Neoplasms	Chronic respiratory diseases	Neurological disorders
Kazakhstan	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Unintentional injuries	Transport injuries	Digestive diseases	Chronic respiratory diseases	Diabetes and kidney diseases	Skin and subcutaneous diseases	Nutritional deficiencies
Kyrgyzstan	Respiratory infections and tuberculosis	Cardiovascular diseases	Neoplasms	Chronic respiratory diseases	Unintentional injuries	Other non-communicable diseases	Musculoskeletal disorders	Skin and subcutaneous diseases	Nutritional deficiencies	Mental disorders
Mongolia	Respiratory infections and tuberculosis	Cardiovascular diseases	Maternal and neonatal disorders	Unintentional injuries	Neoplasms	Substance use disorders	Skin and subcutaneous diseases	Musculoskeletal disorders	Mental disorders	-
Tajikistan	Respiratory infections and tuberculosis	Enteric infections	Neoplasms	Unintentional injuries	Other infectious diseases	Diabetes and kidney diseases	Other non-communicable diseases	Neurological disorders	Musculoskeletal disorders	Skin and subcutaneous diseases
Turkmenistan	Respiratory infections and tuberculosis	Cardiovascular diseases	Enteric infections	Neoplasms	Unintentional injuries	Digestive diseases	Other non-communicable diseases	Diabetes and kidney diseases	Neurological disorders	Skin and subcutaneous diseases
Uzbekistan	Cardiovascular diseases	Respiratory infections and tuberculosis	Neoplasms	Digestive diseases	Unintentional injuries	Diabetes and kidney diseases	Other non-communicable diseases	Maternal and neonatal disorders	Neurological disorders	HIV/AIDS and sexually transmitted
East Asia	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Chronic respiratory diseases	HIV/AIDS and sexually transmitted	Mental disorders	-	-	-
China (mainland)	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Chronic respiratory diseases	HIV/AIDS and sexually transmitted	Mental disorders	-	-	-
DPRK	Respiratory infections and tuberculosis	Cardiovascular diseases	Maternal and neonatal disorders	Digestive diseases	Chronic respiratory diseases	Neoplasms	HIV/AIDS and sexually transmitted	Neurological disorders	Diabetes and kidney diseases	Musculoskeletal disorders
Taiwan	Cardiovascular diseases	Transport injuries	Digestive diseases	Unintentional injuries	Neoplasms	Neurological disorders	Self-harm and interpersonal violence	Musculoskeletal disorders	Other non-communicable diseases	HIV/AIDS and sexually transmitted
HICs in Asia Pacific	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Transport injuries	Digestive diseases	Neurological disorders	Self-harm and interpersonal violence	Skin and subcutaneous diseases	-	-
Brunei	Cardiovascular diseases	Neoplasms	Diabetes and kidney diseases	Chronic respiratory diseases	Respiratory infections and tuberculosis	Neurological disorders	HIV/AIDS and sexually transmitted	Skin and subcutaneous diseases	-	-
Japan	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Transport injuries	Digestive diseases	Neurological disorders	Self-harm and interpersonal violence	Skin and subcutaneous diseases	Nutritional deficiencies	Substance use disorders
Republic of Korea	Cardiovascular diseases	Neoplasms	Digestive diseases	Transport injuries	Chronic respiratory diseases	Neurological disorders	Self-harm and interpersonal violence	-	-	-
Singapore	Cardiovascular diseases	Neoplasms	Respiratory infections and tuberculosis	Chronic respiratory diseases	Diabetes and kidney diseases	Neurological disorders	Skin and subcutaneous diseases	Substance use disorders	-	-
South Asia	Enteric infections	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Other infectious diseases	Digestive diseases	Diabetes and kidney diseases	Neoplasms	Neurological disorders	Mental disorders	-
Bangladesh	Maternal and neonatal disorders	Respiratory infections and tuberculosis	Enteric infections	Other infectious diseases	Nutritional deficiencies	Neoplasms	Cardiovascular diseases	Skin and subcutaneous diseases	Substance use disorders	Mental disorders
Bhutan	Enteric infections	Respiratory infections and tuberculosis	Neglected tropical diseases and malaria	Maternal and neonatal disorders	Cardiovascular diseases	Neoplasms	Diabetes and kidney diseases	Neurological disorders	HIV/AIDS and sexually transmitted	Skin and subcutaneous diseases
India	Enteric infections	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Other infectious diseases	Cardiovascular diseases	Diabetes and kidney diseases	Neoplasms	HIV/AIDS and sexually transmitted	Neurological disorders	Musculoskeletal disorders
Nepal	Respiratory infections and tuberculosis	Other infectious diseases	Enteric infections	Maternal and neonatal disorders	Digestive diseases	Diabetes and kidney diseases	Neoplasms	Transport injuries	Neurological disorders	Substance use disorders
Pakistan	Respiratory infections and tuberculosis	Enteric infections	Other infectious diseases	Maternal and neonatal disorders	Digestive diseases	Neoplasms	Diabetes and kidney diseases	Transport injuries	HIV/AIDS and sexually transmitted	Neurological disorders
Southeast Asia	Respiratory infections and tuberculosis	Enteric infections	Cardiovascular diseases	Other infectious diseases	Maternal and neonatal disorders	Neoplasms	Neurological disorders	HIV/AIDS and sexually transmitted	Diabetes and kidney diseases	Skin and subcutaneous diseases
Cambodia	Respiratory infections and tuberculosis	Other infectious diseases	Maternal and neonatal disorders	Enteric infections	Unintentional injuries	Neurological disorders	Neoplasms	Skin and subcutaneous diseases	Mental disorders	-
Indonesia	Enteric infections	Respiratory infections and tuberculosis	Other infectious diseases	Maternal and neonatal disorders	Digestive diseases	Neoplasms	Diabetes and kidney diseases	Neurological disorders	Transport injuries	HIV/AIDS and sexually transmitted
Laos	Enteric infections	Other infectious diseases	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Digestive diseases	Neoplasms	Diabetes and kidney diseases	HIV/AIDS and sexually transmitted	Neurological disorders	Transport injuries
Malaysia	Cardiovascular diseases	Respiratory infections and tuberculosis	Digestive diseases	Transport injuries	Other infectious diseases	Skin and subcutaneous diseases	Neurological disorders	Mental disorders	-	-
Maldives	Cardiovascular diseases	Enteric infections	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Chronic respiratory diseases	Neoplasms	Neurological disorders	Skin and subcutaneous diseases	HIV/AIDS and sexually transmitted	Substance use disorders
Mauritius	Cardiovascular diseases	Chronic respiratory diseases	Digestive diseases	Respiratory infections and tuberculosis	Maternal and neonatal disorders	HIV/AIDS and sexually transmitted	Neurological disorders	Skin and subcutaneous diseases	Musculoskeletal disorders	Other non-communicable diseases
Myanmar	Respiratory infections and tuberculosis	Enteric infections	Other infectious diseases	Maternal and neonatal disorders	Cardiovascular diseases	Self-harm and interpersonal violence	Neoplasms	HIV/AIDS and sexually transmitted	Neurological disorders	Skin and subcutaneous diseases
Philippines	Respiratory infections and tuberculosis	Enteric infections	Other infectious diseases	Self-harm and interpersonal violence	Cardiovascular diseases	Diabetes and kidney diseases	HIV/AIDS and sexually transmitted	Neurological disorders	Skin and subcutaneous diseases	Transport injuries
Seychelles	Cardiovascular diseases	Digestive diseases	Unintentional injuries	Other infectious diseases	Chronic respiratory diseases	HIV/AIDS and sexually transmitted	Diabetes and kidney diseases	Other non-communicable diseases	Neoplasms	Skin and subcutaneous diseases
Sri Lanka	Cardiovascular diseases	Self-harm and interpersonal violence	Maternal and neonatal disorders	Digestive diseases	Chronic respiratory diseases	Neoplasms	Diabetes and kidney diseases	Neurological disorders	Skin and subcutaneous diseases	HIV/AIDS and sexually transmitted
Thailand	Cardiovascular diseases	Chronic respiratory diseases	Enteric infections	Neoplasms	Transport injuries	Neurological disorders	HIV/AIDS and sexually transmitted	Skin and subcutaneous diseases	Substance use disorders	Musculoskeletal disorders
Timor-Leste	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Enteric infections	Other infectious diseases	Self-harm and interpersonal violence	Neoplasms	HIV/AIDS and sexually transmitted	Diabetes and kidney diseases	Neurological disorders	Musculoskeletal disorders
Viet Nam	Cardiovascular diseases	Respiratory infections and tuberculosis	Maternal and neonatal disorders	Other infectious diseases	Unintentional injuries	Neoplasms	Neurological disorders	HIV/AIDS and sexually transmitted	Substance use disorders	Skin and subcutaneous diseases

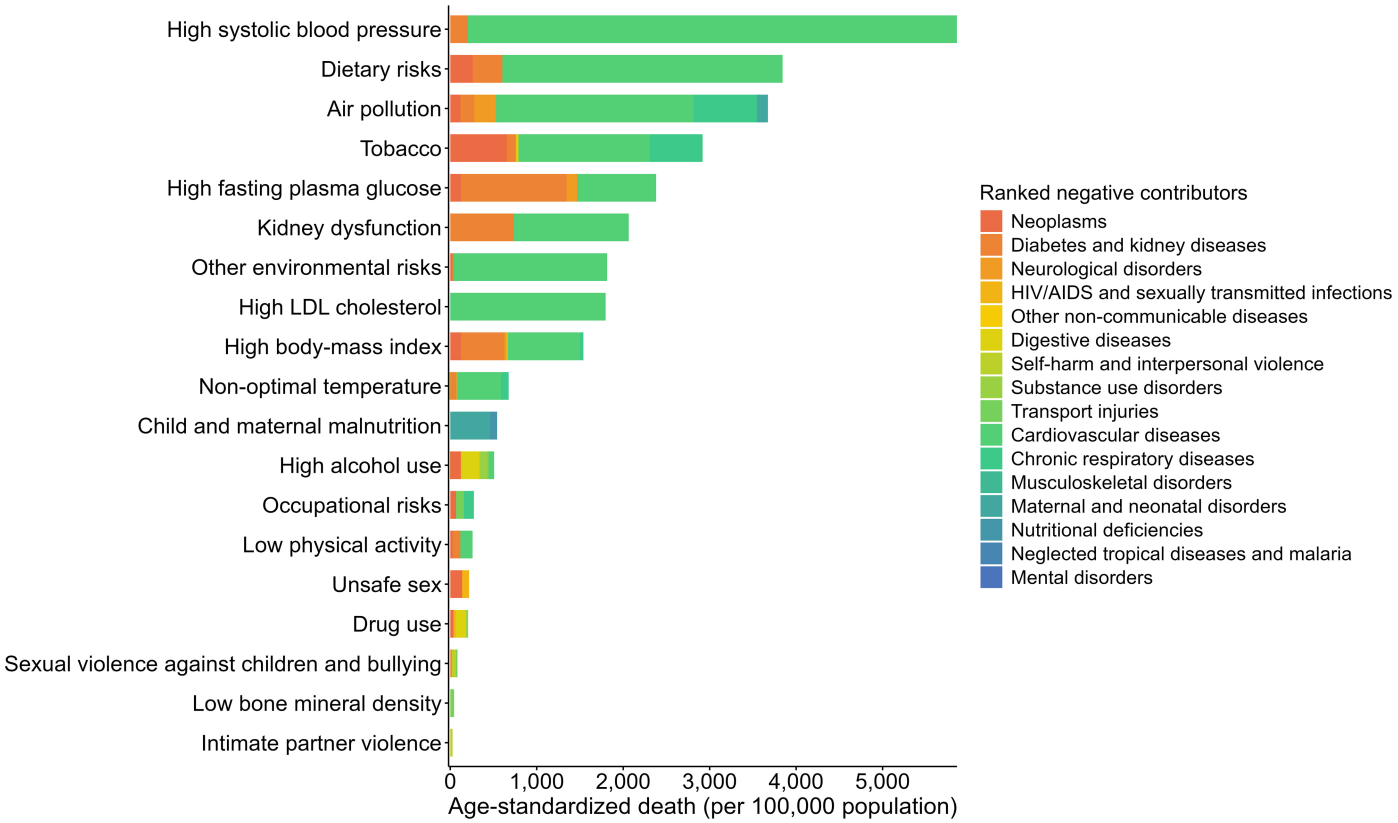
Extended Data Fig. 5 | Top 5 disease and injury contributors to positive or negative changes in life expectancy at birth across 34 Asian countries and territories. *Abbreviations:* HIC, high income country; LE, life expectancy. The color classification followed the GBD level-1 cause categories: Red indicated non-communicable diseases; green represented communicable, maternal, neonatal, and nutritional diseases; and blue referred injuries.



Extended Data Fig. 6 | Period-specific leading disease and injury contributors with positive contributions to changes in life expectancy across alternative time partitions. Estimation decomposed for GBD level-2 cause groups for both sexes. The color classification followed the GBD level-1 cause categories: Red indicated non-communicable diseases; green represented communicable, maternal, neonatal, and nutritional diseases; and blue referred injuries. Solid lines indicate increases no changes in rank, whereas dashed lines indicate decreases in rank.



Extended Data Fig. 7 | Period-specific leading disease and injury contributors with negative contributions to changes in life expectancy across alternative time partitions. *Abbreviation:* NA, not applicable. Estimation decomposed for GBD level-2 cause groups for both sexes. The color classification followed the GBD level-1 cause categories: Red indicated non-communicable diseases; green represented communicable, maternal, neonatal, and nutritional diseases; and blue referred injuries. Solid lines indicate increases or no changes in rank, whereas dashed lines indicate decreases in rank.



Extended Data Fig. 8 | Age-standardized deaths (per 100,000 population) attributable to specific risk factors for the ranked negative contributors to changes in life expectancy for both sexes in the combined 34 Asian countries and territories, 2023. Risk factor was at the GBD level-2 groups for both sexes.

Central Asia (1990-2023, APC)

1 High systolic blood pressure	38.3 (19.1-63.1)	1 High systolic blood pressure	40.9 (33.2-48.2)	0.2
2 Dietary risks	37.6 (26.0-46.8)	2 Air pollution	30.9 (24.9-38.9)	-0.6
3 Air pollution	37.4 (24.0-52.0)	3 Dietary risks	30.3 (18.9-40.0)	-0.7
4 Tobacco	24.0 (21.6-26.9)	4 Tobacco	21.3 (19.5-23.6)	-0.4
5 High fasting plasma glucose	10.7 (7.6-15.4)	5 High fasting plasma glucose	13.6 (10.5-17.8)	0.7

East Asia (1990-2023, APC)

1 Air pollution	68.1 (58.9-78.6)	1 Dietary risks	38.9 (29.0-48.2)	-0.3
2 Dietary risks	43.2 (33.4-52.2)	2 Air pollution	36.4 (28.6-45.3)	-1.9
3 Tobacco	34.0 (31.7-36.6)	3 Tobacco	31.0 (28.3-34.2)	-0.3
4 High fasting plasma glucose	20.2 (12.5-33.9)	4 High systolic blood pressure	29.1 (14.4-52.1)	1.5
5 High systolic blood pressure	17.8 (6.6-37.0)	5 High fasting plasma glucose	18.5 (13.9-26.2)	-0.3

HICs in Asia Pacific (1990-2023, APC)

1 Dietary risks	41.2 (31.5-49.2)	1 Dietary risks	38.3 (28.8-47.0)	-0.2
2 Tobacco	36.3 (33.8-38.8)	2 Tobacco	23.8 (22.0-26.5)	-1.3
3 High systolic blood pressure	33.9 (28.7-38.8)	3 High systolic blood pressure	21.3 (16.7-26.1)	-1.4
4 Air pollution	22.0 (6.4-37.4)	4 Air pollution	21.0 (12.2-30.1)	-0.1
5 High fasting plasma glucose	15.3 (9.9-25.3)	5 High fasting plasma glucose	15.5 (11.1-23.6)	0.1

South Asia (1990-2023, APC)

1 Air pollution	67.5 (60.9-74.6)	1 Air pollution	53.8 (48.1-61.2)	-0.7
2 Dietary risks	43.4 (29.9-51.3)	2 Dietary risks	41.9 (29.4-49.4)	-0.1
3 Tobacco	26.5 (24.2-29.5)	3 High systolic blood pressure	26.4 (20.7-33.6)	0.1
4 High systolic blood pressure	25.9 (12.0-46.6)	4 Tobacco	18.3 (16.8-20.2)	-1.1
5 High fasting plasma glucose	12.8 (8.5-20.5)	5 High fasting plasma glucose	18.1 (12.9-27.7)	1.1

Southeast Asia (1990-2023, APC)

1 Air pollution	57.4 (49.3-66.9)	1 Dietary risks	39.7 (28.8-46.8)	-0.5
2 Dietary risks	47.0 (33.2-53.2)	2 High systolic blood pressure	31.9 (26.1-39.5)	0.1
3 High systolic blood pressure	30.5 (16.2-49.1)	3 Air pollution	31.8 (25.5-37.8)	-1.8
4 Tobacco	29.7 (27.8-31.9)	4 Tobacco	26.5 (25.0-28.0)	-0.3
5 High fasting plasma glucose	10.0 (7.3-13.7)	5 High fasting plasma glucose	12.1 (9.4-15.9)	0.6

Extended Data Fig. 9 | Ranking of the top 5 SEV for major risk factors contributing to the negative changes in life expectancy in 5 Asian regions. *Abbreviations:* APC, annual percentage change; HIC, high income country; SEV, summary exposure value. SEV was at the GBD level-2 groups for both sexes. Solid lines indicate increases no changes in rank, whereas dashed lines indicate decreases in rank.

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Reporting Summary

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For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

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☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
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☐	☒	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☒	☐	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	No primary data collection was carried out of these analyses. Relevant data from population surveys, published studies, and government reports were extracted by a reviewer using a data collection.
Data analysis	All data analyses and visualizations were performed using R Statistical Software (v4.1.2; R Foundation for Statistical Computing, Vienna, Austria; https://www.R-project.org/).

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The findings of this study are based on data from multiple sources, including public online repositories, data available on request, and restricted data used under license. Comprehensive information on all data sources, including provider details and access instructions where applicable, is available through the Global Health

Data Exchange GBD 2023 website (https://ghdx.healthdata.org/gbd-2023.)
This study complies with the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) recommendation (attached Supplementary file). All maps presented in this study are generated by authors; no permissions are required for publication.

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	No primary data collection was carried out for this analysis, so the study does not involve human research participants. As stated in the Methods section, we conducted the sex-stratified analysis to investigate the sex differences in life expectancy at birth.
Reporting on race, ethnicity, or other socially relevant groupings	No primary data collection was carried out for this analysis, so the study does not involve human research participants. The estimates were stratified by socio-demographic index (SDI), which may capture aspects of socio-economic status, but the analysis did not explicitly assess race or ethnicity.
Population characteristics	No primary data collection was carried out for this analysis, so the study does not involve human research participants. The analysis focused on 34 countries categorized as part of Asia region within the Global Burden of Disease study. We explored life expectancy in Asia, stratified by sex country, and SDI, and examined the causes of death and risk factors contributing to changes in life expectancy.
Recruitment	No primary data collection was carried out for this analysis, so we did not recruit participants.
Ethics oversight	This study was approved by the University of Washington IRB committee (the University of Washington Institutional Review Board; study #9060).

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

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Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	Sample size was defined as the population of every location used in our analysis. Country-, region-, and super-region level populations of Asia were estimated as part of the Global Burden of Disease Study 2023. Detailed methods are described in https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(25)01330-3/fulltext.
Data exclusions	We carefully evaluated all data sources for inclusion in our study. Sources were excluded if they lacked necessary survey weight factors or crucial demographic information such as sex or age variables. In addition, we omitted data deemed unreliable, based on assessments by survey administrators or through our own detailed examination. This careful section process ensured the quality and completeness of the information used in our analysis.
Replication	This a meta-analysis of existing studies with many years of cohort and other existing data. When re-applying the method to the same data, we got the same results.
Randomization	Randomizations was not relevant to this study. This analysis is a meta-analysis of existing studies and thus, there were no experimental groups.
Blinding	Blinding was not relevant to this study, as it was an observational study using survey and surveillance data.

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☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Plants

Seed stocks	N/A
Novel plant genotypes	N/A
Authentication	N/A