Risk Management and Healthcare Policy

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

The Evolving Global Epidemiology of Presenile Dementia in People Aged Under 65: A 40-year Cross-Sectional Study

Dan Zhao[1,*], Yingjie Luo[1,*], Binfa Ouyang[1], Li Wang[2], Shan Xu[1], Yijin Zheng[3], Xiaolin Peng[1], Xuan Zhong[1]

[1]Shenzhen Nanshan Mental Health Center, Shenzhen Nanshan Center for Chronic Disease Control, Shenzhen, Guangdong, People's Republic of China; [2]Department of Medical Statistics, School of Public Health, Sun Yat-sen University, Guangzhou, Guangdong, People's Republic of China; [3]Department of Elderly Health Management, Shenzhen Center for Chronic Disease Control, Shenzhen, Guangdong, People's Republic of China

*These authors contributed equally to this work

Correspondence: Xuan Zhong; Xiaolin Peng, Shenzhen Nanshan Mental Health Center, Shenzhen Nanshan Center for Chronic Disease Control, No. 16, Nanshang Road, Nanshan District, Shenzhen, Guangdong, People's Republic of China, Email 18826226671@163.com; 25731738@qq.com

Aim: Despite presenile dementia substantial impact on patients, caregivers, and healthcare systems, comprehensive global assessments of its burden are lacking. This research aims to address this knowledge gap by investigating the trends in the epidemiology of presenile dementia since 1990 and forecast to 2030, providing essential evidence for healthcare policy and resource planning.

Methods: This cross-sectional, population-based study leveraged data for individuals aged 40–64 years of presenile dementia from the GBD study, which performed a detailed evaluation related metrics across 204 countries. We calculated age-standardized rates for incidence, mortality, and DALYs. Projections were generated using a Bayesian APC model based on historical trends. SDI quintiles were used to assess disparities across countries.

Results: The global age-standardized incidence rate of presenile dementia is expected to rise to 43.97 per 100,000 population by 2030 (EAPC, 0.07 [95% CI: −0.02–0.17]). However, age-standardized death and DALY rates are forecasted to decline to 2.61 (EAPC, −0.01 [95% CI: −0.07–0.05]) and 113.38 per 100,000 (EAPC, −0.05 [95% CI: −0.10–0.00]), respectively. Women are expected to exhibit higher incidence rates than men (47.13 vs 40.94 per 100,000 in 2030), reflecting consistent sex-based disparities. Incidence, death, and DALY rates are projected to continue to rise in low SDI countries.

Conclusion: The overall burden of presenile dementia remains substantial due to continued increases in incidence rates, particularly pronounced in low-resource settings. These findings underscore the urgent need for targeted prevention strategies, particularly in low-resource settings, and continued investments in health care infrastructure to address disparities. Expanding screening programs to younger populations globally could help reduce the associated burden of dementia.

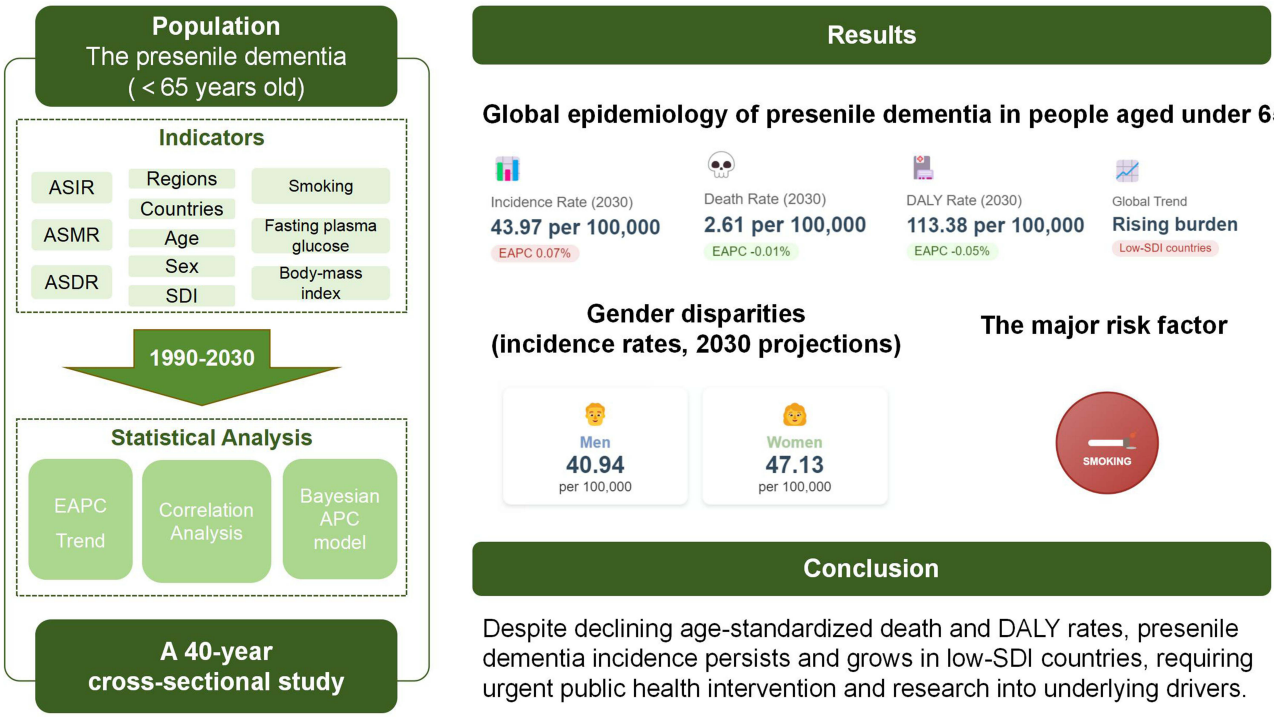
Keywords: presenile dementia, epidemiology, age-standardized rates, disease burden, forecast

Introduction

As the global population ages, dementia, including Alzheimer's disease (AD), have become significant and growing global public health threats. AD is the most prevalent type of dementia, representing around 60–70% of all diagnosed cases.[1] According to the findings of Global Burden of Disease (GBD) research,[2] the global population of individuals with dementia was estimated at 57.4 (95% UI=50.4–65.1) million in 2019. By 2030, this figure is projected to increase to 83.2 (95% UI=73.0–94.6) million, making dementia the seventh leading cause of death worldwide, following lung cancer.[3] Senile dementia, the most prevalent form, is typically observed in people aged 65 years and older. However, it can also occur in person younger the age of 65, known as presenile dementia, which highlights a concerning trend of dementia affecting younger populations. Importantly, individuals with presenile dementia are frequently in the height of their professional careers, managing substantial family, work, and social domains. Research further suggests that, compared to

Received: 14 April 2025
Accepted: 28 July 2025
Published: 12 August 2025

Graphical Abstract



late-onset dementia, presenile dementia is linked to a faster deterioration in cognitive function and places a substantially heavier psychological burden on caregivers.[4,5] Appreciating the global burden of presenile dementia is crucial for the allocation of appropriate healthcare resources across diverse regions.

A systematic evaluation and meta-analysis encompassing 95 studies demonstrated that the global age-standardised prevalence of presenile dementia (30–64 years) was 119.0 per 100,000 individuals.[6] A further systematic evaluation and meta-analysis,[7] comprising 61 articles, revealed an escalation in the global age-standardised prevalence from 0.17/100,000 for ages 30–34 to 5.14/100,000 for ages 60–64, with an overall global age-standardised prevalence of 11/100,000 for ages 30–64 years. However, the majority of these aggregated data were derived from Europe and North America, with limited representation from Africa. This lack of data from low-income countries may fail to accurately reflect the true impact of presenile dementia in these regions. The absence of data from low-income nations may not adequately represent the actual impact of presenile dementia in these areas.

To date, inadequate studies have utilized data from the GBD study to comprehensively forecast the trends in age-standardized incidence, death, and DALYs rates of presenile dementia in the ten countries expected to experience the highest increases. Gaining insights into these projections is essential for informing public health strategies and optimizing resource distribution. To bridge this gap, our study sought to estimate the future burden of presenile dementia by forecasting the anticipated cases, deaths, and DALYs, together with their age-standardized rates, for the period from 2020 to 2030. We employed a Bayesian age-period-cohort model, leveraging GBD data between 1990 and 2019 to ensure the accuracy and reliability of our predictions.

Given the increased recognition of presenile dementia as a public health problem, we built on earlier research by combining trends from high-income nations with limited data from low- and middle-income regions. This method emphasizes the need for more representative and regionally varied data to accurately reflect the worldwide burden of presenile dementia, particularly in underserved and low-resource areas. The findings of epidemiological study will help

to offer insight a more nuanced knowledge of presenile dementia trends and to promote targeted solutions in high-risk populations.

Materials and Methods

Study Design and Data Source

This cross-sectional, population-based research utilized data from GBD study, which offers extensive and detailed estimates of disease and injury burdens across 204 countries and territories worldwide, covering the period from 1990 to 2019. The dataset integrates information from several different sources, including hospital and clinical records, vital registration systems, disease registries, household surveys, census data, and published studies. Data were retrieved through the GBD Results Tool provided by the Institute for Health Metrics and Evaluation (IHME) at http://ghdx.healthdata.org/gbd-results-tool. The study was approved by the Ethics Committee of Shenzhen Nanshan Center for Chronic Disease Control (ll20240017).

Disease Metrics and Definition

GBD utilized case definitions derived from the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, DSM-IV, or DSM V), which are predominantly employed in surveys and cohort studies, as well as from the International Classification of Diseases (ICD-8, ICD-9, and ICD-10), which are utilized in vital registration and claims data sources. Dementia was characterized as a "progressive, degenerative, and chronic neurological disorder distinguished by cognitive dysfunctions that interfere with activities of daily living." In the GBD framework, Alzheimer's disease and other dementias were identified according to specific diagnostic codes: ICD-10 codes F00–F03, G30, and G31, as well as ICD-9 codes 290, 2901.2, 291.8, 294, and 331. This study focuses on presenile dementia, a condition characterized by the onset of dementia under the age of 65 and is also known as dementia with youth onset.[8]

Key indicators included in the analyses include prevalence, incidence, mortality, DALYs and influencing factor proportion. All indicators are disaggregated by age group, gender and year, with the age groups further subdivided into 40–44, 45–49, and five-year intervals up to 64 years. To enable comparisons with different age-structured populations in different regions, age-standardised rates (ASRs) were computed using the standard population defined by the GBD. To account for statistical uncertainty, all estimates were accompanied by 95% uncertainty intervals (UIs), generated through 1000 model simulations.[9] In addition, the Socio-Demographic Index (SDI) is used by the GBD study to examine potential impact of socio-economic development on the burden of disease. The SDI is a combined measure that incorporates three essential indicators: income per capita adjusted for purchasing power parity, the average years of education among individuals aged 15 years and over, and the fertility rate of women younger than 25 years. Higher scores indicate higher levels of socio-economic development, with the SDI taking the minimum value of 0 and the maximum value of 1. Based on the SDI, nations and regions are grouped into five primary categories: low, low-middle, middle, high-middle, and high SDI.[10]

Trend Analysis and Project Trends

Assuming a consistent rate of change on a logarithmic scale over the defined period, the regression model equation below was used to figure out the EAPC and its 95% confidence interval (CI) to describe the temporal trend of the presenile dementia ASR for a given time horizon:[11] The equation $Y = \alpha + \beta X + \varepsilon$ is used, where Y represents the logarithmically transformed ASR, X denotes a time variable expressed in years, and ε is a random error factor that represents unexplained fluctuation. β indicates a positive or negative trend in the ASR. β: slope is the average rate of change in ln(ASR) per unit increase in time (X). The regression model's predicted β is EAPC = $(e^{\beta} - 1) \times 100$.[12] If both the EAPC and the lower boundary of the CI are positive, ASR tends to increase. In contrast, when EAPC and the upper limit of CI are negative Conversely, if the EAPC and the upper boundary of the CI are negative, ASR decreases. When none of these requirements are satisfied, the ASR remains reasonably steady. The connections between the EAPC and ASR, as well as the relationship between the SDI and EAPC, were explored using Pearson's correlation coefficient (ρ) and Gaussian process regression. This method aids in providing a deeper insight into the interrelations among these variables.[13]

Here, burden estimates related to age, period, and birth cohort were forecasted using Bayesian age-period-cohort (BAPC) analysis, employing integrated nested Laplace approximations (INLA). The burden statistics pertaining to age, time (period), and birth cohort were forecasted using BAPC analysis, employing integrated nested Laplace approximations (INLA).[14] Compared to alternative methods like generalized additive, BAPC more effectively captures the intricate relationships among these factors, while INLA, as a rapid approximation method, significantly enhances computational efficiency.[15] Also, Scatter plots were constructed to illustrate the associations between age-standardized rates of incidence, mortality, and DALYs for presenile dementia across various SDI quintiles, offering a comprehensive visualization of how disease burden correlates with socio-economic development levels. The ASR of presenile dementia for specific age groups is derived by multiplying the crude rates, categorized in 5 years intervals, by the GBD 2019 standard population distribution. The summed values for the 40–64 age group help mitigate differences in population age structures, ensuring comparability. For the 95% CI, the BAPC model estimates uncertainty through posterior distributions. ASR is calculated from 500 posterior samples, with the 95% CI established by the 2.5th and 97.5th percentiles, reflecting uncertainty in parameter estimation.

Previously our research team and current published literature have provided a comprehensive overview of GBD research methods, core concepts and basic approaches.[16] Regarding missing data handling, GBD employs sophisticated statistical modeling techniques including spatiotemporal Gaussian process regression and Bayesian approaches to address data gaps and regional variations. All statistical analyses and visualizations were carried out using R 4.1.2 (Lucent Technologies, Jasmine Mountain, USA). P-values < 0.05 were deemed statistically significant.

Results

Prevalence and Trends of Presenile Dementia

The worldwide total number of cases, deaths, and DALYs of presenile dementia in 2019 were 911,600, 55,360, and 2,409,860, respectively. The corresponding of presenile dementia's age-standardized incidence, death, and DALY rates per 100,000 individuals were 43.30, 2.63, and 114.44, respectively (Table 1). In 1990, there were 410,180 incidence cases of presenile dementia, 27,260 deaths, and 1,163,770 DALYs. The corresponding age-standardized incidence of presenile dementia was 38.57 per 100,000; the age-standardized death rate was 2.56 per 100,000; and the age-standardized DALYs rate was 109.50 per 100,000 (Table S1). Between 1990 and 2019, the global total number of presenile dementia cases showed a sustained increase, rising by 122.24%; the number of deaths also increased by 103.08%; and the total number of DALYs rose by 107.07% (Figure S1). The age-standardized incidence rate showed a growing trend with an EAPC of 0.41 (95% CI: 0.39 to 0.44) (Table 1 and Figure 1A). Similarly, the age-standardized death rate increased, with an EAPC of 0.16 (95% CI: 0.12 to 0.21) (Table 1 and Figure 1B). The age-standardized DALYs rate also demonstrated a rising trend, with an EAPC of 0.21 (95% CI: 0.18 to 0.24) (Table 1 and Figure 1C).

In terms of gender, women experienced greater age-standardized incidence rates of presenile dementia than men in 2019, as well as higher death rates and DALY rates (Table 1). These indicators of presenile dementia increased between 1990 and 2019 for both males and females (Table 1 and Figure S2).

In 2019, presenile dementia's incidence, death, and DALY rates grew with age in each of the five age groups (40–64 years, with a 5-year interval per group). The age range of 60–64 had the greatest rates, with the incidence rate of 126.99 per 100,000, the death rate of 9.34 per 100,000, and the DALYs rate of 364.39 per 100,000 (Table 1). These indicators of presenile dementia for each of the five age groups from 1990 to 2019 are shown in Figure S3.

In 2019, age-standardized incidence, death, and DALY rates of presenile dementia were highest in middle-SDI countries and lowest in high-SDI countries (Table 1). A negative association was found by Pearson correlation analysis between the age-standardized incidence ($r = -0.13$, $p < 0.001$), death ($r = -0.29$, $p < 0.001$), and DALY rates ($r = -0.24$, $p < 0.001$) of presenile dementia and SDI in 2019 (Figure S4). Across all SDI nation groups, the age-standardized incidence of presenile dementia increased overall between 1990 and 2019 (Figure S5). In the high-SDI country group, the EAPC for the age-standardized death rate of presenile dementia was −0.15 (95% CI: −0.16 to −0.14), and the EAPC for the DALY rate was −0.06 (95% CI: −0.07 to −0.05), both showing a downward trend. However, both indicators of other SDI country groups showed an upward trend. The high-middle SDI countries experienced the largest increase in the age-

Table 1 Global Burden of Presenile Dementia in 2019 for Individuals Aged 40–64 Years, with Age-Standardized Rates (ASRs) by Sex, Age Groups, SDI Levels, and GBD Regions, and Trends from 1990 to 2030

Group	2019			Estimated Annual Percentage Change of Age-Standardized Rates (1990–2019)			Estimated Annual Percentage Change of Age-Standardized rates (2020–2030)		
	Incidence Cases (Rate)	Death Cases (Rate)	DALYs Cases (Rate)	Incidence Rate (95% CI)	Death Rate (95% CI)	DALYs Rate (95% CI)	Incidence Rate (95% CI)	Death Rate (95% CI)	DALYs Rate (95% CI)
Total	911.60 (43.30)	55.36 (2.63)	2409.86 (114.44)	0.41 (0.39, 0.44)	0.16 (0.12, 0.21)	0.21 (0.18, 0.24)	0.07 (−0.02, 0.17)	−0.01 (−0.07, 0.05)	−0.05 (−0.10, 0.00)
Sex									
Female	496.69 (46.47)	29.64 (2.77)	1289.88 (120.51)	0.39 (0.36, 0.43)	0.17 (0.13, 0.22)	0.21 (0.18, 0.24)	0.04 (−0.05, 0.13)	−0.04 (−0.08, 0.00)	−0.13 (−0.17, −0.08)
Male	414.91 (40.01)	25.71 (2.49)	1119.97 (108.15)	0.43 (0.41, 0.45)	0.15 (0.10, 0.20)	0.20 (0.17, 0.24)	0.14 (0.06, 0.23)	0.06 (0.02, 0.11)	0.04 (0.01, 0.08)
Age groups, years									
40–44	25.80 (5.23)	0.58 (0.12)	32.75 (6.64)	–	–	–	–	–	–
45–49	86.88 (18.34)	3.43 (0.72)	184.70 (38.98)	–	–	–	–	–	–
50–54	153.23 (35.08)	7.42 (1.70)	382.42 (87.55)	–	–	–	–	–	–
55–59	248.80 (67.06)	14.74 (3.97)	671.14 (180.89)	–	–	–	–	–	–
60–64	396.90 (126.99)	29.19 (9.34)	1138.84 (364.39)	–	–	–	–	–	–
Socio-demographic Index									
Low SDI	54.5 (36.91)	3.38 (2.35)	147.98 (101.34)	0.08 (0.04, 0.12)	0.37 (0.33, 0.40)	0.30 (0.27, 0.34)	0.10 (0.04, 0.16)	0.65 (0.56, 0.73)	0.47 (0.42, 0.52)
Low-middle SDI	146.97 (39.73)	9.18 (2.51)	395.30 (107.44)	0.24 (0.21, 0.27)	0.24 (0.21, 0.26)	0.25 (0.23, 0.26)	−0.04 (−0.11, 0.03)	0.50 (0.43, 0.58)	0.34 (0.29, 0.39)
Middle SDI	334.42 (47.97)	20.78 (3.01)	891.73 (128.55)	0.43 (0.41, 0.46)	0.02 (−0.06, 0.09)	0.11 (0.05, 0.16)	0.10 (0.01, 0.18)	−0.23 (−0.30, −0.16)	−0.16 (−0.21, −0.10)
High-middle SDI	238.63 (46.56)	14.29 (2.76)	620.53 (120.42)	0.66 (0.64, 0.68)	0.27 (0.17, 0.37)	0.33 (0.27, 0.40)	0.22 (0.11, 0.33)	−0.24 (−0.31, −0.16)	−0.15 (−0.22, −0.08)
High SDI	136.62 (36.48)	7.69 (2.01)	353.08 (93.36)	0.12 (0.08, 0.16)	−0.15 (−0.16, −0.14)	−0.06 (−0.07, −0.05)	−0.04 (−0.11, 0.03)	−0.24 (−0.31, −0.17)	−0.29 (−0.34, −0.24)
21 GBD regions									
Andean Latin America	5.96 (41.32)	0.33 (2.35)	15.38 (107.46)	0.24 (0.23, 0.25)	0.03 (0.00, 0.05)	0.10 (0.08, 0.12)	0.14 (0.06, 0.22)	−0.36 (−0.40, −0.32)	−0.18 (−0.24, −0.11)
Australasia	3.50 (34.45)	0.18 (1.72)	8.38 (82.21)	−0.02 (−0.05, 0.02)	−0.28 (−0.31, −0.24)	−0.18 (−0.21, −0.15)	0.05 (−0.02, 0.13)	−0.50 (−0.54, −0.45)	−0.15 (−0.22, −0.08)
Caribbean	4.88 (37.69)	0.31 (2.42)	13.80 (106.93)	0.03 (0.02, 0.05)	0.12 (0.10, 0.14)	0.10 (0.08, 0.11)	0.05 (−0.03, 0.13)	−0.22 (−0.26, −0.18)	−0.05 (−0.11, 0.02)
Central Asia	8.77 (36.83)	0.46 (1.93)	21.34 (89.39)	0.15 (0.13, 0.18)	0.21 (0.19, 0.23)	0.19 (0.18, 0.21)	0.08 (0.00, 0.15)	−0.06 (−0.10, −0.01)	0.08 (0.02, 0.14)
Central Europe	17.31 (38.34)	0.95 (2.06)	42.74 (94.27)	0.19 (0.18, 0.20)	−0.03 (−0.05, −0.01)	0.05 (0.03, 0.06)	−0.06 (−0.13, 0.01)	−0.42 (−0.46, −0.37)	−0.29 (−0.34, −0.23)
Central Latin America	24.59 (39.36)	1.61 (2.6)	70.58 (113.67)	0.10 (0.09, 0.12)	0.00 (−0.01, 0.00)	0.04 (0.03, 0.05)	−0.06 (−0.12, 0.01)	−0.08 (−0.12, −0.04)	−0.04 (−0.09, 0.01)
Central Sub-Saharan Africa	6.78 (41.00)	0.40 (2.44)	17.48 (106.13)	0.04 (0.02, 0.05)	0.36 (0.30, 0.43)	0.28 (0.23, 0.34)	0.11 (0.04, 0.19)	0.98 (0.93, 1.02)	0.64 (0.58, 0.70)
East Asia	305.65 (54.35)	19.85 (3.55)	833.90 (148.69)	0.74 (0.69, 0.79)	0.04 (−0.09, 0.16)	0.16 (0.07, 0.25)	0.50 (0.38, 0.63)	−0.50 (−0.57, −0.42)	−0.34 (−0.39, −0.28)
Eastern Europe	29.24 (34.57)	1.63 (1.90)	73.02 (86.00)	0.31 (0.26, 0.37)	0.33 (0.29, 0.38)	0.34 (0.29, 0.38)	−0.01 (−0.08, 0.06)	0.16 (0.06, 0.26)	−0.18 (−0.24, −0.12)
Eastern Sub-Saharan Africa	18.62 (38.90)	1.08 (2.33)	48.42 (102.86)	0.05 (0.02, 0.07)	0.50 (0.46, 0.54)	0.38 (0.34, 0.41)	0.22 (0.16, 0.29)	0.73 (0.69, 0.78)	0.53 (0.47, 0.58)
High-income Asia Pacific	29.31 (40.07)	1.57 (2.11)	71.45 (96.99)	0.42 (0.39, 0.46)	−0.13 (−0.19, −0.07)	−0.02 (−0.06, 0.03)	0.09 (0.03, 0.15)	−0.45 (−0.55, −0.36)	−0.32 (−0.37, −0.26)
High-income North America	48.57 (35.94)	2.43 (1.75)	118.01 (86.97)	−0.26 (−0.37, −0.16)	−0.30 (−0.36, −0.24)	−0.22 (−0.26, −0.17)	−0.02 (−0.12, 0.09)	−0.07 (−0.16, 0.01)	−0.27 (−0.33, −0.20)
North Africa and Middle East	61.51 (48.78)	3.42 (2.77)	151.53 (121.38)	0.11 (0.10, 0.12)	−0.19 (−0.23, −0.14)	−0.10 (−0.13, −0.07)	0.14 (0.08, 0.19)	−0.13 (−0.21, −0.05)	0.01 (−0.03, 0.06)
Oceania	0.85 (37.93)	0.06 (2.90)	2.60 (118.84)	−0.04 (−0.08, 0.00)	−0.35 (−0.45, −0.25)	−0.27 (−0.35, −0.19)	0.22 (0.10, 0.34)	0.25 (0.20, 0.30)	0.19 (0.10, 0.28)
South Asia	130.75 (34.27)	8.08 (2.13)	348.18 (91.47)	0.16 (0.12, 0.19)	0.24 (0.20, 0.29)	0.24 (0.21, 0.27)	−0.19 (−0.25, −0.13)	0.56 (0.48, 0.64)	0.24 (0.19, 0.29)
Southeast Asia	88.44 (48.59)	5.73 (3.19)	244.77 (135.54)	0.15 (0.13, 0.17)	−0.21 (−0.25, −0.17)	−0.10 (−0.13, −0.08)	0.00 (−0.06, 0.06)	−0.26 (−0.34, −0.19)	−0.14 (−0.19, −0.09)
Southern Latin America	6.46 (33.39)	0.34 (1.76)	15.99 (82.61)	0.24 (0.22, 0.26)	0.21 (0.17, 0.25)	0.22 (0.19, 0.25)	0.25 (0.18, 0.32)	−0.11 (−0.16, −0.07)	−0.06 (−0.13, 0.00)
Southern Sub-Saharan Africa	6.05 (38.07)	0.32 (2.06)	14.78 (93.33)	0.09 (0.02, 0.15)	0.18 (0.14, 0.22)	0.15 (0.12, 0.18)	0.27 (0.18, 0.35)	−0.57 (−0.62, −0.52)	−0.22 (−0.29, −0.15)
Tropical Latin America	40.61 (63.46)	1.97 (3.09)	89.80 (140.55)	0.61 (0.52, 0.71)	0.42 (0.22, 0.62)	0.43 (0.29, 0.56)	−2.52 (−2.61, −2.42)	−0.09 (−0.15, −0.04)	−0.45 (−0.51, −0.39)
Western Europe	53.99 (32.63)	3.32 (1.96)	150.47 (89.50)	0.01 (0.00, 0.02)	−0.27 (−0.30, −0.25)	−0.18 (−0.20, −0.16)	−0.09 (−0.14, −0.04)	−0.24 (−0.32, −0.16)	−0.30 (−0.35, −0.25)
Western Sub-Saharan Africa	19.75 (34.57)	1.31 (2.38)	57.21 (102.52)	−0.03 (−0.09, 0.03)	0.45 (0.36, 0.53)	0.33 (0.26, 0.40)	0.15 (0.09, 0.22)	−0.38 (−0.43, −0.32)	−0.06 (−0.12, 0.00)

Notes: Refer to the numbers of presenile dementia cases, deaths, and disability-adjusted life years are thousand (1000), and the age-standardized rates of cases, deaths, and disability-adjusted life years are per 100,000.

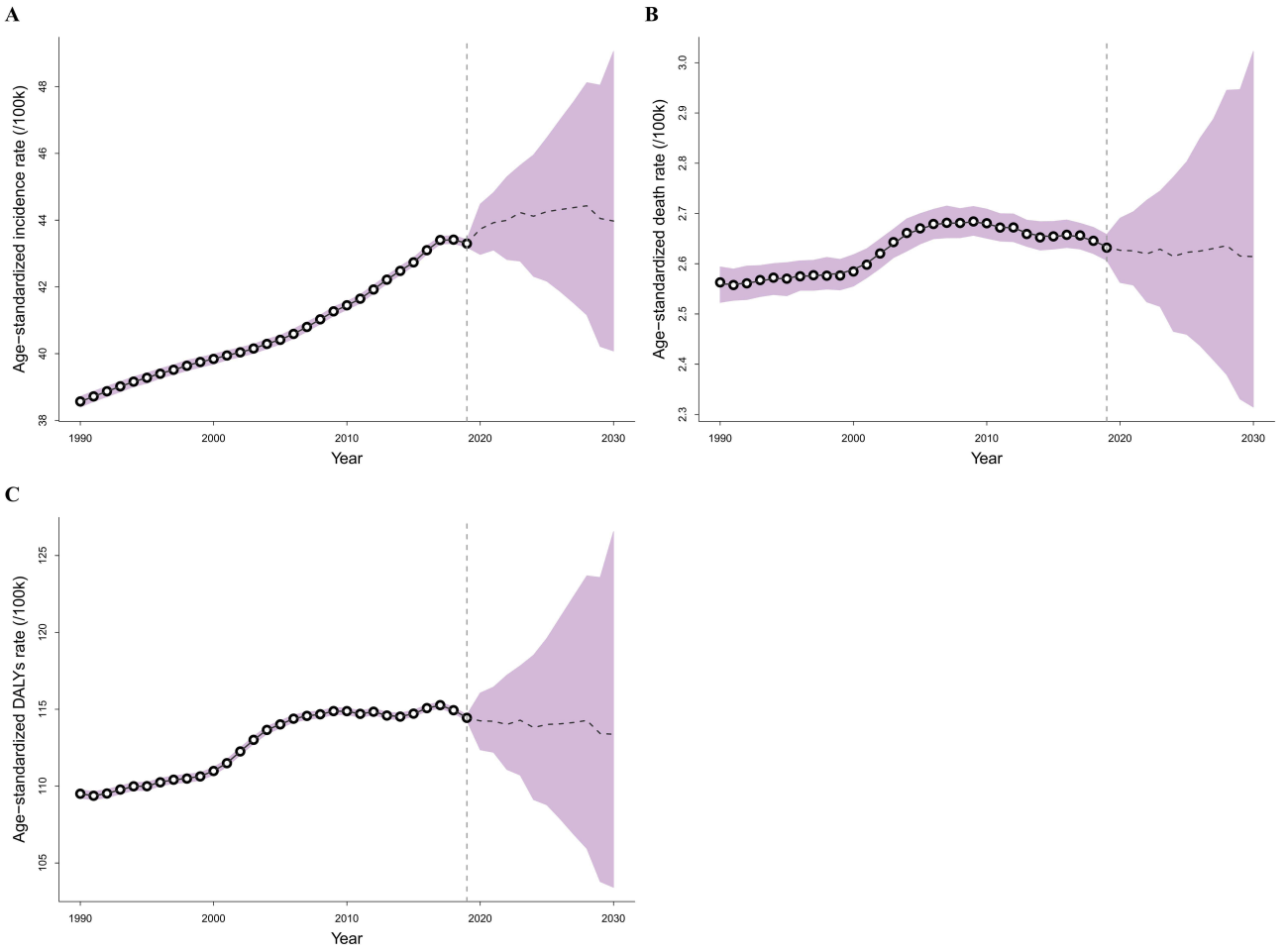


Figure 1 The trends and projections of age-standardized incidence rate, death rate, and DALYs rate of presenile dementia between 1990 and 2030 at the global level. (**A**) The age-standardized incidence rate of global; (**B**) The age-standardized death rate of global; (**C**) The age-standardized DALYs rate of global.

standardized death rate, with an EAPC of 0.33 (95% CI: 0.27 to 0.40). Meanwhile, the low-SDI countries saw the largest increase in the age-standardized DALYs rate, with an EAPC of 0.37 (95% CI: 0.33 to 0.40) (Table 1 and Figure S5).

Among the 21 regions categorized by geographical location, Tropical Latin America had the greatest age-standardized incidence rate of presenile dementia at 63.46 per 100,000 in 2019, while Western Europe had the lowest prevalence at 32.63 per 100,000. The age-standardized death and DALY rates were highest in East Asia, at 3.55 per 100,000 individuals and 148.69 per 100,000, respectively. In comparison, Australasia had the lowest age-standardized death and DALY rates at 1.72 per 100,000 and 82.21 per 100,000, respectively (Table 1). During the period from 1990 to 2019, only Australasia, High-income North America, Oceania, and Western Sub-Saharan Africa exhibited a decline in the age-standardized incidence of presenile dementia, while the remaining regions exhibited an upward trend (Table 1 and Figure 2A). Among these, East Asia experienced the substantial growth in the age-standardized incidence of presenile dementia (EAPC, 0.74 [95% CI: 0.69 to 0.79]). Eastern Sub-Saharan Africa experienced the most substantial rise in the age-standardized death rate of presenile dementia (EAPC, 0.50 [95% CI: 0.46 to 0.54]), while Tropical Latin America saw the largest increase in the age-standardized DALYs rate (EAPC, 0.43 [95% CI: 0.29 to 0.56] (Table 1 and Figure 2B, C)).

Predicted Trends of Presenile Dementia

In 2030, the global age-standardized incidence rate of presenile dementia is predicted to be 43.97 per 100,000. The age-standardized death rate is projected to be 2.61 per 100,000. Additionally, the age-standardized DALYs rate is expected to

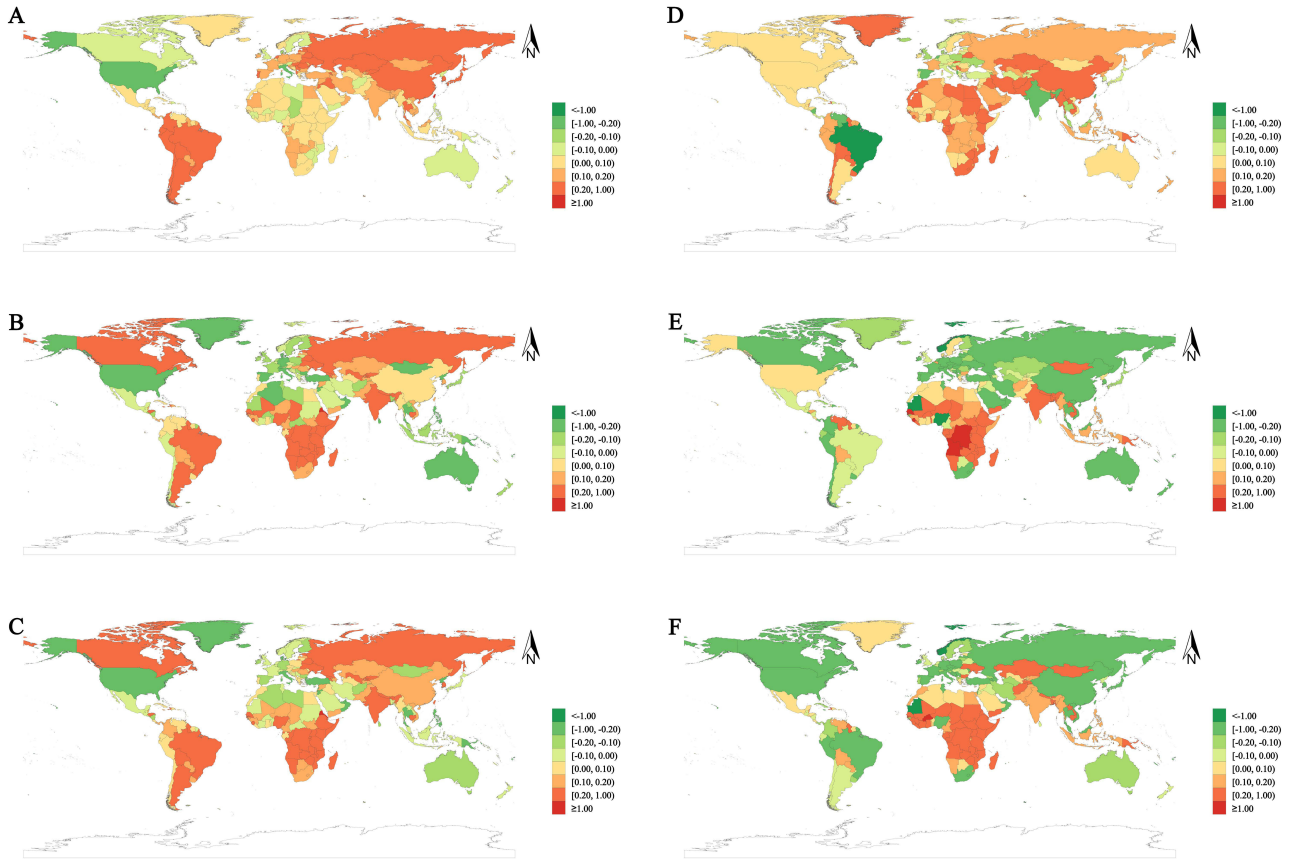


Figure 2 The global distribution and the estimated annual percentage change(EAPC) in age-standardized incidence, death, and DALY rates of presenile dementia at the two time periods (1990–2019 and 2020–2030). (**A**) The EAPC of age-standardized incidence rate, 1990–2019; (**B**) The EAPC of age-standardized death rate, 1990–2019; (**C**) The EAPC of age-standardized DALYs rate, 1990–2019; (**D**) The EAPC of age-standardized incidence rate, 2020–2030; (**E**) The EAPC of age-standardized death rate, 2020–2030; (**F**) The EAPC of age-standardized DALYs rate, 2020–2030.

reach 113.38 per 100,000 (Figure S1). The worldwide age-standardized incidence of presenile dementia is predicted to have an EAPC of 0.07 (95% CI: −0.02 to 0.17), showing a gradual increase; the age-standardized death rate of presenile dementia is predicted to have an EAPC of −0.01 (95% CI: −0.07 to 0.05), and the age-standardized DALY rate is predicted to have an EAPC of −0.05 (95% CI: −0.10 to 0.00), both showing a slight decrease between 2020 and 2030 (Table 1 and Figure 1).

Between 2020 and 2030, the age-standardized incidence rate of presenile dementia in females is predicted to have an EAPC of 0.04 (95% CI: −0.05 to 0.13), showing a slight increase; the age-standardized death rate is predicted to have an EAPC of −0.04 (95% CI: −0.08 to 0.00), and the age-standardized DALYs rate is predicted to have an EAPC of −0.13 (95% CI: −0.17 to −0.08), both showing a downward trend. In contrast, for males, all indicators are predicted to show a small increasing trend, consistent with the data between 1990 to 2019 (Table 1 and Figure S2).

Among the five SDI types of countries, the age-standardized incidence rate of presenile dementia is predicted to have an EAPC of 0.22 (95% CI: 0.11 to 0.33) in high-middle SDI countries, showing the greatest increase; the age-standardized death rate is predicted to have an EAPC of 0.65 (95% CI: 0.56 to 0.73) in low SDI countries, and the age-standardized DALYs rate is predicted to have an EAPC of 0.47 (95% CI: 0.42 to 0.52) in low-middle SDI countries, both showing the greatest increase during the period of 2020 to 2030 (Table 1). Additionally, the age-standardized death and DALY rates of presenile dementia are predicted to increase in low SDI and low-middle SDI countries, while the other three regions are expected to show a decreasing trend (Table 1 and Figure S5).

Among the 21 regions of the world, the age-standardized incidence rate of presenile dementia in Tropical Latin America is expected to see the largest decline (EAPC, −2.52 [95% CI: −2.61 to −2.42]), while East Asia is projected to experience the most significant increase (EAPC, 0.50 [95% CI: 0.38 to 0.63]) between 2020 and 2030 (Table 1 and Figure 2D). During the same period, the age-standardized death and DALY rates of presenile dementia in Central Sub-

https://doi.org/10.2147/RMHP.S534291

Saharan Africa is expected to experience the largest increases, with EAPC of 0.98 (95% CI: 0.93 to 1.02) and 0.64 (95% CI: 0.58 to 0.70), respectively (Table 1 and Figure 2E, F).

At the country level, Singapore is projected to experience the largest increase in the age-standardized incidence rate of presenile dementia between 2020 and 2030 (EAPC, 0.66 [95% CI: 0.54 to 0.78]; Table 2 and Figure S6A), followed by Chile (EAPC, 0.61 [95% CI: 0.52 to 0.70]; Table 2 and Figure S6B) and China (EAPC, 0.52 [95% CI: 0.39 to 0.64]; Table 2 and Figure S6C). During the same period, the country predicted to experience the largest decrease in the age-standardized incidence rate of presenile dementia is Brazil (EAPC, −2.59 [95% CI: −2.69 to −2.49]; Table S2). The country with the largest increase in age-standardized death rate for presenile dementia is projected to be Senegal (EAPC, 1.11 [95% CI: 0.34 to 1.87]; Table 2 and Figure S7A), followed by Angola (EAPC, 1.07 [95% CI: 0.99 to 1.15]; Table 2 and Figure S7B) and the Democratic Republic of the Congo (EAPC, 1.03 [95% CI: 0.98 to 1.09]; Table 2 and Figure S7C). Conversely, the country projected to experience the largest decrease is Norway (EAPC, −4.54 [95% CI: −4.64 to −4.44]; Table S2). Similarly, Burkina Faso is predicted to have the largest increase in the age-standardized DALY rate for presenile dementia (EAPC, 1.54 [95% CI: 1.45 to 1.64]; Table 2 and Figure S8A), followed by Niger (EAPC, 0.95 [95% CI: 0.86 to 1.05]; Table 2 and Figure S8B) and Djibouti (EAPC, 0.83 [95% CI: 0.77 to 0.89]; Table 2 and Figure S8C). The country with the largest decrease is also Norway (EAPC, −1.23 [95% CI: −1.33 to −1.13]; Table S2). Figures S6–S8 present the data for the top 10 countries with the largest increases in the three rates of presenile dementia, respectively.

Figure 2 and Tables S3–S5 illustrate the changes in the EAPC of all presenile dementia indicators across 204 countries during the two periods, 1990–2019 and 2020–2030, respectively. Globally, the EAPC of the age-standardized incidence of presenile dementia during 2020–2030 were negatively correlated with the trends observed during 1990–2019 ($r = -0.27$, $p < 0.001$; Table S6). Among the five SDI types of countries, only the middle SDI countries exhibited a negative correlation ($r = -0.41$, $p = 0.01$; Table S6). The global age-standardized death rate of presenile dementia EAPC showed a positive correlation with the trend during 2020–2030 ($r = 0.34$, $p < 0.001$; Table S6). Among the five SDI types of countries, this correlation was observed only in low SDI countries ($r = 0.58$, $p < 0.001$; Table S6). Similarly, the global age-standardized DALY rates of presenile dementia EAPC showed a positive correlation with the trend during 2020–2030 ($r = 0.38$, $p < 0.001$; Table S6). However, among the five SDI types of countries, this correlation was observed only in high-middle SDI countries ($r = 0.37$, $p = 0.01$; Table S6).

Risk Factors

The percentage of deaths and DALYs among those with presenile dementia worldwide, stratified by SDI and by 21 regions, that can be attributed to particular risk factors (smoking, high fasting blood glucose, and high body mass index) are shown in Figure 3A and B. The results show that, when compared with the other two risk factors, smoking continues

Table 2 Projections and Trends in Age-Standardized Incidence, Death, and DALYs Rates of Presenile Dementia in the Ten Countries Expected to Experience the Highest Increases from 2020 to 2030

Order	Countries	EAPC (95% CI) of Age-Standardized Incidence Rate	Countries	EAPC (95% CI) of Age-Standardized Death Rate	Countries	EAPC (95% CI) of Age-Standardized DALYs Rate
1	Singapore	0.66 (0.54, 0.78)	Senegal	1.11 (0.34, 1.87)	Burkina Faso	1.54 (1.45, 1.64)
2	Chile	0.61 (0.52, 0.70)	Angola	1.07 (0.99, 1.15)	Niger	0.95 (0.86, 1.05)
3	China	0.52 (0.39, 0.64)	Democratic Republic of the Congo	1.03 (0.98, 1.09)	Djibouti	0.83 (0.77, 0.89)
4	Afghanistan	0.51 (0.42, 0.61)	Sierra Leone	1.02 (0.95, 1.10)	Sierra Leone	0.80 (0.73, 0.87)
5	Sudan	0.36 (0.27, 0.45)	Ethiopia	0.90 (0.85, 0.95)	Mozambique	0.77 (0.69, 0.86)
6	Kazakhstan	0.34 (0.24, 0.44)	Uganda	0.87 (0.80, 0.94)	Mali	0.75 (0.67, 0.84)
7	Cyprus	0.33 (0.29, 0.38)	Eritrea	0.87 (0.81, 0.92)	Ghana	0.73 (0.65, 0.81)
8	Iraq	0.33 (0.24, 0.42)	Rwanda	0.85 (0.77, 0.92)	Eritrea	0.71 (0.66, 0.76)
9	Gabon	0.32 (0.27, 0.38)	Djibouti	0.84 (0.78, 0.90)	Nepal	0.69 (0.61, 0.76)
10	Egypt	0.31 (0.23, 0.38)	United Republic of Tanzania	0.81 (0.75, 0.87)	Democratic Republic of the Congo	0.68 (0.62, 0.75)

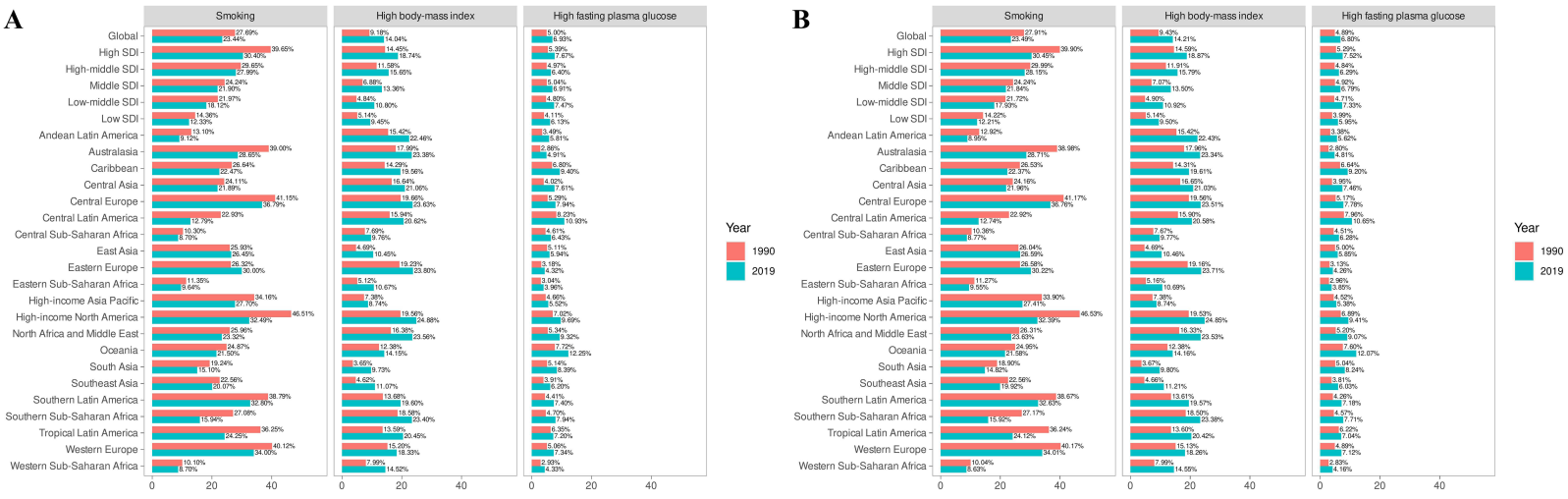


Figure 3 Proportions of death and DALYs attributable to the specific risk factors (Smoking, High fasting plasma glucose, High body-mass index) for presenile dementia worldwide, 1990 and 2019. (**A**) The proportions of death attributable to the specific risk factors; (**B**) The proportions of DALYs attributable to the specific risk factors.

to be the leading cause of deaths and DALYs, both in 1990 and 2019. Compared with 1990, the percentage of deaths and DALYs among patients with presenile dementia resulting from high fasting blood glucose and high body mass index increased in 2019. Among the 21 regions, only East Asia and Eastern Europe saw an increase in smoking-related deaths and DALYs in 2019, while all other regions experienced a decrease.

Discussion

This study forecasted the age-standardized incidence, death, and DALY rates of presenile dementia for the years 2020–2030 by methodically analyzing the global prevalence of presenile dementia during 1990–2019. The global number of cases, deaths, and DALYs of presenile dementia continued to increase between 1990 and 2019, with all indicators rising by at least one-fold. On the one hand, this increase is primarily attributed to the worldwide population's recent decades of rapid expansion and aging. On the other hand, it may also be linked to advancements in disease diagnostic technologies and methods, which have led to the identification of more cases. During this period, the age-standardized incidence, death, and DALY rates of presenile dementia exhibited an overall upward trend. The forecasted results indicate that between 2020 to 2030, the age-standardized incidence rate is expected to rise gradually, whereas the age-standardized death and DALY rates will decline slowly. This suggests that policies such as implementing early intervention, encouraging healthy lifestyles, and bolstering social support systems, as outlined in the 2017 Global Dementia Action Plan of the World Health Organization,[17] have the potential to reduce both death and the overall burden of presenile dementia. Future efforts should prioritize further support for these policies.

Both men and women experienced an upward trend in the age-standardized incidence, death, and DALY rates of presenile dementia from 1990 to 2019. Women had higher age-standardized incidence, death, and DALY rates than men in 2019. A meta-analysis found that although many studies did not show a significant statistical difference in the incidence of AD between men and women, the prevalence and incidence in women were higher in most studies.[18] This phenomenon may be related to the different risks faced by women compared to men at physiological, social, and psychological levels.[19] For example, estrogen in women can act as a protective factor against neurodegeneration, but as women age, especially after menopause, the rapid decline in estrogen levels may increase the risk of AD.[20–22] While the age-standardized incidence of presenile dementia in women is anticipated to modestly rise between 2020 and 2030, the age-standardized death and DALY rates are anticipated to fall over that time. In contrast, in men, the age-standardized incidence, death rate, and DALY rates for presenile dementia are anticipated to exhibit a consistent rising trend, consistent with the patterns observed from 1990 to 2019. This suggests that there may be a growing need for targeted early screening and disease management strategies for presenile dementia in the male population to address the increasing disease burden in this group.

Ageing, as the primary risk factor for AD, follows the same trend in presenile dementia.[2] Among the five age groups in 2019, the older the age group, the higher the incidence, death, and DALY rates. The age group aged 60–64 had the highest incidence, death, and DALY rates. However, a study by Hendriks et al highlighted that the early symptoms of presenile dementia are often subtle, and most data on AD are collected primarily from the elderly population, with young populations frequently excluded from studies.[6] As a result, the incidence of presenile dementia in younger age groups may be significantly underestimated. The earlier the onset of presenile dementia, the greater the resulting disease burden. Therefore, in addition to focusing on the elderly population, early screening of younger individuals should also be prioritized.

Our study found that in 2019, the age-standardized incidence, death, and DALY rates of presenile dementia were negatively correlated with the SDI. The age-standardized death rates in low SDI nations increased the most between 1990 and 2019, whereas only the age-standardized death and DALY rates of presenile dementia in high SDI countries exhibited a downward trend. First, countries with higher SDI levels tend to have higher economic development and more abundant medical resources, which facilitates early diagnosis and intervention, potentially slowing the progression of presenile dementia. In contrast, low SDI countries generally face lower economic development and limited medical resources. These countries often prioritize addressing infectious diseases and malnutrition, which may result in fewer resources allocated for presenile dementia.[9] Consequently, presenile dementia is typically detected at later stages when the patient's condition has worsened. This delay in diagnosis and treatment could contribute to an increased mortality rate

and higher DALY rates. Secondly, high SDI countries typically have more comprehensive social support systems, which can provide better care services and social welfare to individuals with presenile dementia, thereby reducing disability and death associated with the disease. The forecast for 2020–2030 reveals significant variations in the expected changes across different countries. High-income countries, such as Norway, are projected to experience improvements in the disease burden, while low and middle-income countries, including Senegal, Angola, and Burkina Faso, face a growing burden due to aging populations and inadequate public health infrastructure. Thus, it is crucial to develop targeted intervention strategies tailored to the unique requirements of each country to address the health challenges posed by presenile dementia.

The 2024 Lancet Dementia Commission report identified 14 risk factors for dementia, including hypertension, smoking, obesity, physical inactivity, diabetes, and others.[23] In this study, we analyzed three specific risk factors—smoking, Body Mass Index (BMI), and high fasting blood glucose. We found that smoking accounted for the largest proportion of deaths and DALYs related to presenile dementia. Moreover, both high fasting blood glucose and high BMI have been shown to increasingly contribute to the burden of presenile dementia, as they accounted for a growing proportion of deaths and DALYs worldwide. According to certain research, leading a healthy lifestyle that includes regular exercise, eating a balanced diet, and giving up bad habits like smoking will greatly lower the incidence of AD and presenile dementia.[24–26] Given the limited progress in developing effective drugs for AD,[27] controlling risk factors offers a critical avenue for prevention and management. By targeting risk factors that can be changed, like diabetes, high blood pressure, smoking, and a high BMI, we can mitigate the risk of presenile dementia, reduce its burden, and improve overall health outcomes. This approach is especially significant as it presents a preventive strategy when pharmacological solutions remain limited.

This study has several restrictions. First off, the GBD database served as the sole source of data for our investigation. There are variations in the diagnosis and reporting of presenile dementia throughout various nations and areas. In particular, in low-income countries, the incidence and disease burden of presenile dementia may be significantly underestimated. Secondly, the COVID-19 pandemic that occurred after 2019 in the world may have a significant impact on the epidemic trend of presenile dementia. Lastly, while there are many known risk factors associated with AD, the GBD data only includes metabolic and environmental factors, and does not account for other relevant risk factors. Therefore, future studies could improve the accuracy and reliability of global presenile dementia epidemic predictions by enhancing data quality, refining prediction models, and incorporating additional risk factors.

Conclusions

While our findings reveal a persistent and growing burden of presenile dementia—particularly in low SDI countries—despite declining age-standardized death and DALY rates, future research should aim to identify the underlying drivers of rising incidence and regional disparities. To lessen the increasing burden of disease, early detection, treatment, and public health initiatives must be strengthened immediately. These results highlight the necessity of focused preventative measures, especially resource-poor settings, where enhancing healthcare infrastructure, improving access to care, and promoting healthy lifestyles can help slow the rise in disease burden. Expanding screening programs to younger populations globally may alleviate the associated dementia burden, while systematic research and policy adjustments remain crucial to optimizing efforts to control presenile dementia.

Data Sharing Statement

The data were obtained from GBD study (http://ghdx.healthdata.org/gbd-results-tool), and replication details are provided in the supplementary file.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Shenzhen Nanshan Center for Chronic Disease Control (ll20240017).

Funding

This research was funded by National Nature Science Foundation of China (No: 82473625), and Shenzhen Science and Technology Program (No: JCYJ20230807153400001).

Disclosure

The authors report no conflicts of interest in this work.

References

1. World Health Organization. Fact sheets: dementia. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/dementia. Accessed March 10, 2025.
2. Nichols E, Steinmetz JD, Vollset SE, et al. Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease Study 2019. *Lancet Public Health*. 2022;7(2):e105–e125. doi:10.1016/S2468-2667(21)00249-8
3. World Health Organization. Dementia: key facts. 2023. Available from: https://www.who.int/zh/news-room/fact-sheets/detail/dementia. Accessed March 10, 2025.
4. Wattmo C, Wallin ÅK. Early-versus late-onset Alzheimer's disease in clinical practice: cognitive and global outcomes over 3 years. *Alzheimers Res Ther*. 2017;9:1–13. doi:10.1186/s13195-017-0294-2
5. Velayudhan L. Role of behavioural problems in carer burden in young onset dementia. *Int Psychogeriatr*. 2024;36:1–7. doi:10.1017/S1041610224000127
6. Hendriks S, Peetoom K, Bakker C, et al. Global prevalence of young-onset dementia: a systematic review and meta-analysis. *JAMA Neurol*. 2021;78(9):1080–1090. doi:10.1001/jamaneurol.2021.2161
7. Hendriks S, Peetoom K, Bakker C, et al. Global incidence of young-onset dementia: a systematic review and meta-analysis. *Alzheimers Dementia*. 2023;19(3):831–843. doi:10.1002/alz.12695
8. Zichlin M. Presenile Dementia. In: Kreutzer JS, DeLuca J, Caplan B, editors. *Encyclopedia of Clinical Neuropsychology*. New York, NY: Springer; 2011. doi:10.1007/978-0-387-79948-3_1140
9. Vos T, Lim SS, Abbafati C, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204–1222. doi:10.1016/S0140-6736(20)30925-9
10. Wang H, Abbas KM, Abbasifard M, et al. Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1160–1203. doi:10.1016/S0140-6736(20)30977-6
11. Hankey BF, Ries LA, Kosary CL, et al. Partitioning linear trends in age-adjusted rates. *Cancer Causes Control*. 2000;11:31–35. doi:10.1023/a:1008953201688
12. Kim HJ, Fay MP, Feuer EJ, et al. Permutation tests for joinpoint regression with applications to cancer rates. *Stat Med*. 2000;19(3):335–351. doi:10.1002/(sici)1097-0258(20000215)19:3<335::aid-sim336>3.0.co;2-z
13. Bu Q, Qiang R, Cheng H, et al. Analysis of the global disease burden of down syndrome using YLDs, YLLs, and DALYs based on the global burden of disease 2019 data. *Front Pediatr*. 2022;10:882722. doi:10.3389/fped.2022.882722
14. Riebler A, Held L. Projecting the future burden of cancer: bayesian age–period–cohort analysis with integrated nested Laplace approximations. *Biometrical J*. 2017;59(3):531–549. doi:10.1002/bimj.201500263
15. Rue H, Martino S, Chopin N. Approximate Bayesian inference for latent Gaussian models by using integrated nested Laplace approximations. *J R Stat Soc Ser B*. 2009;71(2):319–392. doi:10.1111/j.1467-9868.2008.00700.x
16. Liang D, Wang L, Liu S, et al. Global incidence of diarrheal diseases—an update using an interpretable predictive model based on XGBoost and SHAP: a systematic analysis. *Nutrients*. 2024;16(18):3217. doi:10.3390/nu16183217
17. World Health Organization. Global action plan on the public health response to dementia 2017–2025. World Health Organization; 2017.
18. Peeters G, Katelekha K, Lawlor B, et al. Sex differences in the incidence and prevalence of young-onset Alzheimer's disease: a meta-analysis. *Int J Geriatr Psychiatry*. 2022;37(1). doi:10.1002/gps.5612
19. Mielke MM, Aggarwal NT, Vila-Castelar C, et al. Consideration of sex and gender in Alzheimer's disease and related disorders from a global perspective. *Alzheimers Dementia*. 2022;18(12):2707–2724. doi:10.1002/alz.12662
20. Lan Y-L, Zhao J, Li S. Update on the neuroprotective effect of estrogen receptor alpha against Alzheimer's disease. *J Alzheimers Dis*. 2015;43(4):1137–1148. doi:10.3233/JAD-141875
21. Vina J, Lloret A. Why women have more Alzheimer's disease than men: gender and mitochondrial toxicity of amyloid-β peptide. *J Alzheimers Dis*. 2010;20(s2):S527–S533. doi:10.3233/JAD-2010-100501
22. Barth C, Crestol A, De Lange A-M, et al. Sex steroids and the female brain across the lifespan: insights into risk of depression and Alzheimer's disease. *Lancet Diabetes Endocrinol*. 2023;11(12):926–941. doi:10.1016/S2213-8587(23)00224-3
23. Livingston G, Huntley J, Liu KY, et al. Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission. *Lancet*. 2024;404(10452):572–628. doi:10.1016/S0140-6736(24)01296-0
24. Niu -Y-Y, Zhong J-F, Wen H-Y, et al. Association of combined healthy lifestyle factors with incident dementia in participants with and without multimorbidity: a large population-based prospective cohort study. *J Gerontol Ser A*. 2024;79(4):e034. doi:10.1093/gerona/glae034
25. Yang JJ, Keohane LM, Pan X-F, et al. Association of healthy lifestyles with risk of Alzheimer disease and related dementias in low-income Black and White Americans. *Neurology*. 2022;99(9):e944–e953. doi:10.1212/WNL.0000000000200774
26. Dhana K, Franco OH, Ritz EM, et al. Healthy lifestyle and life expectancy with and without Alzheimer's dementia: population based cohort study. *BMJ*. 2022;377:1756–1833. doi:10.1136/bmj-2021-068390
27. Cummings J, Zhou Y, Lee G, et al. Alzheimer's disease drug development pipeline: 2024. *Alzheimers Dementia*. 2024;10(2):e12465. doi:10.1002/trc2.12465