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Burden of uterine cancer in China from 1990 to 2021 and 15-year projection: a systematic analysis and comparison with global levels

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Abstract

Objective Uterine cancer (UC) is one of the prevalent malignancies in the female reproductive system. Estimating the burden trends of UC is crucial for developing effective prevention strategies at the national level. However, there has been no comprehensive analysis of the UC burden in China. We focused on the evaluation of the burden trends of UC in China over the past 32 years to provide a 15-year projection, comparing it with global levels.

Methods Data on incidence, prevalence, mortality, and disability-adjusted life years (DALYs) were extracted from Global Burden of Disease (GBD) 2021 to describe the burden of UC in China. Joinpoint regression analysis was employed to describe the temporal trends of UC in China and globally over the past 32 years. A Bayesian age-period-cohort model was utilized to predict the trends of UC in the next 15 years. Spearman correlation analysis was used to compare the relationship between ASIR, ASPR, ASMR, ASDR, and SDI in UC in China and globally. Changes in ASMR and ASDR in UC caused by high BMI in China and globally from 1990 to 2021 were explored.

Results In 2021, the age-standardized incidence rate (ASIR), age-standardized prevalence rate (ASPR), age-standardized mortality rate (ASMR), and age-standardized DALY rate (ASDR) of UC in China were 6.65, 46.52, 1.24, and 37.86 (per 100,000 population) respectively. Compared to 1990, the ASMR and ASDR decreased by 48.63% and 48.15% respectively, while the ASIR and ASPR increased by 17.79% and 37.67% respectively. Globally, the burden of UC followed a similar trend in China, with increasing ASIR and ASPR, and decreasing ASMR and ASDR, although the magnitude of increase and decrease was smaller than in China. Joinpoint regression analysis results showed an overall upward trend in ASIR and ASPR for both China and global UC, while an overall downward trend was observed in ASMR and ASDR. Age-specific analysis revealed that during the period from 1990 to 2021, the age groups with the highest incidence, prevalence, mortality, and DALYs for UC in China generally occurred at earlier ages compared to the global pattern. It is projected that over the next 15 years, the burden of UC in China will continue to increase at a higher rate than the global level. Spearman correlation analysis showed that ASIR and ASPR of UC in China and the world were significantly positively correlated with SDI ($p < 0.05$), and ASMR and ASDR were significantly negatively correlated with SDI ($p < 0.001$). High BMI is a risk factor affecting the mortality rate and DALYs of UC in both China and globally, with the increase in ASMR and ASDR due to high BMI being greater in China than globally.

Conclusion The incidence and prevalence burden of UC among Chinese and global women have shown an increasing trend over the past 32 years, while the mortality and DALYs have decreased. The projected burden of UC in China is anticipated to continue rising at a higher rate than the global level over the next 15 years. Given the large population in China, the government needs to strengthen screening and prevention strategies to mitigate the burden of UC.

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Keywords Uterine cancer, Burden of disease, Epidemiology, Joinpoint regression, Age-period-cohort model, Projection

Introduction

As one of the three most prevalent malignancies in the female reproductive system, uterine cancer (UC) accounts for 20% to 30% of malignant tumors in the female reproductive tract [1]. According to the GLOBOCAN 2022 cancer statistics, globally, UC has risen to the fourth position in terms of the incidence of new cancer cases and cancer-related deaths among women. Compared to 1990, the number of new UC cases worldwide has increased by approximately 2.5 times in 2022 [2, 3]. The incidence and mortality rates of UC are closely related to the human development index [2]. The latest cancer statistics in the United States in 2023 show that UC ranks fourth among newly diagnosed cancers in women (7% of cases) and sixth in terms of mortality among female cancers [4, 5]. As the most populous developing country in the world, China indisputably holds the highest burden of cancer incidence and mortality globally [4]. It is worth noting that while UC is no longer the second leading cause of gynecological cancer deaths in China, it remains the second most common type of gynecological cancer [6].

China, as a rapidly developing country, has witnessed an increasing and younger age onset trend of UC in recent years, attributed to changes in the country's socioeconomic structure, people's dietary and lifestyle habits, and an increased prevalence of endocrine and metabolic disorders [7]. In terms of socioeconomic status, the incidence of UC in urban areas of China is considerably higher than in rural areas. Rural areas have a higher annual percentage change (APC) in incidence due to changes in lifestyle and population movement [8]. Previous studies have identified excessive estrogen exposure and imbalances in estrogen and progesterone as key risk factors for UC [9]. Hormone secretion is tightly linked with age, and after adjusting for age deviation, the overall rate of increase in UC mortality among Chinese women in the same birth cohort is much slower compared to cervical and ovarian cancers [7]. Diabetes and obesity are also major risk factors for UC as they lead to increased levels of biologically available estrogen in circulation [10]. Dietary patterns take a pivotal part in UC, and studies have shown that a dietary pattern consisted of macronutrients with lower fat and higher carbohydrate or sugar intake can reduce the risk of UC in the general population [11]. Increased body mass index (BMI) and waist circumference are tightly linked with UC risk, as reported in both observational and Mendelian randomization (MR) analyses [1, 12, 13]. Liu et al. [14] conducted a detailed analysis of the burden of UC caused by high BMI on the global, regional, and national scales using Global Burden of Disease (GBD) 2019 data, exploring the variations among different countries and regions.

So far, no current comprehensive analysis of the incidence, prevalence, mortality, and disability-adjusted life years (DALYs) burden of UC in China has been conducted. Therefore, this study utilized data from GBD 2021 to comprehensively describe the temporal trends and age distribution of UC burden in China from 1990 to 2021. Joinpoint regression analysis was employed to identify trend changes in specific periods. Additionally, we utilized the Bayesian age-period-cohort (BAPC) model to estimate the burden trend of UC from 2022 to 2035. Associations of ASIR, ASPR, ASMR, ASDR with SDI for the disease burden of UC in China and globally were analyzed using Spearman correlation. In addition, this study explored the changes of ASMR and ASDR in UC attributable to high BMI in 1990 and 2021 in China and globally. The study offered reliable epidemiological evidence for UC in China and valuable insights for future public policy formulation.

Methods

Data source

We downloaded data from GBD 2021 (http://ghdx.healthdata.org/gbd-results-tool, accessed on June 24, 2024). GBD 2021 provides comprehensive data on the burden of 371 diseases and injuries across 204 regions and countries from 1990 to 2021, along with data on 88 risk factors. Following data were downloaded for subsequent analysis:

1. Age-specific data on the annual incidence, prevalence, mortality, and DALYs of UC in China and globally from 1990 to 2021, including absolute numbers, crude rates (CRs), and age-standardized rates (ASRs) with 95% uncertainty intervals (UI).
2. Relative percentage change data with corresponding 95% UI for ASRs in China and globally from 1990 to 2021.
3. Population data by age group for China and globally from 1990 to 2021, as well as population projections from 2022 to 2035.
4. Abbreviations used in the article: CR, including crude incidence rate (CIR), crude prevalence rate (CPR), crude mortality rate (CMR), and crude

DALYs rate (CDR); ASR, including age-standardized incidence rate (ASIR), age-standardized prevalence rate (ASPR), age-standardized mortality rate (ASMR), age-standardized DALY rate (ASDR), and Socio-demographic Index (SDI). According to the Global Burden of Disease (GBD) official website tool (https://www.healthdata.org/data-visualization/gbd-compare), when filtering the risk factors influencing UC mortality rate and DALYs in China and globally, only one risk factor is identified: high body-mass index (BMI). Screening tools were from GBD official website (https://ghdx.healthdata.org/record/ihme-data/gbd-2021-tuberculosis-incidence-mortality-1990-2021) in 1990-2021 SDI in China and globally.

Statistical analysis

Descriptive analysis

We conducted a descriptive analysis of the temporal trends in UC burden in China compared to the global level. Prepared by using Microsoft Excel 2019, we analyzed all data used in the descriptive analysis using Python software (version 3.9.0). A p-value < 0.05 was considered statistically significant.

Joinpoint regression analysis

As a statistical approach to investigation of the trend of a disease over time, Joinpoint regression analysis is also called segmented regression modeling. The primary principle of Joinpoint regression analysis is to fit a long-term trend line into several statistically significant trend segments [15]. Each segment is displayed by a continuous linear line, and join points are the points that connect different trend segments [15]. Joinpoint software (version 4.9.1.0; National Cancer Institute, Rockville, Maryland, USA) was employed to construct the model. APC, average annual percentage change (AAPC), and their corresponding 95% confidence interval (CI) were calculated to measure the burden trend of the disease. The significance of the fluctuation trend in different segments was assessed by comparing APC/AAPC with 0. A p-value less than 0.05 was considered statistically significant. If APC/AAPC > 0, it suggested an upward trend, while APC/AAPC < 0 suggested a downward trend. A stable trend was indicated if the 95% CI included 0.

BAPC model for burden prediction

The BAPC model, developed from the basis of the age-period-cohort model, assumes a correlation between incidence or mortality rates and age structure and population size. The BAPC model incorporates second-order random walks to smooth the priors of age, period, and cohort effects for predicting future incidence or mortality rates. This approach combines nested Laplace approximations, which avoid any mixing and convergence issues induced by sampling techniques associated with Markov Chain Monte Carlo, demonstrating improved coverage and accuracy compared to other methods [16, 17]. Based on age-specific population data from 1990 to 2021, predicated population data from 2022 to 2035, and the GBD world population age standard, we employed the BAPC model to predict the ASIR, ASPR, ASMR, and ASDR of UC in China and globally for the next 15 years. The BAPC model was established using R software (version 4.3.1) with the R packages "INLA" and "BAPC".

The relationship between UC burden and SDI

SDI is a comprehensive indicator to measure the level of regional socioeconomic development, which comprehensively measures the total fertility rate of women under the age of 25, the years of education of people over the age of 15, and the lagged income distribution per capita [18]. It is used to classify and compare the differences in health and disease burden in different regions. In this study, we analyzed the relationship between ASIR, ASPR, ASMR, ASDR and SDI in UC in China and globally and tested the association between age-standardized rate and SDI by Spearman correlation analysis. R software (version 4.3.1) was used for data visualization.

Results

Temporal trends in the burden of UC in China and globally from 1990 to 2021

In 2021, the ASIR, ASPR, ASMR, and ASDR of UC in China were 6.65, 46.52, 1.24, and 37.86 per 100,000 individuals, respectively. Compared to 1990, the ASMR and ASDR in China decreased by 48.63% and 48.15%, while the ASIR and ASPR increased by 17.79% and 37.67%, respectively. Globally, the burden trend of UC was similar to that in China, with an increase in ASIR and ASPR and a decrease in ASMR and ASDR, although the magnitude of the increase and decrease was smaller than in China (Table 1).

In China, approximately 500,700 cases of UC were estimated in 2021, including 72,000 new cases and 13,600 deaths, resulting in 405,500 DALYs. Compared to 1990, the CIR and CPR displayed an upward trend in 2021. Conversely, CMR and CDR exhibited a decreasing trend. On a global scale, all rates showed an increasing trend (Table S1).

We also compared the trends in the incidence, prevalence, mortality, DALYs, and corresponding ASRs of UC in China and globally over the years. As shown in Fig. 1 and Table S2, from 1990 to 2021, the incidence and prevalence of UC in China exhibited a pattern of initial increase, followed by a decrease, and

Table 1 The changes in ASIR, ASPR, ASMR, and ASDR of UC in China and globally from 1990 to 2021 (per 100,000 individuals)

Measure	China			Global		
	ASRs (95% UI) in 1990	ASRs (95% UI) in 2021	Percentage change in ASRs	ASRs (95% UI) in 1990	ASRs (95% UI) in 2021	Percentage change in ASRs
Incidence	5.64 (3.94–7.1)	6.65 (4.91–9.25)	17.79%	8.87 (8.12–9.35)	10.36 (9.42–11.24)	16.74%
Prevalence	33.79 (23.16–42.75)	46.52 (33.62–64.67)	37.67%	61.17 (56.35–64.14)	75.73 (69.37–81.78)	23.79%
Mortality	2.42 (1.74–3.01)	1.24 (0.91–1.7)	− 48.63%	2.6 (2.32–2.8)	2.11 (1.87–2.34)	− 18.94%
DALYs	73.01 (49.39–91.9)	37.86 (28.14–51.76)	− 48.15%	69.17 (59.85–75.3)	56.15 (50.07–62.37)	− 18.83%

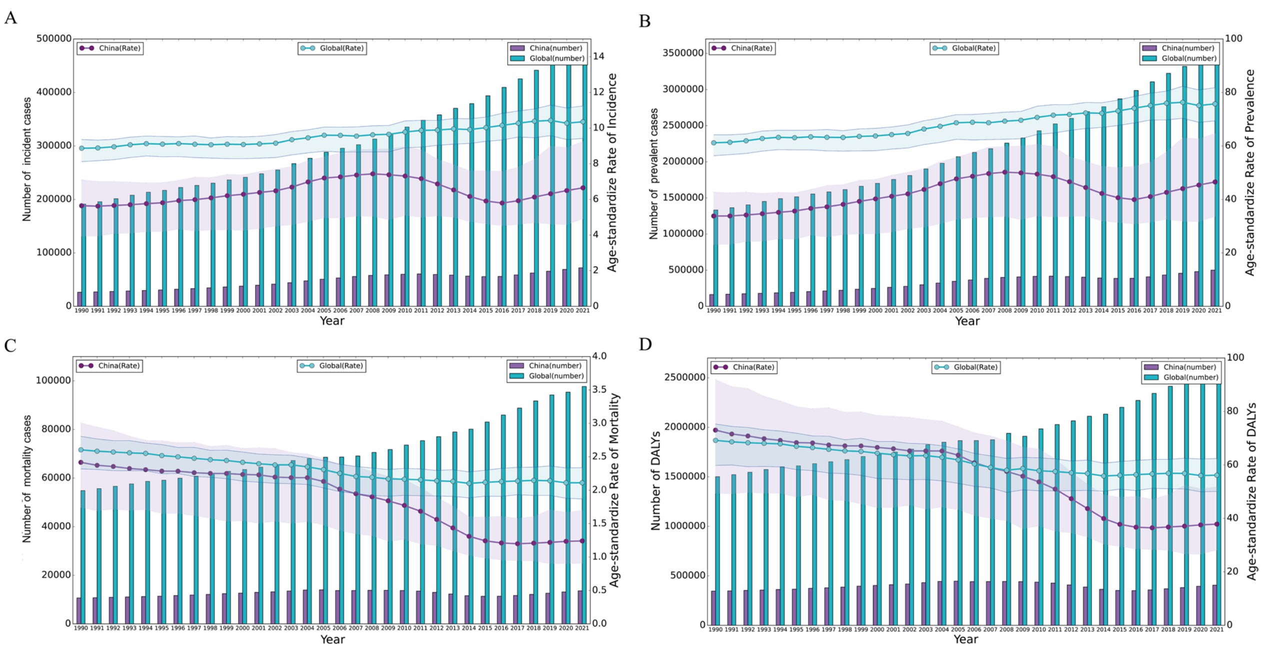

Fig. 1 The number of incident cases and ASIR (**A**), the number of prevalent cases and ASPR (**B**), the number of mortality cases and ASMR (**C**), and the number of DALYs and ASDR (**D**) of UC in China and globally from 1990 to 2021

then another increase (Fig. 1A, B). The turning points of peak incidence and prevalence occurred in 2011 and 2015, reaching new peaks in 2021. The number of deaths and DALYs attributed to UC in China followed a similar pattern, with turning points in 2005 and 2015/2016. The incidence, prevalence, mortality, and DALYs globally showed an overall steady increase.

Regarding the trends in ASRs, the ASIR and ASPR of UC in China showed a pattern of initial increase, followed by a decrease, and then another increase (Fig. 1C, D). The turning points of peak ASIR and ASPR occurred in 2008 and 2016. The ASMR and ASDR of UC in China exhibited a pattern of initial decrease, followed by an increase, with a turning point in 2017, and a slight upward trend in 2021. Additionally, the ASIR and ASPR of UC globally showed a slow upward trend, while the ASMR and ASDR generally displayed a pattern of initial decrease, followed by an increase, and then a decrease again, with the lowest values observed in 2014.

Joinpoint regression analysis results

Next, we examined the specific trends in ASRs of UC in China and globally from the Joinpoint regression analysis results for the period 1990–2021. The results indicate that over these 32 years, the overall trend for the ASIR and ASPR of UC in both China and globally has been increasing (Fig. 2A, B). The AAPC for ASIR in China was 0.57; globally, it was 0.5. The AAPC for ASPR in China was 1.09, while globally it was 0.69. The AAPC in ASIR and ASPR of UC in China was higher than the global average. Furthermore, the APC for each year in China reached its highest point in 2010 and gradually decreased, reaching its lowest point in 2016, and then showed an upward trend. In contrast, the global APC peaked in 2018 and showed a decreasing trend since then.

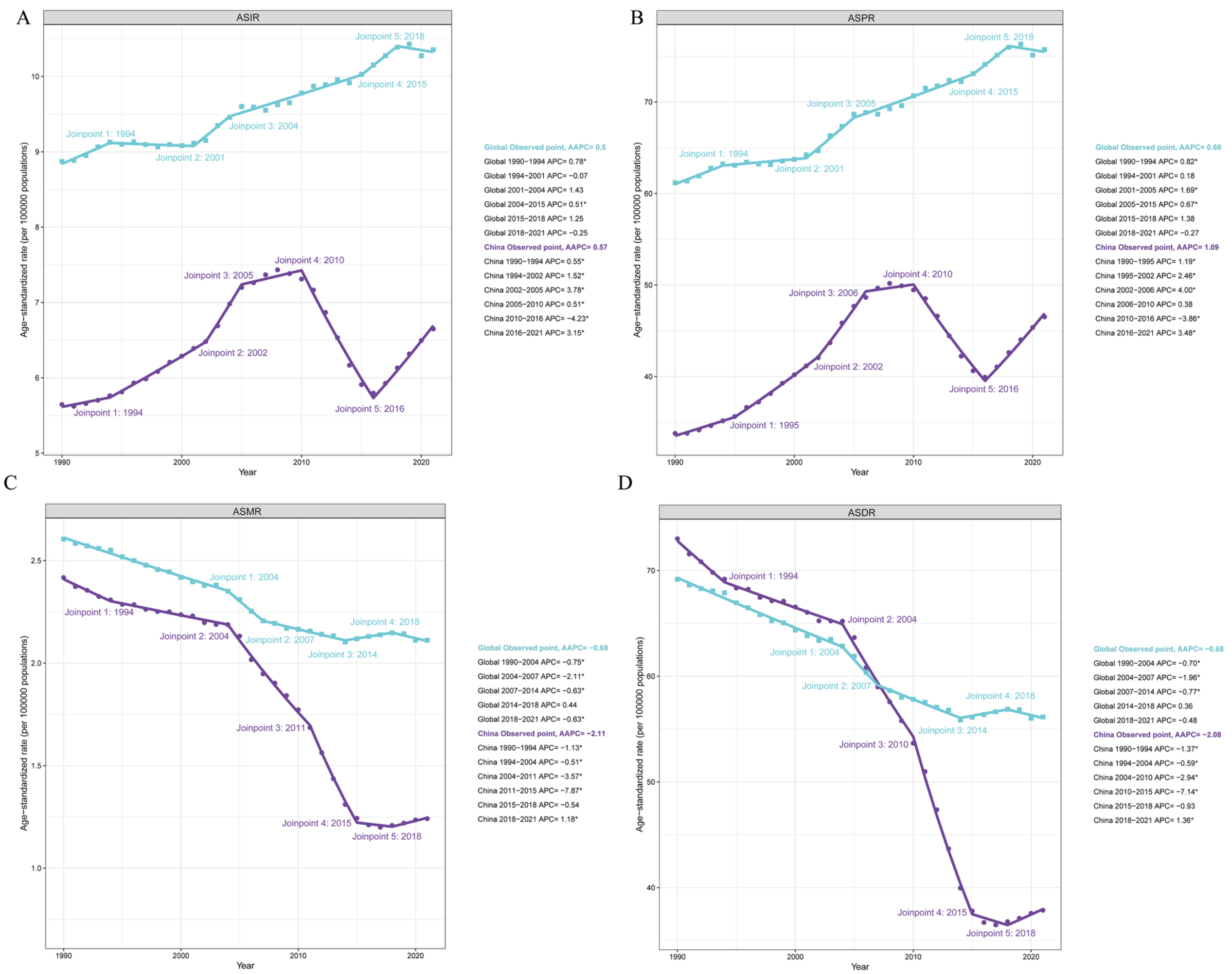

Fig. 2 Joinpoint regression analysis of ASRs for UC in China and globally from 1990 to 2021. **A** ASIR. **B** ASPR. **C** ASMR. **D** ASDR. APC* denoted significant *p*-values (< 0.05), indicating statistically significant changes in APC

Regarding ASMR and ASDR, the overall trend for China and global UC decreased (Fig. 2C, D). The AAPC for ASMR in China was − 2.11, while globally it was − 0.69. The AAPC for ASDR in China was − 2.08, while globally it was − 0.68. The AAPC in ASMR and ASDR of UC in China was higher in the downward direction compared to the global average. Additionally, it is noteworthy that the ASMR and ASDR of UC in China showed an upward trend after 2018, while globally they showed a decreasing trend.

Trends in UC burden by age group in China and globally in 1990 and 2021

In Fig. 3, we present a comparison of the number of incidences, prevalence, mortality, and DALYs, and CIR, CPR, CMR, and CDR of UC in different age groups in China and globally in 1990 and 2021. For more detailed data, please refer to Table S3. From Fig. 3A, B, it could be observed that the incidence and prevalence of UC in China and globally, as well as the corresponding CRs (CIR and CPR), showed a pattern of initial increase followed by a decrease with increasing age. Moreover, in 2021, the incidence, prevalence, and CRs in each age group were generally higher than those in 1990. In terms of specific age groups, the greatest number of incidence (13,986) and prevalence (107,904) for UC in China was in the 55–59 age group, which increased by 204.84% and 242.99% respectively compared to 1990. In contrast, in 2021, the greatest number of incidence (79,324) and prevalence (617,926) for global UC was in the 60–64 age group, which increased by 146.67% and 158.59% respectively compared to 1990.

From Fig. 3C, D, it could be observed that the number of mortality and DALYs of UC in China and globally showed a pattern of initial increase followed by a decrease with increasing age. The overall trend for the

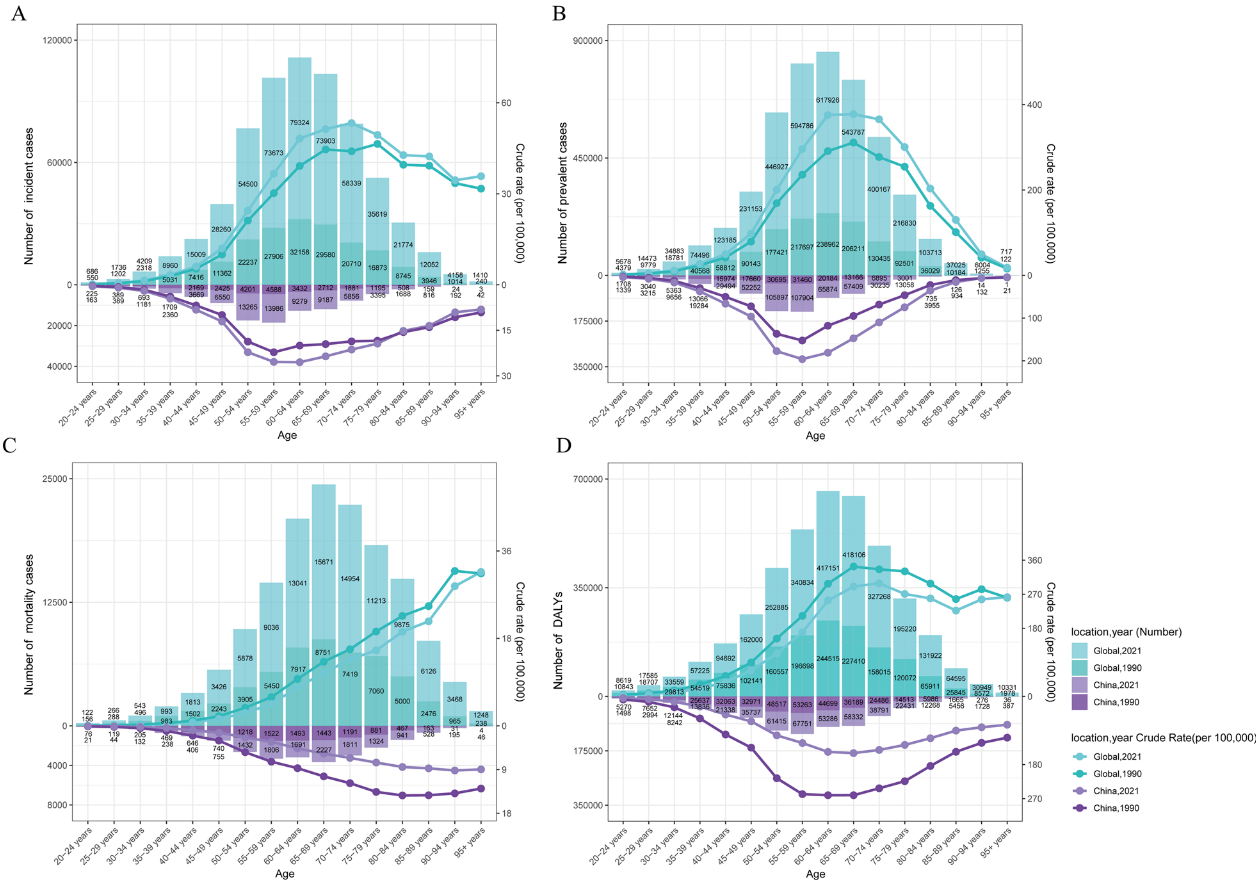

Fig. 3 Comparison of the number of incident cases and ASIR (**A**), comparison of the number of prevalent cases and ASPR (**B**), comparison of the number of mortality cases and ASMR (**C**), comparison of the number of DALYs and ASDR (**D**) of UC in different age groups in China and globally between 2021 and 1990

CMR and CDR of UC in China and globally was an initial increase followed by a decrease. Additionally, compared to 2019, the CMR and CDR of UC in each age group in 2021 were lower. Specifically, in China, the highest number of deaths (2,227) due to UC was in the 65–69 age group, which increased by 54.33% in 2021 compared to 1990. The greatest number of cases (67,751) in the 55–59 age group increased by 27.21% in 2021 compared to 1990. For global UC, the greatest number of deaths (15,671) and DALYs (418,106) was in the 65–69 age group, which increased by 79.07% and 83.86% respectively compared to 1990.

Forecast of UC burden in China and globally from 2022 to 2035

Finally, we conducted Bayesian Age-Period-Cohort (BAPC) analysis to forecast the number of incidences, prevalence, mortality, and DALYs of UC in China and globally from 2022 to 2035, as well as the corresponding trends in ASIR, ASPR, ASMR, and ASDR. The results are presented in Fig. 4 and Table S4. The projected incidence, prevalence, mortality, and DALYs of UC in China and globally are expected to increase over the next 15 years. On a global scale, ASIR, ASPR, ASMR, and ASDR showed a declining trend. In contrast, in China, ASIR, ASPR, ASMR, and ASDR exhibited an upward trend. It is estimated that by 2035, the global UC incidence, prevalence, and mortality will reach approximately 621,400, 4,369,100, and 128,700, respectively, with DALYs count of approximately 3,157,200. In China, the projected UC incidence, prevalence, and mortality by 2035 will reach approximately 136,800, 887,600, and 24,000, respectively, with DALYs count of approximately 621,400. Furthermore, when examining the annual data of UC ASRs from 2022 to 2035, it is evident that the growth rates of ASIR, ASPR, ASMR, and ASDR in China are significantly higher than the global average over the next 15 years.

5 Association between the burden of UC and SDI in China and globally from 1990 to 2021

We explored the association between the burden of UC and SDI in China and the world from 1990 to 2021 in

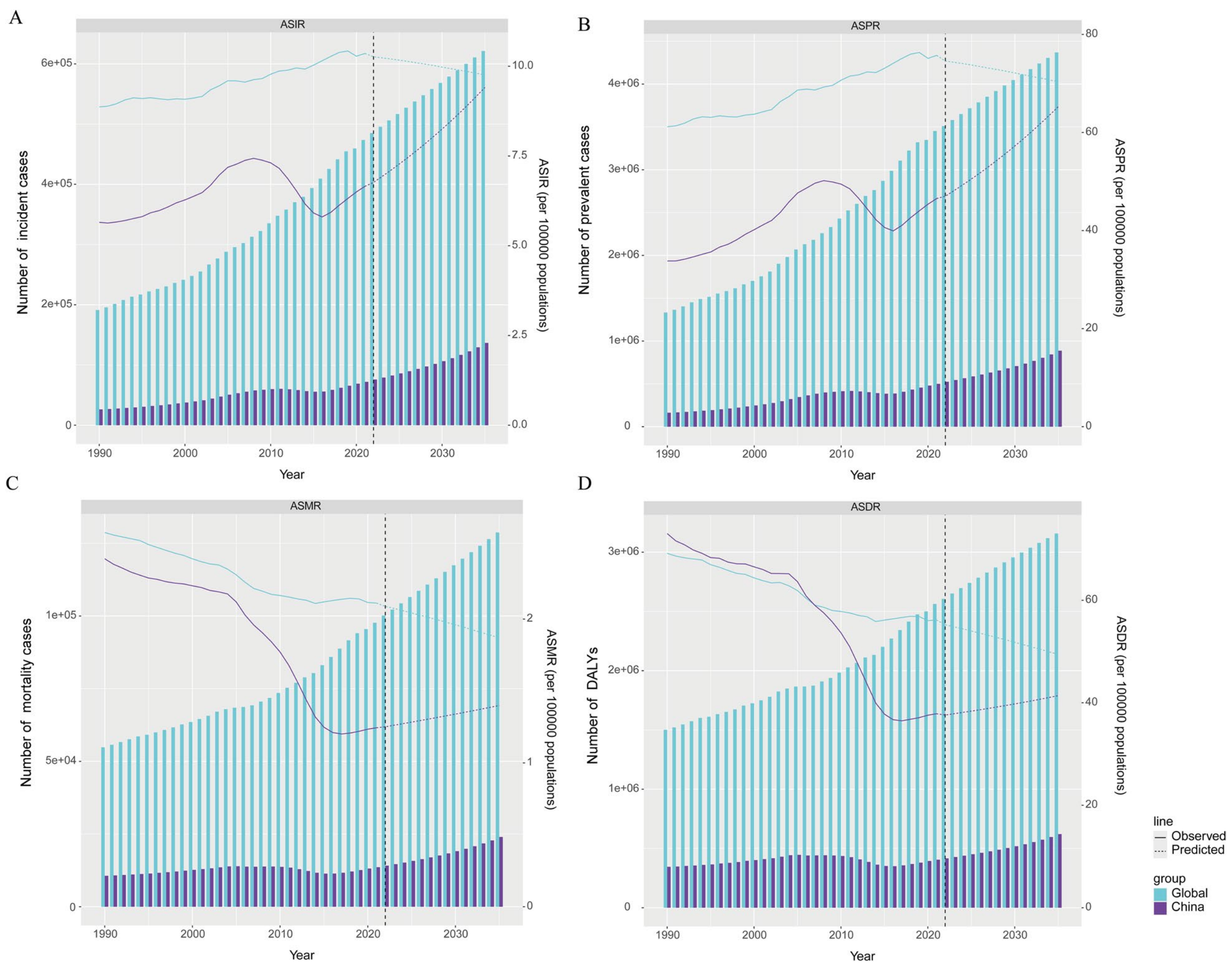

Fig. 4 Temporal trends of the number of incidences, prevalence, mortality, DALYs, and ASIR, ASPR, ASMR, and ASDR of UC in China and globally from 1990 to 2035. The dashed lines represent the predicted values, while the solid lines represent the observed values in the GBD dataset. The vertical dashed line indicates the starting point of the predictions. **A** ASIR; **B** ASPR; **C** ASMR; **D** ASDR

Fig. 5 and Table S5. According to the results, there was a significant positive correlation between ASIR, ASPR of UC and SDI in China and the world ($P < 0.05$). However, there was a significant negative correlation between ASMR, ASDR and SDI in UC in China and globally ($P < 0.001$). In terms of the strength of correlation, the correlation between the burden of UC and SDI was heavier in the world than in China.

Changes in ASMR and ASDR of UC attributed to high BMI in China and globally in 1990 and 2021

In subsequent research, we identified the risk factors influencing the mortality and DALYs of UC in China and globally and found that only high BMI was a significant factor. We further analyzed the changes in ASMR and ASDR of UC attributed to high BMI in China and globally in 1990 and 2021, as shown in Table 2. Compared to 1990, the ASMR of UC attributed to high BMI in China increased by 19.46% in 2021, and the ASDR increased by 20.86%. For global UC attributed to high BMI, the ASMR increased by 8.30% in 2021, and the ASDR increased by 11.42%. Overall, the increase in ASMR and ASDR of UC attributed to high BMI in China was greater than the global average.

Discussion

We compared the burden of UC in China and globally based on the GBD 2021 database. We employed Joinpoint regression analysis to comprehensively evaluate the trends of ASIR, ASPR, ASMR, and ASDR of UC in China and globally. We visualized the trends of UC burden and used BAPC to forecast the changes in UC burden in China and globally in the next 15 years. Spearman correlation analysis was used to analyze the relationship between ASIR, ASPR, ASMR, ASDR and SDI of the disease burden of UC in China and global, and to reveal the

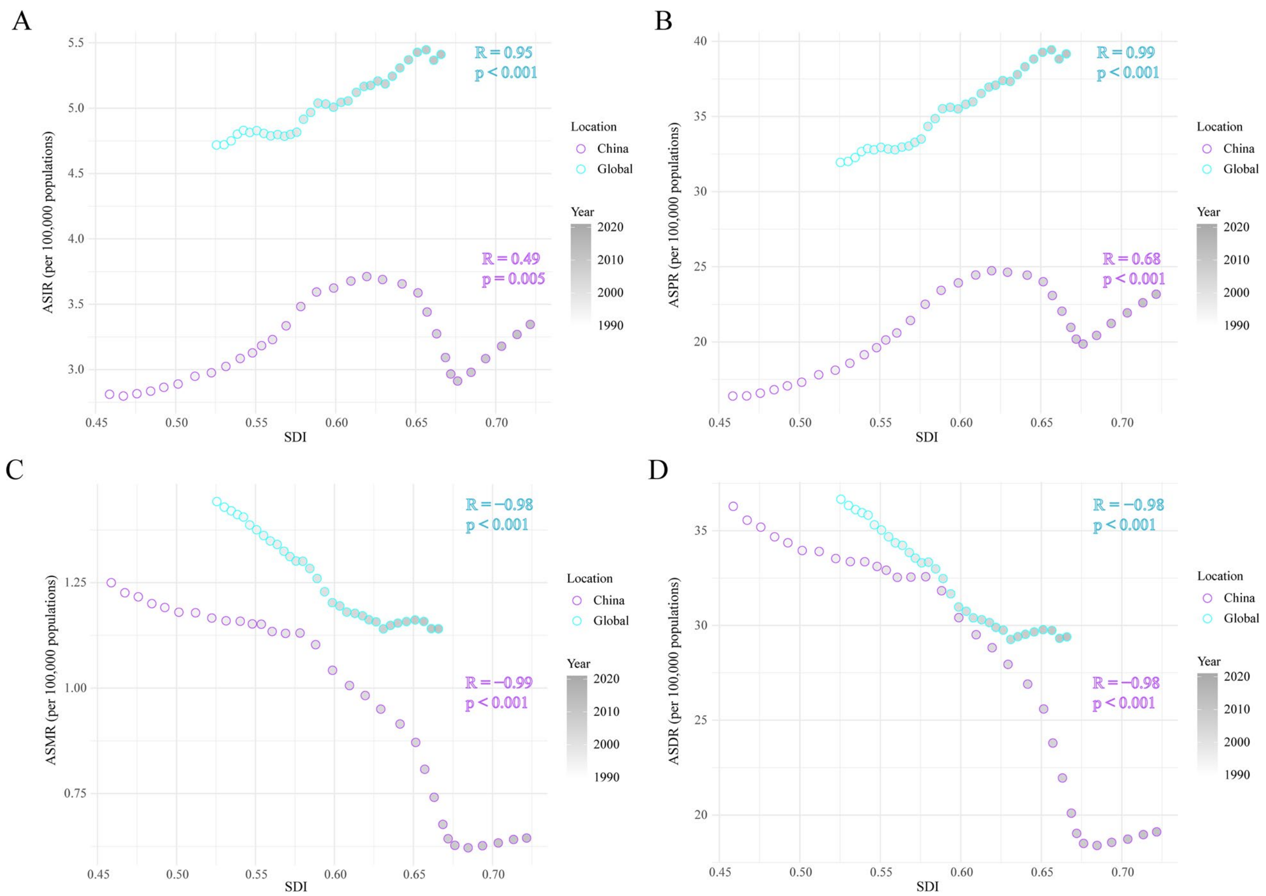

Fig. 5 Association of ASIR (**A**), ASPR (**B**), ASMR (**C**), ASDR (**D**) with SDI in UC in China and globally from 1990 to 2021

Table 2 Changes in UC ASMR and ASDR due to High BMI factors in China and globally from 1990 to 2021

Measure	China			Global		
	ASRs (95% UI) in 1990	ASRs (95% UI) in 2021	Percentage change in ASRs	ASRs (95% UI) in 1990	ASRs (95% UI) in 2021	Percentage change in ASRs
Mortality	0.27 (0.17–0.41)	0.33 (0.20–0.51)	19.46%	0.66 (0.47–0.89)	0.72 (0.52–0.94)	8.30%
DALYs	8.44 (5.18–12.68)	10.20 (6.10–15.89)	20.86%	17.26 (12.25–23.16)	19.23 (13.8–25.38)	11.42%

impact of socioeconomic development on the burden of UC. The changes of ASMR and ASDR of UC caused by high BMI in 1990 and 2021 in China and globally were explored, and the impact of obesity and other related metabolic diseases on the burden of UC was revealed. The findings of this study may provide data references for formulating prevention and management policies for UC in China.

From 1990 to 2021, the incidence and prevalence of UC, as well as the CRs and ASRs in China, showed remarkable increases. Although the global burden of UC also exhibited an upward trend during that period, the growth rate of UC burden in China was much higher than the global level. This was in line with a previous study [19], which pointed out that in 2019, the number of incident cases in China (66,744) ranked second only to the United States (80,070). This may be attributed to the rapid socio-economic development in China during that period, changes in lifestyle, and an increase in the population affected by endocrine and metabolic disorders [20, 21]. In contrast, the decline in ASRs for mortality and DALYs in China is much greater than the global average, while the global CMR and CDR show an upward trend. This difference could be due to the consideration of variations in the Sociodemographic Index (SDI) across different regions globally [2, 19]. Since the beginning of the twenty-first century, remarkable breakthroughs have been accomplished in the treatment of UC in China including the implementation of comprehensive surgical staging, the application of minimally invasive techniques, rational adjuvant chemotherapy and radiotherapy, and comprehensive management for advanced-stage patients, leading to improvement of prognosis for patients at certain degree [22, 23]. Therefore, the reasons for these differences may also be attributed to the advancements in medical care and technological improvements in early cancer detection in China.

The Joinpoint regression model enabled us to better capture the changing trends in different time periods and quantify the APC in UC burden. Our data showed that from 1990 to 2010, the ASIR of UC in China exhibited an increasing trend, followed by a significant decline after 2010. The analysis of the incidence rate of UC in China during the same period (2008–2012) by the China National Central Cancer Registry (NCCR) revealed that the ASIR of UC based on the Chinese standard population in 2000 displayed a significant annual increase of 3.0% from 2003 to 2012 [24], however, our data analysis does not align with those findings. The ASMR in China demonstrated a consistent decreasing trend, which is similar to the data reported in the China Death Surveillance Dataset between 2006 and 2020 but is different from its time period [25]. The discrepancy may be attributed to the GBD 2021 adjustment of data sources, considering the heterogeneity of different studies and standardized data, thereby further validating the necessity of our study.

We conducted a visual analysis of UC burden in different age groups in China and globally over a span of 32 years. The study indicated that during the period from 1990 to 2021, the peak age groups for incidence, prevalence, mortality, and DALYs of UC in China generally occurred earlier than globally. This phenomenon may be attributed to the gradually improved disease prevention and healthcare system established in China in recent years. The introduction of advanced diagnostic methods such as transvaginal ultrasound scanning or endometrial sampling has accelerated the prevention and precise screening of UC [26]. Additionally, there has been an increase in health awareness among middle-aged and young adults, with people attaching more importance to regular check-ups and the prevention of chronic diseases. As a result, UC has gained more attention at an earlier stage, leading to higher detection rates [27]. Therefore, the more advanced medical technology, improved screening rates, and increased disease awareness are likely important factors that contribute to the earlier occurrence of incidence, prevalence, mortality, and DALYs of UC in China compared to globally.

Predicting the burden of UC contributes to informing and assisting healthcare resource allocation policies. With the growth of the population and aging, this study predicted that the burden of UC in China and globally would show an upward trend over the next 15 years. It is estimated that by 2035, the global number of UC cases could reach approximately 621,400, with around 136,800 cases in China. Additionally, based on the data, the growth rate of ASRs for UC in China over the next 15 years is significantly higher than the global average. If left untreated, the burden of UC in China is expected to become even heavier in the future. Therefore, China and other countries worldwide should take effective comprehensive prevention and treatment measures to alleviate the burden, such as strengthening public health education, promoting healthy lifestyles and disease awareness, implementing and improving UC vaccination programs, and conducting early screening for UC [28].

In the Spearman correlation analysis of the burden of UC and SDI in China and globally, we found a significant positive correlation between ASIR, ASPR and SDI in China and globally, indicating that the incidence and prevalence of UC showed an increasing trend with the increase of SDI. This may be related to lifestyle changes, obesity, and the increase of endocrine and metabolic diseases in people living in high SDI areas [29, 30]. The correlation between SDI and the burden of UC in the world is higher than that in China, which may be related to the differences in medical level, the popularity of health awareness, and the development level of diagnostic technology in different countries. At the same time, the significant negative correlation between ASMR, ASDR and SDI reflects the contribution of better medical services and early screening to reduce mortality in high SDI areas, and advanced medical means and prevention strategies may play a more important role in improving the prognosis of UC [31, 32]. For China, public health policies should be further strengthened in the future, especially for disease prevention and management in areas with high SDI to cope with the increasing burden of UC.

Furthermore, an important aspect of enhancing prevention and control measures for UC is to strengthen early screening and intervention in high-risk populations. The results of this study demonstrated that BMI was a risk factor influencing UC mortality rates and DALYs in China and globally. The prevalence of obesity and related metabolic diseases may be the primary driving force behind the increased burden of UC [33]. Moreover, overall, the increase in ASMR and ASDR for UC attributed to high BMI factors in China is greater than the global average. This finding suggests that China faces unique challenges in addressing the burden of UC and needs to take more proactive measures to control high BMI and its associated health risks. Promoting a healthy lifestyle and emphasizing body weight management are necessary. Studies have shown that women with a higher BMI have a 50% higher risk of developing UC in later years [34]. Additionally, a report stated that engaging in physical exercise and maintaining weight loss for more than 5 years can reduce the risk of UC by 25% in women [35]. Furthermore, obesity can enhance the aromatization of estrogen precursors in adipose tissue, resulting in an elevated estrogen state, which may be the major mechanism that connects obesity to UC [36]. Therefore, to reduce the incidence and mortality rate of UC, multi-level and multi-faceted comprehensive measures must be taken, including health education, community interventions, policy support, and comprehensive management of the healthcare system. Through these measures, BMI levels can be effectively controlled, reducing the risk of UC and improving women's health status and quality of life.

Despite the progress made in this study, there are still some limitations. Firstly, the data used in this study were sourced from GBD 2021. Although efforts were made to improve the quality of data through modifications and adjustments in the evaluation of data sources and collection, biases introduced by data extrapolation may be difficult to avoid entirely. Secondly, the data lacked individual-level data and histological type information, failing to get a more detailed and comprehensive analysis of UC burden in China. Lastly, UC data were calculated using the GBD standard population rather than the Chinese population, which was more suitable for cross-country or global horizontal comparisons. However, this approach may underestimate the disease burden because of the larger proportion of the elderly population in China. Currently, UC remains a great challenge for public health in China and globally. This study can provide insights and data support for the development and implementation of relevant policies and adjustments in China.

Conclusion

This study utilized the data system of GBD 2021 to analyze the burden and temporal trends of UC in China and globally from 1990 to 2021 and predicted the development trends for the next 15 years. The results indicate that the incidence and burden of UC in China have significantly increased over the past few decades, with a growth rate higher than globally. However, China has experienced a greater decline in mortality and DALYs burden compared to the global level. With the development of socioeconomic factors and changes in lifestyle, the incidence and burden of UC in China and globally are expected to continue to rise in the future, presenting a challenging situation for UC burden in China. Additionally, risk factors such as obesity and high BMI play a significant role in the occurrence and progression of UC. Therefore, effective prevention and control measures targeting these risk factors are of great significance in reducing the burden of UC. The findings of this study provide reliable epidemiological evidence for the formulation of public health policies aimed at improving the prevention, early diagnosis, and treatment outcomes of UC, thereby enhancing the survival rate and quality of life for patients.

Supplementary Information

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Additional file 1

Additional file 2

Author contributions

Zhan Lin: Conceptualization, Data analysis, Methodology, Draft Mei Gan: Data collection, Project administration, Draft Xiangping Wang: Project administration, Investigation, Writing—review & editing, Zhonghua Su: Resources, Software, Visualization, Investigation.

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Availability of data and materials

All the data within this manuscript could be gotten from corresponding author at reasonable request.

Declarations

Ethics approval and consent to participate

The Institutional Ethics Committee exempted the study, which did not require approval because the 2021 GBD data is publicly available. The study followed guidelines for accurate and transparent health assessment reporting.

Competing interests

The authors declare no competing interests.

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