

# Dataset Development of the Spatio-temporal Dynamics in the Prevention and Treatment of Women Common Diseases in China (2007–2020)

Fan, Z. X.<sup>1,2</sup> Wang, P. H.<sup>1,4</sup> Wang, S. K.<sup>1,4,5</sup> Pei, C. Y.<sup>3</sup> Xu, C. D.<sup>1,4</sup> Li, Z. R.<sup>6</sup>  
Liu, Y. L.<sup>3</sup> Ma, J.<sup>7\*</sup> Wang, Z. B.<sup>1,4\*</sup>

1. Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China;
2. School of Health and Medicine, Dezhou University, Dezhou 253023, China;
3. School of Health Policy and Management, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing 100730, China;
4. University of Chinese Academy of Sciences, Beijing 100049, China;
5. College of Landscape Architecture, Beijing Forestry University, Beijing 100083, China;
6. Department of Disease Control and Prevention, Sichuan Provincial Center for Disease Control and Prevention, Chendu 610041, China;
7. Institute for Hospital Management of Tsinghua University, Shenzhen 518071, China

**Abstract:** This study analyzes temporal and spatial trends of women common disease screening in China using data from the China health statistics yearbook, China health and family planning statistics yearbook, and China health and wellness statistics yearbook. The analysis applies descriptive statistical methods, data structuring, Interrupted Time Series (ITS) analysis, global spatial autocorrelation analysis, and Getis-Ord  $G_i^*$  cold hotspot analysis. The dataset includes screening-related indicators from 31 provincial-level administrative regions between 2007 and 2020, covering the number of individuals scheduled for screening, the number of individuals actually screened, screening rate and the detection rate of gynecological diseases, including Trichomoniasis, cervical erosion, condyloma acuminatum, cervical cancer, and breast cancer. Additionally, it contains spatial data, ITS analyses results of screening rates, and year-on-year changes in screening rates at both the national and provincial levels. The dataset is archived in .xlsx and .shp data formats, and consists of 115 data files with data size of 169 MB (compressed into one file with 112 MB).

**Keywords:** women common diseases; screening rates; spatial and temporal trend analysis

**DOI:** <https://doi.org/10.3974/geodp.2025.02.05>

---

**Received:** 04-03-2025; **Accepted:** 20-05-2025; **Published:** 25-06-2025

**Foundation:** National Natural Science Foundation of China (42130713)

**\*Corresponding Author:** Ma, J., Institute for Hospital Management of Tsinghua University, [jingma@sz.tsinghua.edu.cn](mailto:jingma@sz.tsinghua.edu.cn);  
Wang, Z. B., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, [wangzb@igsnrr.ac.cn](mailto:wangzb@igsnrr.ac.cn)

**Data Citation:** [1] Fan, Z. X., Wang, P. H., Wang, S. K., *et al.* Dataset development of the spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020) [J]. *Journal of Global Change Data & Discovery*, 2025, 9(2): 175–188. <https://doi.org/10.3974/geodp.2025.02.05>.

[2] Fan, Z. X., Wang, P. H., Wang, S. K., *et al.* Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2025. <https://doi.org/10.3974/geodb.2025.02.08.V1>.

**Dataset Availability Statement:**

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: <https://doi.org/10.3974/geodb.2025.02.08.V1>.

## 1 Introduction

Women common diseases pose a significant threat to both their physical and mental health, particularly reproductive health<sup>[1]</sup>. With China's aging population and declining fertility rates, women's health issues are becoming increasingly prominent and demand urgent attention. The prevention, early diagnosis, and treatment of common and frequently occurring diseases in women are crucial for maintaining their health throughout their life cycle and also support the sustainable development of population health in China. Systematic screening of women common diseases facilitates early detection and timely intervention, which enables the effectiveness of clinical treatment, lowers mortality risks, and improves reproductive health. Additionally, it contributes to a higher quality of life and a more efficient allocation of healthcare resources<sup>[2–4]</sup>.

Since the mid-20th century, public health in China has gradually established standardized screening mechanisms for common women diseases, including sexually transmitted infections, uterine prolapse, urinary fistulae, menstrual disorders, and trichomoniasis<sup>[5,6]</sup>. In recent years, policies such as the Outline for women's development in China (2011–2020) (hereafter referred to as the Outline)<sup>[7]</sup> and the Law on the protection of women's rights and interests of China<sup>[8]</sup>, have further reinforced support of women's health screening, making them a national priority.

This study aims to systematically analyze data related to the screening of common women diseases in China from 2007 and 2020, examine spatio-temporal trends, provide a scientific basis for future disease prevention and treatment strategies, promote early detection and intervention, and comprehensively safeguard women's health.

## 2 Metadata of the Dataset

The metadata of the Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020)<sup>[9]</sup> is summarized in Table 1. It includes details such as the full and short names of the dataset, authors, dataset year, data format, data size, data files, etc.

## 3 Methods

### 3.1 Data Sources

The data used in this study were obtained from China health statistics yearbook, China health and family planning statistics yearbook, and China health and wellness statistics published by the China's National Health Authority<sup>[11]</sup>. The dataset includes nationwide health statistics as well as provincial-level data on health development and population health levels in 31 provinces, autonomous regions, and municipalities directly under the central government. The core data were extracted from the investigation and treatment of women's diseases statistical table systematically included in the yearbooks. These data include the year, region (province), the number of individuals scheduled for screening, the number of

**Table 1** Metadata summary of Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020)

Items	Description
Dataset full name	Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020)
Dataset short name	WomenCommonDiseases2007–2020
Authors	<p>Fan, Z. X., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, School of Health Policy and Management, Chinese Academy of Medical Sciences &amp; Peking Union Medical College, fanzixuan_pumc@163.com</p> <p>Wang, P. H., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, University of Chinese Academy of Sciences, wph1996@126.com</p> <p>Wang, S. K., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, College of Landscape Architecture, Beijing Forestry University, wskcollins@bjfu.edu.cn</p> <p>Pei, C. Y., School of Health Policy and Management, Chinese Academy of Medical Sciences &amp; Peking Union Medical College, chenyang3061@163.com</p> <p>Xu, C. D., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, University of Chinese Academy of Sciences, xucd@reis.ac.cn</p> <p>Li, Z. R. Department of Disease Control and Prevention, Sichuan Provincial Center for Disease Control and Prevention, zhli2045@alumni.sydney.edu.au</p> <p>Liu, Y. L., School of Health Policy and Management, Chinese Academy of Medical Sciences &amp; Peking Union Medical College, liuyuanli_pumc@163.com</p> <p>Ma, J., Institute for Hospital Management of Tsinghua University, jingma@sz.tsinghua.edu.cn</p> <p>Wang, Z. B., Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, University of Chinese Academy of Sciences, wangzb@igsnr.ac.cn</p>
Geographical region	The 31 provincial-level administrative regions in China (data for Hong Kong, Macao, and Taiwan are temporarily unavailable)
Year	2007–2020
Data format	.xlsx, .shp
Data size	169 MB (compressed to 112 MB)
Data files	(1) Differences in the inspection rate of women common diseases in China and 31 provinces from 2007–2020; (2) yearly growth rate of inspection rate on women common disease from 2009–2020; (3) results of ITS analysis of the inspection rate of women common diseases from 2007–2020; (4) original and amended data on the number of persons to be inspected, inspected and the inspection rate during 2008–2010; (5) the inspection rate of women common diseases and the prevalence rate of 5 types of women common diseases in each province from 2007–2020
Foundation	National Natural Science Foundation of China (42130713)
Data computing environment	Excel, Stata, ArcGIS
Data publisher	Global Change Research Data Publishing & Repository, <a href="http://www.geodoi.ac.cn">http://www.geodoi.ac.cn</a>
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	(1) <i>Data</i> are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use <i>Data</i> subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute <i>Data</i> subject to written permission from the GCdataPR Editorial Office and the issuance of a <i>Data</i> redistribution license; and (4) If <i>Data</i> are used to compile new datasets, the “ten percent principal” should be followed such that <i>Data</i> records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset <sup>[10]</sup>
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS, GEOSS, PubScholar, CKRSC

individuals actually screened, screening rates and several indicators related to common women diseases. These diseases include trichomoniasis, urogenital fistula, uterine prolapse (grade II or higher), HIV, gonorrhoea, cervical erosion, condylomata acuminata, and ovarian,

cervical, and breast cancers.

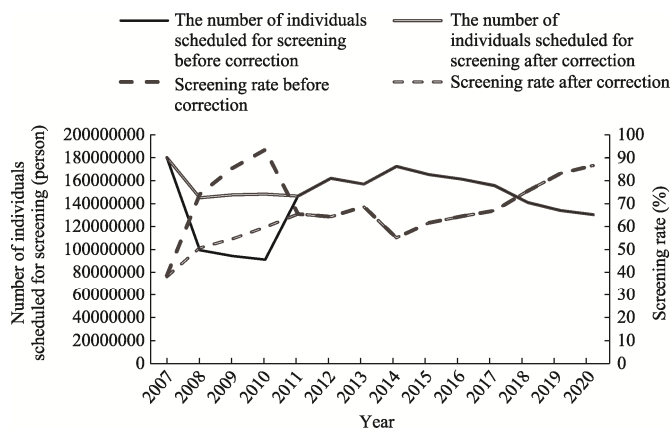
All survey data were collected through a comprehensive reporting system managed by district- and county-level maternal and child healthcare institutions or other relevant medical institutions<sup>[12]</sup>. This study focused on China's mainland, excluding Hong Kong, Macau, Taiwan, and the South China Sea Islands.

### 3.2 Data Processing

Analysis of the trend in the number of individuals actually screened and screening rates for women common diseases in China from 2007 to 2020 revealed that the number of eligible women from 2008 to 2010 was significantly lower than in other years (Table 2, Figure 1). According to the National Survey System of Maternal and Child Health Services, the number of eligible women for screening is calculated by dividing the total number of women aged 20–64 years in a given region by the examination cycle. This cycle requires all women in this age range to undergo a comprehensive examination every 3 years<sup>[13]</sup>. Thus, the number of women eligible for screening each year primarily depends on the actual population size of the region, which typically does not fluctuate significantly over short periods. Using data from the population statistics table by age and sex in the China Statistical Yearbook<sup>[14]</sup>, corrections were made to the number of eligible women for the years 2008–2010. Before and after these adjustments, the revised trend of screening rate of women common disease in China from 2007 to 2020 is presented in Table 2 and Figure 1.

**Table 2** National statistics on the number of individuals scheduled for screening, the number of individuals actually screened, screening rates, before and after correction (2008–2010)

Year	Number of women scheduled for screening, China health statistics yearbook (person)	Number of women scheduled for screening, China statistical yearbook (person)	Number of women actually screened, China health statistics yearbook (person)	Screening rate before correction (%)	Screening rate after correction (%)
2008	99,282,938	145,073,656.5	73,557,216	74.1	50.7
2009	94,331,132	147,678,885.1	80,557,572	85.4	54.5
2010	91,077,516	148,159,050.4	84,946,929	93.5	59.6



**Figure 1** Trends in the number of individuals scheduled for screening and screening rates before and after correction

### 3.3 Data Analysis

#### 3.3.1 Descriptive Statistical Analysis

Descriptive statistics were used to analyze trends in the number of individuals scheduled for screening, the number of individuals actually screened, screening rate, and the detection rate of common gynecological diseases at the national level from 2007 to 2020.

The formula for calculating the screening rate is as follows:

$$C_p = \frac{N_p}{T_p / 3} \times 100\% \quad (1)$$

where,  $C_p$  represents the screening rate (%) in each province,  $N_p$  denotes the annual number of individuals actually screened per province (person),  $T_p$  indicates the registered female population aged 20–64 years in each province’s statistical year (person).

The annual growth rate of the screening rate was also calculated using the following equation:

$$G_C = \frac{C_{p,y_2} - C_{p,y_1}}{C_{p,y_1}} \times 100\% \quad (2)$$

where,  $G_C$  represents the annual growth rate of the screening rate (%) in each province,  $C_{p,y_1}$  denotes the screening rate last year (%),  $C_{p,y_2}$  indicates the screening rate this year (%).

#### 3.3.2 Data Structuring Processing

To facilitate spatial analysis, screening rates from the 31 provinces were georeferenced using ArcGIS 10.8. The data were matched with corresponding geographic coordinates and converted into vector layers for spatial visualization. These spatial layers provided the foundation for further spatial analysis of screening rates across the country.

#### 3.3.3 Interrupted Time-series (ITS) Analysis

ITS analysis was performed using Stata software to assess the impact of key policy changes on screening rates, including the liberalization of family planning policies<sup>[15]</sup>, institutional reforms in the health sector in 2014<sup>[16]</sup>, and the launch of the “Healthy China Strategy” as a basic national policy in 2017.

A segmented regression model was applied using the following equation:

$$Y_t = \beta_0 + \beta_1 \text{time} + \beta_2 \text{intervention} + \beta_3 \text{post} + \varepsilon_t \quad (3)$$

where,  $Y_t$  represents the observed outcome at “time”,  $time$  is a time variable from the beginning to the end of the study,  $intervention$  is a dummy variable indicating whether the policy was implemented,  $post$  represents the time elapsed since the policy intervention,  $\beta_0$  represents the baseline screening rate at the beginning of the study,  $\beta_1$  represents the pre-intervention slope, reflecting the difference between the observed outcome at the time of implementation and the expected outcome had the policy not been introduced,  $\beta_2$  represents the immediate effect of the policy intervention,  $\beta_3$  represents the change in trend following the policy intervention, capturing its ongoing impact on screening rates over time,  $\varepsilon_t$  is an error term that represents random factors not explained by the model, including omitted variables, measurement error, and unpredictable random perturbations.

### 3.3.4 Global Spatial Autocorrelation Analysis

This study employed global spatial autocorrelation analysis to assess the spatial distribution of women's screening rates for common diseases across 31 provinces in China. *Moran's I* index was calculated to determine whether the distribution was clustered, dispersed, or random. The formula used is as follows:

$$Moran's I = \frac{n}{S_0} \times \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2} \quad (4)$$

$$S_0 = \sum_{i=1}^n \sum_{j=1}^n w_{ij}$$

$$Z = \frac{I - E[I]}{\sqrt{V[I]}}$$

where,  $n$  is the total number of elements,  $x_i$  and  $x_j$  represent the attribute values of the  $i_{th}$  and  $j_{th}$  spatial units, respectively,  $\bar{x}$  represents the mean of all space cell attribute values,  $w_{ij}$  denotes the spatial weight between elements  $i$  and  $j$ ,  $S_0$  is the aggregation of all spatial weights,  $Z$  is the significance of spatial autocorrelation,  $E[I]$  represents the expected value of *Moran's I*.  $V[I]$  is the variance of *Moran's I*. *Moran's I* range from  $[-1,1]$ , and in the event that the results are significant ( $p < 0.05$ ,  $Z > 1.96$  or  $< -1.96$ ), *Moran's I*  $> 0$  indicates a clustered pattern, *Moran's I*  $< 0$  indicates a dispersed distribution, *Moran's I*  $= 0$  indicates a random distribution.

### 3.3.5 Getis-Ord $G_i^*$ Analysis

Getis-Ord  $G_i^*$  analysis was conducted to explore the spatial heterogeneity in women's screening rates for common diseases across 31 provinces, identifying hotspots (areas with high screening rates) and cold spots (areas with low screening rates). The formula used is as follows:

$$G_i^* = \frac{\sum_{j=1}^n w_{ij} x_j - \bar{x} \sum_{j=1}^n w_{ij}}{s \sqrt{\frac{n \sum_{j=1}^n w_{ij}^2 - \left( \sum_{j=1}^n w_{ij} \right)^2}{n-1}}} \quad (5)$$

$$Z = \frac{G_i^* - E(G_i^*)}{\sqrt{Var(G_i^*)}} \quad (6)$$

where,  $G_i^*$  represents the agglomeration index of spatial unit  $i$ ,  $x_j$  is the value of the attribute of space cell  $j$ .  $w_{ij}$  is the spatial weight between elements  $i$  and  $j$ ,  $n$  is the total number of elements,  $Z$  is the degree of significance of the agglomeration index.  $S$  is the

standard deviation of the attributes corresponding to  $n$  elements.  $E(Gi^*)$  and  $Var(Gi^*)$  denote the expected value and variance of  $Gi^*$ , respectively. A significant positive  $Z$  indicates a high-value agglomeration area (hotspot), while a significant negative  $Z$  suggests a low-value cluster (cold spot).

Spatial visualization, map drawing, Moran’s  $I$  index calculation, and Getis-Ord  $Gi^*$  analysis were performed using ArcGIS 10.8 software, a two-sided significance level of  $\alpha=0.05$  was applied.

## 4 Data Results

### 4.1 Dataset Composition

The dataset of Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020) is mainly composed of: (1) data on changes in the difference in screening rates for women common diseases at the national and provincial levels from 2007 to 2020; (2) data on the year-on-year growth rate of screening rates for women common diseases at the national and provincial levels from 2009 to 2020; (3) the results of the ITS analysis of the screening rates for women common diseases from 2007 to 2020; (4) the number of individuals scheduled for screening, the number of individuals actually screened, screening rates at the national level in the years 2008–2010, both before and after the adjustment; (5) data on the screening rate for women common diseases and the prevalence rate of 5 types of women common diseases by province for each year from 2007 to 2020, which were used as raw data in the calculation. The data contents and data descriptions represented by each field in the InspectionPrevalenceWomenCommonDisease\_2007–2020.shp files are shown in Table 3.

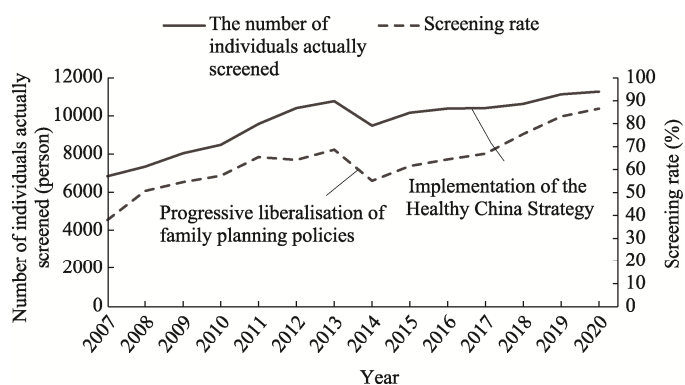
**Table 3** The attribute field of the vector data

Field content	Field names	Description
ID	FID	Number of each province
Region	E_NAME/Region	Nationwide, Beijing, Tianjin, Hebei, Shanxi, ...
Number of persons to be investigated (person)	Number_of_	Number of individuals scheduled for screening for common women diseases
Number of persons investigated (person)	Number_of1	Number of individuals actually screened for common women diseases
Inspection rate (%)	Inspection	Percentage of actual inspections against the number of persons to be inspected
Baseline inspection rate (%)	Detection_	Baseline level of completion rate of inspections
Prevalence of trichomoniasis (%)	Prevalence	Percentage of people diagnosed with trichomoniasis during examinations
Prevalence of celiac disease (%)	Prevalence_1	Percentage of people diagnosed with coeliac disease in screening tests
Prevalence of condyloma acuminatum (0.1%)	Prevalence_2	Percentage of people diagnosed with condyloma acuminatum in screening tests
Prevalence of cervical cancer (0.1%)	Prevalence_3	Percentage of people diagnosed with cervical cancer in screening tests
Prevalence of breast cancer (0.1%)	Prevalence_4	Percentage of people diagnosed with breast cancer in screening tests

## 4.2 National Trends in Screening for Women Common Diseases

### 4.2.1 Overall Upward Trend in Screening Rates for Women Common Diseases in China (2007–2020)

Between 2007 and 2020, the number of individuals actually screened for women common diseases increased significantly, reaching 112.7 million by 2020, approximately 25% of the female population aged 20–64 years. During the early study years, the screening rate increased steadily, peaking at 68.67% in 2013. However, a sharp decline occurred in 2014, followed by a slow recovery to 2013 levels by 2017. From 2017 onward, the screening rate rose rapidly, exceeding 80% by 2019, meeting the national target for inspection coverage. Although growth slowed slightly between 2019 and 2020 due to the COVID-19 epidemic, the overall national screening rate continued to rise, reaching 86.58% by the end of 2020 (Figure 2).



**Figure 2** Trends in the number of individuals scheduled for screening and the screening rate for women common diseases (2007–2020)

### 4.2.2 Impact of Family Planning Policy Adjustments on Screening for Women Common Diseases

A literature search and policy analysis revealed that screening for women common diseases in China has historically been closely linked to family planning programs, with implementations executed by family planning personnel<sup>[17,18]</sup>. Given the relaxation of the two-child policy in 2014, it was hypothesized that this policy shift influenced screening practices for women common diseases. To assess the policy's impact on the prevention and treatment of common diseases in women, we conducted an ITS analysis of the screening rate for women common diseases from 2007 to 2020, using 2014 as the breakpoint. The analysis showed that before the policy, the screening rate was 43.1% in 2014 and increased annually by 4.64% ( $P < 0.001$ ). However, in the first year following the policy adjustment, the screening rate dropped significantly by 21% ( $P < 0.001$ ). While the annual screening rate increased by 0.67% after the policy, this change was not statistically significant ( $P = 0.383$ ) (Figure 3 and Table 4).

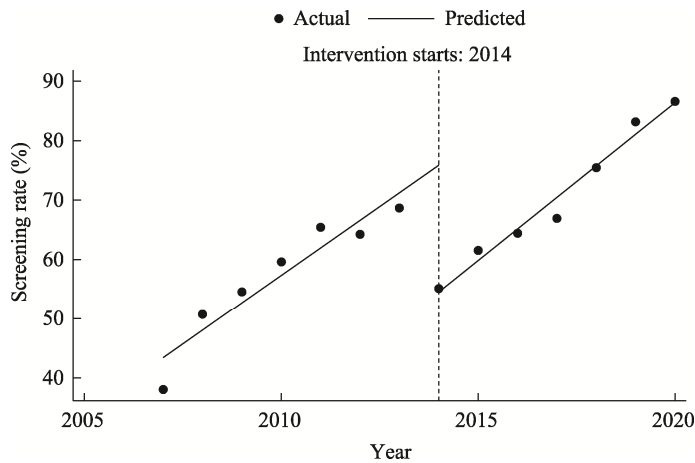
These findings suggest that the health system reforms at the end of 2013 and the adjustment of family planning policies in 2014 impacted screening rates, leading to a temporary period of neglect in the prevention of women common diseases.

### 4.2.3 National Trends in Screening Rates of Women Common Diseases

According to national statistics (2014–2020), the overall detection rate of gynecological

diseases declined annually, while the prevalence of major conditions, such as cervical and breast cancers, increased significantly after 2016 (Table 5). The detection rates for trichomoniasis, cervical erosion, and condyloma acuminatum showed a downward trend.

The relaxation of the family planning policy in 2014 appears to have contributed to gaps in the prevention and treatment of women common diseases. Additionally, compared to other studies<sup>[6,18]</sup>, the detection rate and prevalence rates reported in national statistics were lower, raising concerns that provincial-level reports might underestimate the actual disease burden.



**Figure 3** ITS analysis results of screening rates for women common diseases (2007–2020)

**Table 4** ITS analysis results of screening rates for women common diseases, 2007–2020 (with 2014 as breakpoint)

Independent variable	Coefficient	Standard deviation	<i>t</i>	<i>p</i>	95% CI
Constant term $\beta_0$	43.10	2.72	15.85	0.000	[37.04, 49.15]
Existing trend $\beta_1$	4.64	0.71	6.57	0.000	[3.06, 6.21]
Level change $\beta_2$	-21.00	3.05	-6.88	0.000	[-27.80, -14.20]
Trend change $\beta_3$	0.67	0.74	0.91	0.383	[-0.97, 2.31]

Note: CI = Confidence Interval.

**Table 5** National screening outcomes of women common diseases (2014–2020)

Year	Detection rate of gynaecological diseases (%)	Prevalence of trichomoniasis (%)	Prevalence of celiac disease (%)	Prevalence of condyloma acuminatum (0.1%)	Prevalence of cervical cancer (0.1%)	Prevalence of breast cancer (0.1%)
2014	27.6	13.4	10.7	34.1	17.6	14.3
2015	26.3	12.9	10.0	28.5	15.8	13.2
2016	25.6	12.6	9.5	35.6	46.1	46.8
2017	24.2	12.3	7.5	28.1	45.6	51.2
2018	22.2	11.6	5.8	27.0	45.2	44.3
2019	20.6	11.0	4.8	19.2	43.3	43.4
2020	19.5	10.6	4.1	17.8	38.5	41.9

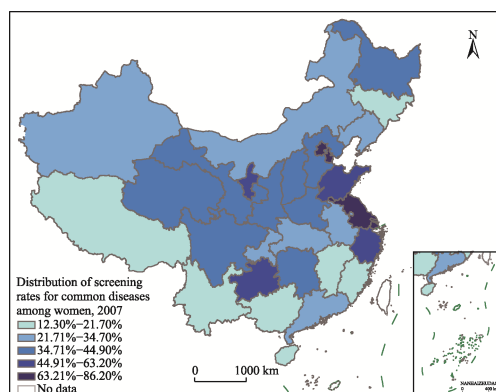
Source of data: China health and family planning statistics yearbook and China health and wellness statistics yearbook, 2015–2021, “Women common diseases checklist”.

### 4.3 Provincial-level Screening for Women Common Diseases

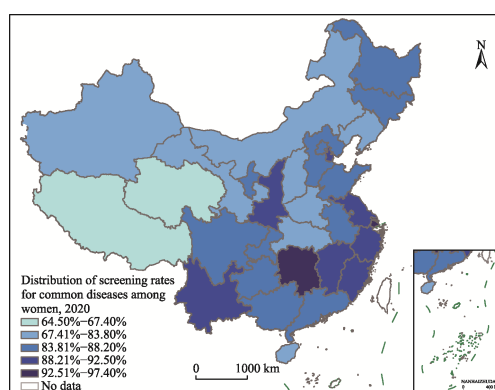
#### 4.3.1 Screening Rates by Province (2007, 2020)

In 2007, provinces with the highest screening rates were concentrated in the eastern coastal region, with Shanghai (86.2%), Tianjin (80.4%), Beijing (77.3%), Jiangsu (76.1%), and Shandong (63.2%). These regions are characterized by higher levels of economic development (Figure 4). In contrast, provinces with the lowest screening rates were located in the southwestern region, including Guangxi (14%), Fujian (13.9%) and Yunnan (12.3%). 18 provinces had screening rates below the national average of 38.5%, and only Shanghai and Tianjin exceeded 80%.

Compared with 2007, the screening rate for women common diseases in 2020 remained higher in the eastern coastal region than in the central and western regions. However, provinces with the highest screening rates gradually shifted from the eastern to the southeastern region, reflecting a change in spatial distribution over time. 17 provinces had screening rates below the national average of 86.6%, with only Qinghai and Xizang failing to meet the 80% target set in the Outline. The spatial distribution of the screening rates followed the Hu Line, with higher rates in the southeast and lower rates in the northwest. A global spatial autocorrelation analysis revealed a *Moran's I* value of 0.135,776 ( $P < 0.05$ ), indicating significant spatial clustering in screening rates for women common diseases across China (Figure 5).



**Figure 4** Distribution map of screening rates for women common diseases (2007)

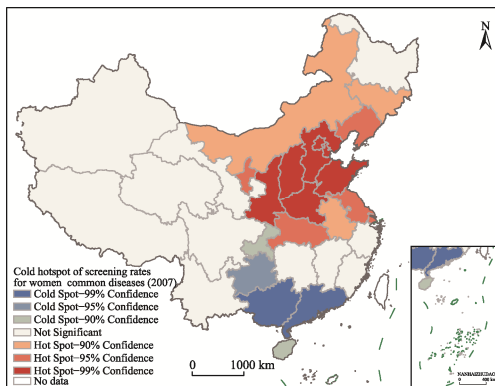


**Figure 5** Distribution map of screening rates for women common diseases (2020)

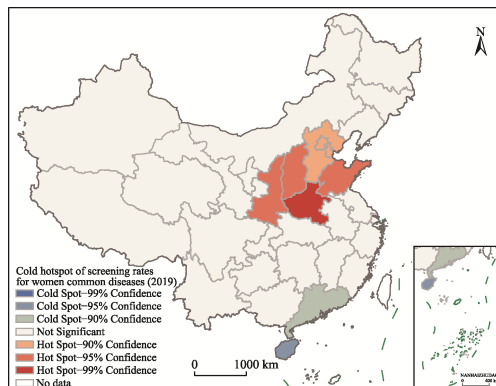
The Getis-Ord  $G_i^*$  analyses of screening rates in 2007, 2019, and 2020 revealed distinct regional patterns: in 2007, a north-south disparity was evident, with hotspot areas concentrated in the northern region and cold-spot areas in the south (Figure 6). By 2019 and 2020, the extent of cold hotspot areas had significantly decreased. The northern region remained a hotspot, while cold spot areas in the south were mainly concentrated in Guangdong and Hainan (Figures 7, 8). This shift suggests a narrowing gap between the northern and southern provinces, with a general reduction in disparities in screening rates over time.

Figure 9 illustrates the evolution of screening rates from 2007 to 2020. In 2007, most provinces had low screening rates, with only a few economically developed regions achieving higher rates. Between 2008 and 2013, some provinces prioritized screening for

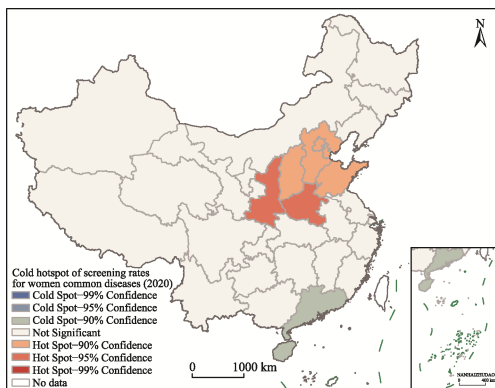
women common diseases, leading to widening disparities between regions. Following major policy changes in 2014, screening rates in many provinces declined temporarily. From 2017 onward, national efforts to strengthen screening programs led to steady improvements, particularly in provinces with previously low inspection rates. By 2019, most provinces met the national screening targets, and despite the COVID-19 pandemic in 2020, screening rates continued to rise steadily.



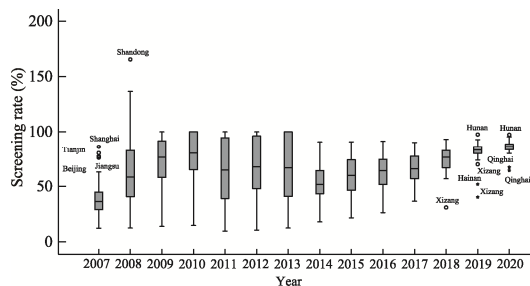
**Figure 6** Cold hotspot map of screening rates for women common diseases (2007)



**Figure 7** Cold hotspot map of screening rates for women common diseases (2019)



**Figure 8** Cold hotspot map of screening rates for women common diseases (2020)



**Figure 9** Trends in screening rates for women common diseases by province (2007–2020)

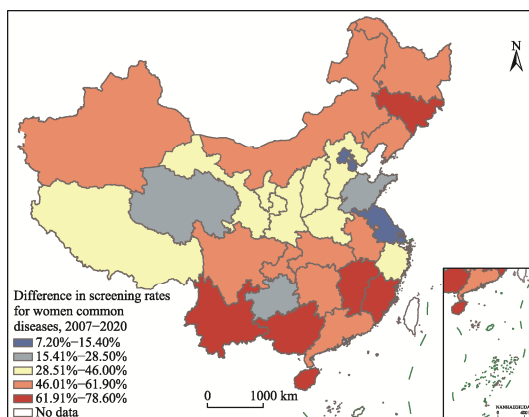
### 4.3.2 Spatial and Temporal Trends in Screening Rates for Women Common Diseases (2007–2020)

Between 2007 and 2020, screening rates for women common diseases improved across most provinces in China, though the rate of increase varied significantly between regions. Figure 10 illustrates these regional disparities: The southern provinces, particularly Fujian, exhibited notable increases in screening rates. Central provinces experienced relatively smaller increases over time. Beijing, despite recording a modest increase of 7.2%, had a high baseline screening rate in 2007, suggesting that provinces with smaller increases generally started with higher rates.

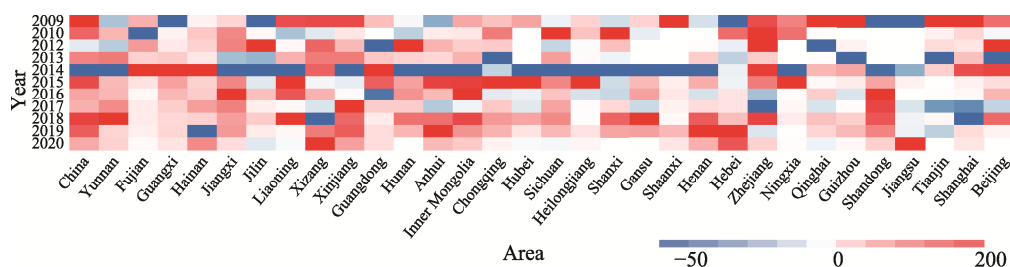
Overall, the national screening rate increased by 48.1% between 2007 and 2020, demonstrating substantial progress in expanding screening coverage. This trend highlights

regional differences in policy implementation and the effectiveness of localized efforts to promote women's health in each region.

Based on the annual growth rate of screening rates (excluding data anomalies in 2008 and 2011), provinces were ranked according to their 2020 screening rates, and a hotspot map was generated to visualize regional growth trends from 2009 to 2020 (Figure 11).



**Figure 10** Map of provincial-level growth trends of the screening rates for women common disease in China (2007–2020)



**Figure 11** Hotspot of annual growth in screening rates for women common diseases in China (2009–2020)

Observations show that provinces with initially higher screening rates saw significant growth after 2015, with particularly strong increases after 2018. A notable decline in screening rates was observed across all provinces in 2014, coinciding with policy adjustments and healthcare sector reforms. Following 2014, all provinces resumed an upward trajectory, although the growth rate slowed in some provinces. In 2020, the national average screening rate increased by 3.5%, reaching 86.6%. However, 8 provinces experienced negative growth, compared to only 4 provinces in 2019. In 2019, the national screening rate grew by 7.6%, suggesting a slower expansion in 2020. This slowdown was likely influenced by the COVID-19 pandemic, which may have disrupted screening programs and healthcare access.

## 5 Discussion and Conclusion

Screening for women common diseases plays a crucial role in women's health throughout their life cycle and has broader implications for national fertility rates and public health. This study systematically analyzed the implementation of women common disease screening in China, revealing regional differences and temporal trends, employing a mixed research

method integrating epidemiology and geography.

This study employs a mixed-methods approach, integrating ITS, global spatial autocorrelation, and Getis-Ord  $G_i^*$  hotspot analysis to reveal the dynamic changes in screening rates across both temporal and spatial dimensions. The ITS method, utilizing segmented regression modeling, effectively identifies both the immediate effects and long-term trend changes following policy interventions. Breakpoint selection was grounded in explicit policy contexts, enhancing the model's interpretability. In the global spatial autocorrelation analysis, *Moran's I* index demonstrated significant spatial clustering of screening rates. The reliability of these findings was confirmed through the two-tailed hypothesis testing ( $\alpha=0.05$ ) and the sensitivity analyses using multiple spatial weight matrices.

The key findings of this study are as follows: (1) Overall screening rates have increased, but the reported rates may be higher than actual levels due to potential bias in data collection and reporting. This underscores the need for enhancing data monitoring and statistical accuracy. (2) Family planning policy adjustments, disrupted screening efforts in certain regions, leading to temporary declines in screening intensity. (3) The detection and prevalence rates reported in national statistics may underestimate the actual burden of disease, suggesting that some provinces may be underreporting data. This highlights the importance of improving screening quality and data accuracy. (4) Significant regional disparities in screening coverage persist, with spatial clustering patterns evident. However, the gap between provinces has gradually narrowed, reflecting the success of national and local efforts to expand screening coverage.

Despite substantial progress in screening coverage between 2007 and 2020, this study identifies inequities in screening access. Regional disparities remain, particularly in central and western provinces, where screening continues to lag. Increased screening coverage is insufficient, ensuring high-quality screening and accurate diagnostic results is essential. A focus solely on increasing screening rates may conceal deficiencies in screening quality, leading to delayed diagnoses and unnecessary healthcare costs.

Additionally, policy shifts, had some impact on screening continuity. A decline in screening rates during this period suggests that policy changes should be coordinated with simultaneous adjustments in the health sector to mitigate disruptions to public health programs. Although screening efforts recovered post-policy adjustments, quality control measures require further strengthening.

To enhance strategies for the prevention, control, and management of women common diseases, future research and policy efforts should focus on ensuring both high screening coverage and quality assurance through robust supervision and standardized protocols, improving data reliability by refining monitoring mechanisms and reducing underreporting; Integrating screening programs with broader public health initiatives, ensuring that policy changes do not disrupt essential healthcare services. By addressing these challenges, China can further strengthen women's health protection, contribute to long-term public health improvements, and reduce the burden of preventable diseases.

### ***Author Contributions***

Fan, Z. X. contributed to the data collection and paper writing; Wang, P. H. contributed to the data visualization; Wang, S. K. contributed to the paper writing and formatting; Liu, Y. L. proposed the research idea. All authors proposed the research idea, reviewed and revised the content, and guided the statistical analyses.

### ***Conflicts of Interest***

The authors declare no conflicts of interest.

## References

- [1] Li, T., Liu, Z. H. Current status and progress of common female reproductive tract infections at home and abroad [J]. *Modern Obstetrics and Gynaecology*, 2023, 32(10): 782–784.
- [2] Sheng, B. Z. Analysis of the application value of preventive health care measures for common gynaecological diseases in elderly women [J]. *Psychology Monthly*, 2020, 15(10): 158.
- [3] Li, S. E. Treatment plan and preventive health care method of common gynaecological diseases in middle-aged women [J]. *Wisdom Health*, 2020, 6(7): 77–78, 92.
- [4] Wang, H. L. Research on treatment and preventive health care measures for common gynaecological diseases in middle-aged women [J]. *Capital Food and Medicine*, 2020, 27(1): 34–35.
- [5] Fan, Z. X., Yan, M. Y., Pei, C. Y., *et al.* Current status and trend analysis of screening studies on common diseases among China's women [J]. *Journal of Chinese Academy of Medical Sciences*, 2024, 46(1): 33–38.
- [6] Chen, J. X., Di, J. L. Analysis of the current situation of screening for common diseases among women in China [J]. *Chinese Journal of Maternal and Child Health*, 2019, 10(4): 74–78.
- [7] National Bureau of Statistics. Final statistical monitoring report on the Programme for the Development of Chinese Women (2011–2020) [EB/OL]. [2024-08-24]. [https://www.gov.cn/xinwen/2021-12/21/content\\_5663667.htm](https://www.gov.cn/xinwen/2021-12/21/content_5663667.htm).
- [8] Xinhua News Agency. Law of P. R. China on the Protection of Rights and Interests of Women (Revised 2022) [OL]. [2024-08-24]. [https://www.gov.cn/xinwen/2021-12/21/content\\_5663667.htm](https://www.gov.cn/xinwen/2021-12/21/content_5663667.htm).
- [9] Fan, Z. X., Wang, P. H., Wang, S. K., *et al.* Analyzing dataset of spatio-temporal dynamics in the prevention and treatment of women common diseases in China (2007–2020) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2025. <https://doi.org/10.3974/geodb.2025.02.08.V1>.
- [10] GCdataPR Editorial Office. GCdataPR data sharing policy [OL]. <https://doi.org/10.3974/dp.policy.2014.05> (Updated 2017).
- [11] CNKI-CSYD. China health statistics yearbook [EB/OL]. [2025-06-18]. <https://cnki.nbsti.net/CSYDMirror/trade/yearbook/Single/N2022010155?z=Z020>.
- [12] National Bureau of Statistics. National statistical survey system of maternal and child health [EB/OL]. (2021-08-21) [2024-08-24]. [https://www.stats.gov.cn/fw/bmdcxmsp/bmzd/202302/t20230215\\_1907110.html](https://www.stats.gov.cn/fw/bmdcxmsp/bmzd/202302/t20230215_1907110.html).
- [13] Statistical Information Centre of the National Health Commission. Notice of the Ministry of Health on the implementation of the National Health Surveillance Survey System and four other systems [EB/OL]. (2010-10-21) [2024-08-24]. <http://www.nhc.gov.cn/mohwsbwstjxxzx/s7965/201010/49390.shtml>.
- [14] National Bureau of Statistics. China statistical yearbook [OL]. [2024-08-24]. <https://www.stats.gov.cn/sj/ndsjs/>.
- [15] Wen, Y. Family planning and Healthy China Strategy [J]. *Population and Family Planning*, 2018(4): 30–32.
- [16] Central Government Portal. Programme for Institutional Reform and Functional Transformation of the State Council [OL]. (2013-03-15) [2024-08-24]. [https://www.gov.cn/2013lh/content\\_2354443.htm](https://www.gov.cn/2013lh/content_2354443.htm).
- [17] Chen, J. X. Analysis of opportunities and challenges of screening for women common diseases in China [D]. Beijing: Chinese Centre for Disease Control and Prevention, 2019.
- [18] Zheng, R. M., Li, L. J., Wang, L. H., *et al.* Survey on the current status of screening management and related policies for women common diseases in China [J]. *Chinese Journal of Maternal and Child Health*, 2012, 3(3): 145–148.