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ORIGINAL RESEARCH

The Ecology of Medical Care in Shanghai: Temporal Trends and International Comparisons

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Background: To better understand the temporal evolution of healthcare utilization in Shanghai, this study examines changes in Shanghai's ecology of medical care from 2018 to 2023 and compares them with other countries to contextualize global trends.

Methods: Using data from the 7th Shanghai Health Service Survey (2023), this study estimated monthly health-related symptoms and healthcare-seeking behaviors per 1,000 residents, examined subgroup differences via logistic regression, and contextualized findings through a scoping review of international studies applying the ecology of medical care framework.

Results: In 2023, per 1,000 Shanghai residents per month, 503 reported illness, 495 sought treatments (including healthcare visits or self-medication), 228 visited healthcare facilities, 144 visited primary care, 98 self-medicated, 31 used TCM, 6 were hospitalized, and 3 underwent surgery. Compared to 2018, self-reported illness (+59), treatment seeking (+62), and self-medication (+6) increased, while outpatient visits, primary care, TCM use, and hospitalizations declined. Internationally, Shanghai shows relatively low illness reporting, primary care use, TCM use, and hospitalization rates, but relatively high treatment-seeking and self-medication.

Conclusion: These findings suggest a shift in Shanghai's healthcare utilization from formal services toward individual-led actions, with increased treatment-seeking, higher self-medication, and decreased outpatient, primary care, TCM, and hospitalization use. Internationally, Shanghai shows a distinctive pattern of high treatment-seeking and self-care despite low formal service use, indicating greater reliance on informal health strategies.

Keywords: The ecology of medical care, Patterns of healthcare utilization, Logistic regression, Shanghai, China

Introduction

In 1961, White proposed the seminal work known as the theory of "the ecology of medical care", which organizes the intricate connections between population health and healthcare.[1] The ecology of medical care theory offers a comprehensive framework for visualizing patterns of health care utilization.[2] It typically quantifies the number of residents per 1,000 who use various types of medical services within a one-month period, thereby facilitating a clearer understanding of how people engage with the health care system.[3–5] Over the past several decades, the theory has been widely adopted across various countries to characterize the local ecology of medical care and has undergone continuous refinement and expansion.[6–24]

In Japan, the ecology of medical care framework has been extensively applied to explore variations in healthcare utilization across different regions and population groups, as well as changes over time. For instance, studies have mapped the health ecology of remote islands near Okinawa, including investigations into healthcare-seeking behaviors among isolated island residents.[6,7] Other research has examined utilization patterns across age groups, such as older adults and children, highlighting differences in illness reporting and healthcare-seeking behaviors.[8,9] A comparative study analyzing trends from 2003 to 2013 reported declines in self-reported illness, physician visits, and over-the-counter

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medication use, alongside a rise in the use of complementary and alternative medicine.[10] During the COVID-19 pandemic, further reductions in outpatient visits and non-prescription drug use were observed, particularly among the elderly, compared with the pre-pandemic period.[2]

In the United States, the ecology of medical care framework has been used to examine healthcare utilization trends over time, across racial and ethnic groups, and by age. One study assessed changes following the implementation of the Patient Protection and Affordable Care Act (ACA) and found that, two years post-implementation, overall patterns of healthcare utilization remained largely unchanged, with persistently low use of primary care services.[11] Another study, which compared data from 1996 and 2012, reported stable rates of outpatient visits, primary care consultations, prescription drug use, and hospital admissions, but noted increased use of optometry and complementary or alternative medicine services.[12] Racial disparities in healthcare utilization have also been explored. American Indians and Alaska Natives, despite reporting poorer self-rated health, exhibited similar levels of primary care and inpatient service use compared to other racial groups.[13] Additionally, a study comparing White, Black, and Hispanic populations found that Black and Hispanic individuals were less likely to use outpatient and emergency services, but more likely to use inpatient and home-based care.[14]

Beyond the United States and Japan, several other countries have applied the ecology of medical care framework to examine local healthcare utilization patterns. In Korea, a study found that a greater proportion of patients sought outpatient care at tertiary hospitals, and that a notable discrepancy existed between the prevalence of self-reported illness and actual healthcare service use compared to other countries.[15] In Norway, higher rates of self-reported illness, primary care use, specialist outpatient visits, and hospital admissions were observed. Notably, the study suggested that extensive primary care utilization did not necessarily reduce the demand for specialist or inpatient services.[16] An Austrian study comparing local health ecology with that of other developed countries revealed higher rates of specialist consultations and hospital admissions in Austria.[3] In Canada, a study assessed healthcare utilization using both demographic survey and administrative data, highlighting regional variations: Quebec reported more specialist visits, British Columbia had a higher number of family physician visits, and hospital admission rates were elevated across all study areas.[17]

In addition, the ecology of medical care framework has been widely applied to analyze healthcare utilization patterns among specific populations, including older adults, women, children, pilots, and individuals with chronic conditions such as asthma. A study on children indicated that they exhibited healthcare utilization patterns similar to adults, with a higher reliance on community-based outpatient services. Key determinants of children's healthcare access included age, ethnicity, income, and health insurance coverage.[18] In Israel, a study on pilots found that while their self-reported illness cases was comparable to that of the general population, their actual utilization of medical care was significantly lower.[19] A Japanese study examining women's perinatal care behaviors revealed that low-risk pregnant women often bypassed primary care facilities and directly sought care from secondary or tertiary institutions, a pattern associated with poorer perinatal outcomes.[20] A cross-sectional study in Japan focusing on older adults demonstrated a higher utilization of inpatient and home healthcare services among this demographic.[4] Similarly, a case-control study from the United States employing the medical ecology framework found that individuals with asthma were more likely to use outpatient services compared to those without asthma, highlighting how chronic conditions influence healthcare-seeking behavior and utilization patterns.[21]

Since 1961, the ecology of medical care framework has evolved in response to emerging medical technologies, pharmaceutical advancements, changes in healthcare organization, rising healthcare expenditures, and the increasing availability of health data.[5] In 1973, White revised the original model to emphasize the levels of care, include primary, secondary, and tertiary care.[22] In 2001, Green et al further modified the model by expanding the study population to include children and by broadening the range of healthcare services considered. These additions included behaviors such as contemplating medical consultation, using complementary and alternative medicine, receiving home healthcare, and visiting emergency departments.[5] In 2016, Johansen et al refined it once more by incorporating additional healthcare services, including visits to midwives, physician assistants, nurse practitioners, oral health professionals, optometrists, and podiatrists.[23]

The ecology of medical care framework was first applied to Shanghai in 2018, providing a population-level snapshot of healthcare utilization across care settings.[24] However, in the years since, Shanghai's health system has undergone considerable changes, including the impact of the COVID-19 pandemic, rapid expansion of digital health, and ongoing health reforms.[25–27] These shifts may have significantly altered patterns of healthcare-seeking behavior. Yet, no updated ecological analysis has been conducted to reflect the post-pandemic context. In addition, comparing Shanghai with other countries is important because it places local healthcare patterns in a global context. This helps distinguish which trends are universal and which are unique to Shanghai, thereby providing valuable insights for policies that draw on international experience while addressing local challenges such as rapid aging and the growth of digital health. To address this gap, the central research question is how the ecology of medical care in Shanghai has changed from 2018 to the post-pandemic period, using data from the 7th Shanghai Health Service Survey (2023) and logistic regression to examine associated factors, and how these changes compare across countries through a scoping review of international studies.

Methods

This study adopts a two-pronged methodological approach. First, a quantitative analysis was carried out to apply the ecology of medical care model to the context of Shanghai. A one-month recall period was selected to maintain comparability with the previous studies, thereby enabling the identification of specific characteristics of healthcare utilization in Shanghai. Furthermore, the quantitative analysis explored variations in healthcare-seeking behavior among different socio-demographic groups. The details of the quantitative approach are presented in the following sections.

Second, a scoping review was conducted to identify and synthesize existing international applications of the ecology of medical care model.[28] The literature search covered eight major academic databases—PubMed, Web of Science, Scopus, Embase, Cochrane Library, CINAHL, CNKI, and Wanfang Data—and include publications published between 1961 and 2023. The review was carried out between 7 March 2023 and 12 August2023. The search strategy for the PubMed database is provided in Table 1 as an example. The inclusion criteria are presented in Table 2. After removing duplicates using EndNote (Version 20; Clarivate Analytics), other records were integrated into Covidence systematic review software (Veritas Health Innovation, Australia) for a two-stage literature screening process. An initial title and abstract review was conducted based on predefined inclusion and exclusion criteria, followed by full-text assessment of potentially relevant studies. Reference lists of all included articles were subsequently reviewed to identify any additional eligible publications. Data extracted from the eligible sources were compiled and structured into an Excel spreadsheet. To

Table 1 Search Strategy for PubMed

Number	Search Terms
#1	(Ecology AND (medical care OR health care OR healthcare)) [Title/Abstract]
#2	Medical ecology [Title/Abstract]
#3	#1 OR #2
#4	(utiliz* OR utilis* OR seek* OR visit* OR access* OR contact* OR accept*) [Title/Abstract]
#5	(use OR used OR using OR uses OR usage OR receive OR receives OR received OR receiving OR receipt OR reception OR have OR having OR has OR had OR delivered OR avail OR availed OR avails OR availing OR available OR availability) [Title/Abstract]
#6	(setting* OR pattern* OR resource*) [Title/Abstract]
#7	#4 OR #5 OR #6
#8	((health care) OR (healthcare) OR (health, care)) [Title/Abstract]
#9	((health service*) OR (health, service*) OR (medical service*) OR (medical, service*)) [Title/Abstract]
#10	Health services [MeSH Terms]
#12	(medical care OR primary care OR secondary care OR tertiary care OR care OR medical system) [Title/Abstract]
#13	(treatment* OR therap* OR medicine*) [Title/Abstract]
#14	Medical assistance [MeSH Terms]
#15	(medical assistance OR (assistance, AND medical) OR health provision OR health support OR health assistance) [Title/Abstract]
#16	#8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15
#17	#7 AND #16
#18	#3 AND #17

Table 2 Eligibility Criteria for Screen

Criteria	Included	Excluded
Context	• Health care utilization	• Other context
Topic	• The ecology of medical care • Healthcare patterns or settings or resources	• Studies unrelated to any of these topics
Outcomes	• Number of people using all types of health services at a given time for a given number of people • The patterns of illness, health-seeking behavior, and utilization of health services	• Other results
Publication type	• Primary research articles • Conference abstracts: no duplication of original research • Policy report • Conceptual articles • Letter to the Editor	• All other sources
Time-period	• 1961-2023	• Published before 1961
Language	• Published in English	• All other languages
Study design	• All	• -

ensure comparability, this study focused on nationally representative studies targeting the general population, and only the most recent pre-pandemic data were included to avoid temporary distortions in healthcare utilization patterns. While most countries are represented by national-level studies, additional region-specific data from China (eg, Beijing and Hong Kong) were incorporated to provide a more nuanced understanding of intra-national variation.

Quantitative Approach

Data and Sample

This study uses data from the seventh Shanghai Health Services Survey in 2023. Since 1993, Shanghai has conducted a comprehensive health service survey every five years. This citywide survey primarily assesses the health needs, demands, utilization patterns, medical expenditures, and satisfaction levels of its permanent residents. It provides an objective reflection of the progress and challenges faced in Shanghai's healthcare reform and development. The sampling method employed is a multistage stratified cluster random sampling. The survey covers all 16 administrative districts of Shanghai. In each district, five sub-districts (streets) are selected. From each sub-district, two neighborhood committees are randomly chosen, and within each neighborhood committee, 60 households are surveyed, resulting in 600 households per district. Given that the population of Pudong New Area accounts for a large proportion of Shanghai's total population, it was treated as two separate districts for sampling purposes, with a total of 1,200 households surveyed. In 2023, the actual number of households surveyed in Shanghai was 10,200, with corresponding numbers of individuals surveyed totaling 21,700.

Study Variables

Outcome variables. The outcome variables used in this study were derived from the seventh Health Service Survey of Shanghai to estimate the number of people using various types of healthcare services per 1000 people per month. Table 3 presents the outcome variables stratified by each of the eight care settings.

Independent variables. The independent variables included in the analysis were classified into five categories: (1) Age group: 0–17years, 18–29years, 30–59years, over 60 years. (2) Gender: male, female. (3) Income level: The income quintiles were derived by ranking all surveyed households by per capita income from highest to lowest and dividing them into five equal groups. The top 20% constituted the highest income group, followed by the high, middle, low, and lowest income group, respectively. (4) Census register type: Shanghai household registration, non-Shanghai household registration. (5) Health insurance status was categorized into four groups: Urban Employee Basic Medical Insurance (UEBMI), Urban and Rural Resident Basic Medical Insurance (URRBMI), Other Social Health Insurance (include Public Medical Insurance), Uninsured (Not Covered by Any Social Medical Insurance).

Table 3 Definitions of Outcome Variables in This Analysis[24]

Term	Definition
Self-reported illness	Any self-reported illness. Self-reported illness was defined if the respondent met any of the following criteria: sought treatment at a medical facility for illness or injury; consulted a doctor online due to discomfort; engaged in self-treatment; or experienced work, school absence, or bed rest for at least one day due to physical symptoms.
Receive treatment	Any act of obtaining medical care by visiting healthcare institutions or undertaking self-medication in response to illness or injury.
Visit a health care facility	Any medical visit with an outpatient provider in a health care facility.
Visit a primary care facility	Any medical visit with a physician in a primary care facility, such as community health service center or station, etc.
Self-medication	Any self-treatment methods, include purchase over-the-counter medicines and prescription medicine, use traditional herbs or traditional medicine, eat Vitamins or health supplements, and Health care equipment, etc.
TCM	Any part of treatment included TCM-related interventions, regardless of whether they also received other types of medical care.
Hospitalization	Any overnight stay in a healthcare facility due to illness, injury, rehabilitation, childbirth.
Surgery	Any surgery during hospitalization.

Statistical Analysis

Descriptive statistical analyses were conducted to estimate the monthly number of individuals per 1,000 population in Shanghai reporting illness and healthcare-seeking behaviors in 2023. Comparative analyses were performed to assess differences between 2018 and 2023, as well as between Shanghai and selected countries. Subgroup analyses were further conducted by age, gender, income level, census registration type, and health insurance coverage. To ensure comparability with studies from other regions (most of which report health ecosystem indicators on a monthly basis), this study also converted non-monthly indicators from the Shanghai data into monthly estimates. To estimate the monthly number of cases from the two-week recall data, we first identified ongoing cases by considering patients who developed an illness prior to the recall period and remained symptomatic within the two-week window, as well as those with chronic conditions persisting throughout the period, as continuously ill for the entire month. This approach ensures that chronic and ongoing cases are fully accounted for, preventing underestimation. Second, new cases occurring within the two-week recall period were counted separately, allowing us to distinguish incident cases from ongoing ones. Finally, to approximate the monthly incidence, the number of new cases observed over the two-week period was multiplied by two and added to the number of patients already considered continuously ill. Annual indicators such as hospitalization and surgery rates were assumed to be evenly distributed throughout the year and were accordingly converted to monthly cases,[24] in practice, this was implemented by dividing the annual rate by 12 to obtain an approximate monthly estimate.

Logistic regression analyses were performed to explore the associations between independent variables and outcome variables described above. For each outcome variable, a separate logistic regression model was constructed to assess the effects of independent variables. Statistical analysis of the study data was performed using R 4.2.1 for Windows. All statistical tests are two-tailed and the results of statistical analyses are considered statistically significant when the p-value is less than 0.05.

Results

Sample Characteristics

In 2023, 21,700 individuals participated in the Shanghai Health Service Survey. Females slightly outnumbered males. Registered residents accounted for 89.25%, and non-registered residents 10.75%. The elderly (≥60 years) represented the largest age group (51.83%), followed by middle-aged adults (30–59 years, 35.03%). Regarding health insurance, most participants were covered by Urban Employee Basic Medical Insurance (UEBMI, 62.94%), followed by Urban-Rural Resident Basic Medical Insurance (URRBMI, 29.63%). Detailed characteristics are shown in Table 4.

Ecology of Medical Care in 2023

Based on the survey data standardized to a one-month period, among every 1,000 Shanghai residents, 503 individuals self-reported illness, 495 received treatment, 228 visited a healthcare facility, and 144 visited primary medical institutions. Additionally, 98 people adopted self-care, 31 received traditional Chinese medicine (TCM) services, 6 were

Table 4 Demographic Information of Survey Participants in 2023

	Number	Percentage (%)
Age group		
0-17	1,726	7.95
18-29	1,125	5.18
30-59	7,602	35.03
60-	11,247	51.83
Gender		
Male	10,377	47.82
Female	11,323	52.18
Register type		
In Shanghai	19,368	89.25
Out Shanghai	2,332	10.75
Income group		
Lowest income	4547	20.95
Low income	4868	22.43
Middle income	3622	16.69
High income	4360	20.09
Highest income	4303	19.83
Insurance type		
UEBMI	13659	62.94
URRBMI	6430	29.63
Other	1142	5.26
Uninsured	469	2.16

hospitalized, and 3 underwent surgical procedures. Table 5 presents monthly cases per 1,000 population estimates of illness and various forms of healthcare utilization, stratified by age, sex, household registration status, income level, and insurance type.

Influence of Sociodemographic Factors on Illness and Health Care Utilization in 2023

Table 6 presents adjusted odds ratios (ORs) for experiencing health problems and receiving care across healthcare settings, showing how these outcomes vary by age, sex, household registration, income, and insurance type among all respondents (n = 21,700). The table highlights associations between sociodemographic factors and patterns of health needs and healthcare utilization.

After adjusting for sociodemographic factors, older adults had higher odds of reporting illness, receiving treatment, visiting healthcare facilities, seeking primary care, using TCM services, self-medicating, being hospitalized, and undergoing surgery compared to younger groups. Females had lower odds of self-reported illness (OR=0.93, 95% CI: 0.87–0.98, $p < 0.05$) and treatment (OR=0.93, 95% CI: 0.87–0.99), but higher odds of visiting care facilities (OR=1.11, 95% CI: 1.04–1.19, $p < 0.05$) and utilizing TCM services (OR=1.55, 95% CI: 1.31–1.83, $p < 0.05$) than males. Non-registered residents had lower odds of self-reported illness (OR=0.69, 95% CI: 0.62–0.78, $p < 0.05$), receiving treatment (OR=0.68, 95% CI: 0.61–0.76, $p < 0.05$), visiting healthcare facilities (OR=0.64, 95% CI: 0.54–0.75, $p < 0.05$), visiting primary care facilities (OR=0.38, 95% CI: 0.29–0.49, $p < 0.05$), and utilizing TCM services (OR=0.56, 95% CI: 0.36–0.85, $p < 0.05$) compared to registered residents. Conversely, the odds of self-medication were higher among non-registered residents (OR=1.31, 95% CI: 1.10–1.56, $p < 0.05$). Using the lowest income group as reference, they were more likely to report illness, receive treatment, visit primary care, and be hospitalized compared to higher-income groups. Regarding insurance, UEBMI participants were less likely to report illness, receive treatment, or visit primary care compared to other insurance types, but more likely to self-medicate than URRBMI enrollees, and more likely to use TCM services than both URRBMI enrollees and the uninsured.

Table 5 Monthly Health Care Utilization per 1,000 Population in Shanghai 2023 by Sociodemographic Characteristics

	Number per 1000 persons (95% CI)							
	Self-Reported Illness	**Receive Treatment**	**Visit a Health Care Facility**	**Visit a Primary Care Facility**	**Self-Medication**	**TCM**	**Hospitalization**	**Surgery**
Overall	503 (496.30, 509.60)	495 (488.28, 501.58)	228 (221.98, 233.14)	144 (139.31, 148.65)	98 (93.68, 101.58)	31 (28.43, 33.02)	6 (5.87, 6.45)	3 (2.85, 3,27)
Age group								
0-17	242 (221.99, 262.35)	235 (214.70, 254.62)	163 (146.69, 181.57)	16 (10.77, 22.66)	83 (71.29, 97.42)	13 (8.90, 19.92)	2 (1.71, 3.00)	1 (0.40, 1.13)
18-29	129 (110.56, 149.74)	119 (214.70, 254.62)	65 (51.92, 80.82)	14 (8.77, 22.98)	59 (46.38, 73.96)	10 (5.47, 17.42)	2 (1.68, 3.32)	1 (0.90, 2.19)
30-59	306 (295.84, 316.56)	298 (288.03, 308.59)	129 (121.44, 136.50)	59 (53.98, 64.59)	78 (72.57, 84.66)	20 (17.45, 23.82)	3.5 (3.20, 3.96)	2.4 (2.09, 2.71)
60-	714 (705.10, 721.81)	706 (697.03, 713.87)	320 (311.79, 329.04)	234 (226.20, 241.84)	117 (110.76,122.63)	42 (38.76, 46.20)	9 (8.41, 9.36)	4 (3.72, 4.38)
Gender								
Male	504 (494.48, 513.71)	496 (485.90, 505.14)	215 (207.48, 223.30)	138 (131.31, 144.57)	98 (92.15, 103.58)	24 (21.22, 27.12)	6 (5.67, 6.50)	3 (2.63, 3.22)
Female	502 (492.69, 511.11)	494 (485.19, 503.60)	239 (230.96, 246.66)	150 (143.07, 156.21)	97 (92.09, 103.01)	37 (33.43, 40.36)	6 (5.83, 6.64)	3 (2.90, 3.49)
Register type								
In Shanghai	529 (521.85, 535.91)	521 (514.13, 528.20)	241 (235.20, 247.25)	157 (152.06, 162.31)	96 (91.96, 100.26)	33 (30.42, 35.44)	6.5 (6.19, 6.82)	3 (2.97, 3.43)
Out Shanghai	287 (269.30, 306.01)	277 (259.23, 295.53)	114 (101.79, 127.61)	34 (27.65, 42.49)	110 (98.13, 123.56)	12 (8.67, 17.80)	3 (2.69, 4.01)	2 (1.45, 2.47)
Income group								
Lowest income	594 (579.45, 607.99)	586 (571.50, 600.12)	256 (243.52, 268.88)	177 (166.65, 188.86)	91 (82.61, 99.30)	32 (26.96, 37.17)	7 (6.67, 8.05)	3 (2.79, 3.73)
Low income	497 (483.29, 511.37)	490 (475.70, 503.77)	220 (208.80, 232.07)	149 (139.41, 159.42)	98 (89.95, 106.66)	25 (20.66, 29.40)	6 (5.28, 6.48)	3 (2.56, 3.43)
Middle income	575 (558.37, 590.56)	567 (550.34, 582.60)	268 (253.64, 282.47)	177 (164.62, 189.46)	113 (103.29,123.93)	37 (31.07, 43.35)	8 (6.89, 8.46)	4 (3.16, 4.28)
High income	490 (475.31, 504.98)	482 (467.30, 496.95)	226 (213.97, 238.80)	138 (128.37, 148.87)	95 (86.83, 104.25)	34 (28.76, 39.50)	6 (5.48, 6.77)	3 (2.73, 3.68)
Highest income	366 (351.76, 380.53)	357 (343.24, 371.87)	173 (162.12, 184.73)	81 (72.87, 89.16)	94 (85.31, 102.73)	28 (23.59, 33.50)	4 (3.55, 4.62)	2 (1.95, 2.77)
Insurance type								
UEBMI	486 (477.24, 494.00)	478 (469.26, 486.02)	219 (212.05, 225.92)	137 (131.32, 142.85)	99 (93.94, 103.95)	36 (32.95, 39.20)	6 (5.72, 6.44)	3 (2.97, 3.51)
URRBMI	575 (562.99, 587.15)	568 (555.66, 579.87)	258 (247.15, 268.53)	175 (165.87, 184.44)	95 (88.25, 102.60)	23 (19.20, 26.47)	7 (6.39, 7.52)	3 (2.71, 3.48)
Other	381 (353.19, 409.43)	370 (342.01, 397.92)	206 (183.34, 230.19)	94 (78.13, 111.98)	86 (70.93, 103.48)	24 (16.30, 34.18)	4 (2.84, 4.85)	1 (1.00, 2.33)
Uninsured	316 (275.15, 358.98)	305 (264.96, 348.01)	117 (91.21, 149.55)	43 (27.77, 64.95)	122 (95.00, 154.22)	4 (1.17, 15.41)	4 (2.46, 5.62)	1 (0.72, 2.77)

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Table 6 Adjusted Odds Ratios (95% CI) for Health Symptoms and Healthcare-Seeking Behaviors by Demographic Factors in Shanghai 2023

	Adjust OR (95% CI)							
	Self-Reported Illness	**Receive Treatment**	**Visit a Health Care Facility**	**Visit a Primary Care Facility**	**Self-Medication**	**TCM**	**Hospitalization**	**Surgery**
Age group								
0-17	0.07* (0.06, 0.08)	0.07* (0.06, 0.08)	0.25* (0.21, 0.30)	0.03* (0.02, 0.05)	0.36* (0.28, 0.47)	0.30* (0.16, 0.51)	0.26* (0.19, 0.36)	0.19* (0.10, 0.32)
18-29	0.05* (0.04, 0.06)	0.05* (0.04, 0.06)	0.13* (0.09, 0.17)	0.04* (0.02, 0.07)	0.26* (0.19, 0.36)	0.19* (0.09, 0.36)	0.27* (0.19, 0.38)	0.37* (0.22, 0.58)
30-59	0.19* (0.17, 0.20)	0.19* (0.18, 0.20)	0.32* (0.29, 0.34)	0.24* (0.21, 0.27)	0.49* (0.43, 0.55)	0.43* (0.35,0.52)	0.40* (0.35, 0.46)	0.60* (0.50, 0.72)
60-	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Gender								
Male	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Female	0.93* (0.87, 0.98)	0.93* (0.87, 0.99)	1.11* (1.04, 1.19)	1.06 (0.98, 1.15)	0.97 (0.88, 1.07)	1.55* (1.31, 1.83)	1.01 (0.91, 1.12)	1.08 (0.94, 1.25)
Register type								
In Shanghai	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Out Shanghai	0.69* (0.62, 0.78)	0.68* (0.61, 0.76)	0.64* (0.54, 0.75)	0.38* (0.29, 0.49)	1.31* (1.10, 1.56)	0.56* (0.36, 0.85)	0.86 (0.68, 1.07)	0.87 (0.64, 1.16)
Income group								
Lowest income	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Low income	0.80* (0.73, 0.88)	0.81* (0.73, 0.89)	0.92 (0.83, 1.02)	0.98 (0.87, 1.10)	1.21* (1.04, 1.40)	0.74* (0.57, 0.96)	0.85* (0.73, 0.99)	0.95 (0.77, 1.19)
Middle income	0.78* (0.70, 0.86)	0.77* (0.70, 0.86)	0.95 (0.85, 1.06)	0.90 (0.80, 1.02)	1.28* (1.09, 1.50)	0.89 (0.68, 1.14)	0.95 (0.81, 1.12)	1.03 (0.82, 1.30)
High income	0.71* (0.65, 0.79)	0.71* (0.65, 0.79)	0.91 (0.82, 1.01)	0.84* (0.73, 0.95)	1.09 (0.93, 1.28)	0.93 (0.72, 1.21)	0.86 (0.73, 1.01)	0.98 (0.78, 1.24)
Highest income	0.67* (0.60, 0.74)	0.66* (0.60, 0.74)	0.89 (0.79, 1.00)	0.72* (0.62, 0.83)	1.23* (1.04, 1.46)	0.96 (0.73, 1.27)	0.73* (0.61, 0.88)	0.86 (0.67, 1.10)
Insurance type								
UEBMI	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
URRBMI	1.14* (1.06, 1.23)	1.14* (1.06, 1.23)	1.03 (0.95, 1.11)	1.11* (1.01, 1.22)	0.88* (0.79, 1.00)	0.56* (0.45, 0.69)	1.00 (0.88, 1.13)	0.93 (0.78, 1.10)
Other	1.21* (1.02, 1.43)	1.21* (1.02, 1.43)	1.17 (0.97, 1.41)	1.33* (1.04, 1.69)	1.02 (0.78, 1.32)	0.79 (0.47, 1.26)	0.84 (0.61, 1.13)	0.76 (0.47, 1.18)
Uninsured	1.01 (0.79, 1.30)	0.98* (0.76, 1.26)	0.71 (0.50, 0.99)	0.69 (0.39, 1.13)	1.24 (0.85, 1.76)	0.24* (0.04, 0.75)	1.01 (0.62, 1.56)	0.74 (0.33, 1.43)

Notes: *Significant difference, $P < 0.05$.

Temporal Trends in the Ecology of Medical Care Compared with 2018

Between 2018 and 2023, the number of self-reported illness cases among surveyed residents increased from 444 to 503 per 1,000 population per month, representing a rise of 59 cases. Similarly, the number receiving treatment rose from 433 to 495 per 1,000 population per month, an increase of 62 cases; self-medication cases increased modestly from 92 to 98 per 1,000 population per month. In contrast, visits to health care facilities, visits to primary care facilities, utilization of TCM services, and hospitalizations declined over the same period, decreasing from 305 to 228, 212 to 144, 33 to 31, and 7 to 6 per 1,000 population per month, with decreases of 77, 68, 2, and 1 case, respectively. Notably, the number of surgeries remained stable at 3 per 1,000 population per month throughout the period. Temporal trends in the ecology of medical care are presented in Figures 1 and 2.

Comparison of the Ecology of Medical Care Between Shanghai and Other Regions

A total of 3,140 records were retrieved from eight databases: PubMed (n=389), Web of Science (n=959), Scopus (n=633), Embase (n=468), Cochrane Library (n=515), CINAHL (n=174), CNKI (n=1), and Wanfang Data (n=1). After removing 1,145 duplicates, 1,995 records underwent title and abstract screening, yielding 57 full-text articles. Four additional records were identified via reference screening, resulting in 43 studies included in the final analysis (Figure 3).

Most included studies were original research articles (n=40, 93.02%), predominantly quantitative (90.70%), including 32 cross-sectional, 1 case-control, 4 cohort, and 2 panel studies. Eleven studies (25.58%) targeted the general population. Geographically, studies were conducted mainly in Asia (n=19), followed by North America (n=13), Europe (n=7), South America (n=2), and Oceania (n=1), with Japan (n=8) and the United States (n=10) leading in Asia and North America, respectively. Detailed characteristics are presented in Table 7.

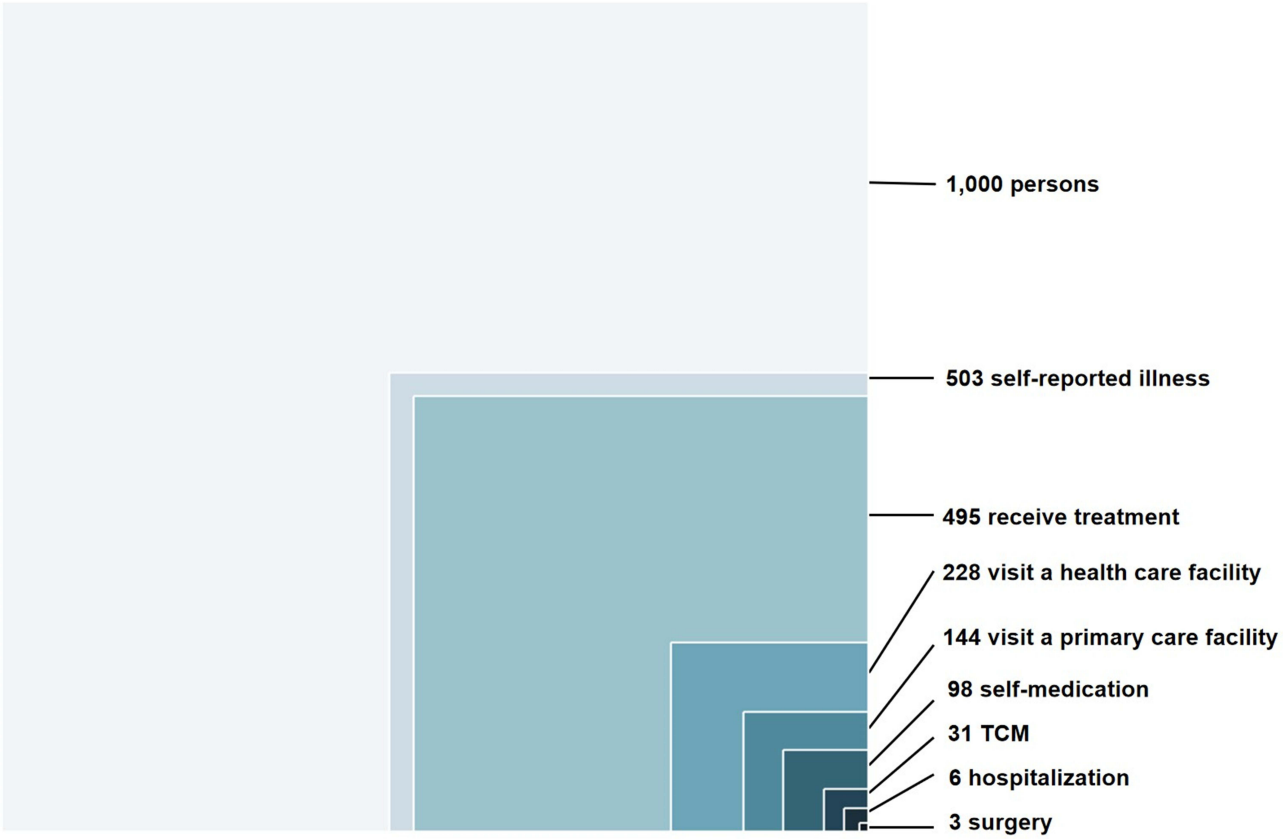

Figure 1 Estimated monthly number of individuals per 1,000 population who experienced a health problem and utilized medical care services across various healthcare settings in 2023.

https://doi.org/10.2147/RMHP.S553882

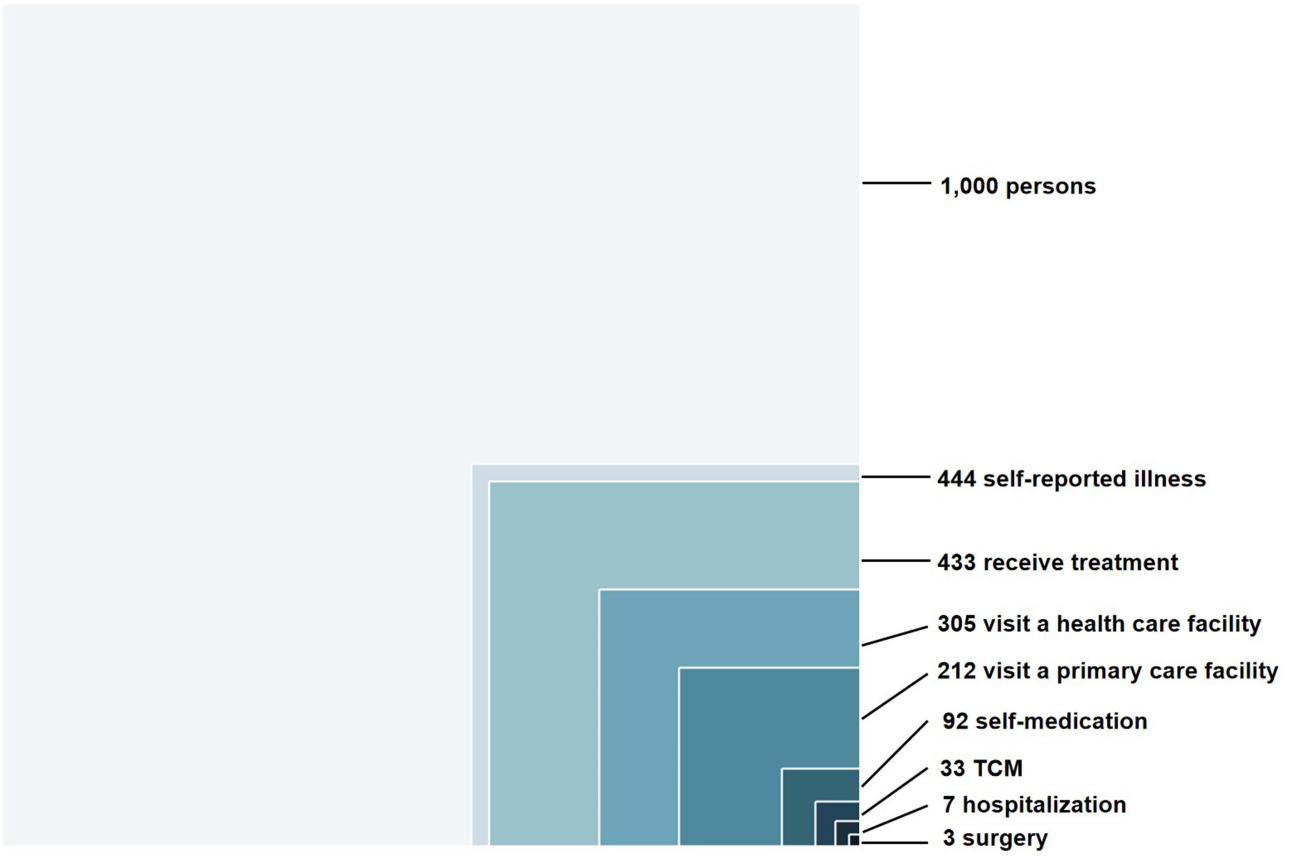

Figure 2 Estimated monthly number of individuals per 1,000 population who experienced a health problem and utilized medical care services across various healthcare settings in 2018[24].

In 2023, the number of self-reported illness cases per 1,000 population among Shanghai's permanent residents in the month preceding the survey was relatively low compared to other countries and regions, ranking just above Beijing, Brazil, and Israel. Despite the low number of illness cases, Shanghai exhibited the highest rate of treatment-seeking. In Asia, the proportion of residents visiting medical institutions was lower in Shanghai than in Japan, and the utilization of primary healthcare services was also lower, falling behind Japan, Hong Kong, Taiwan, and South Korea. The level of self-medication in Shanghai was comparable to that in Hong Kong but considerably lower than in Japan. The number of hospitalized individuals per 1,000 population was similar to those in Japan but remained lower than in most other countries and regions, surpassing only Australia. Regarding the use of TCM services, only 31 per 1,000 residents in Shanghai reported utilizing TCM, a figure lower than that in other Asian regions, including Beijing, Hong Kong, and Japan. For further details, see Table 8.

Discussions

The publication of The Ecology of Medical Care in 1961 has inspired extensive research on healthcare ecosystems across various countries and regions. In China, Shanghai carried out a similar study in 2018. However, in the context of ongoing healthcare system reforms and evolving service delivery patterns, the city's medical ecology may have undergone significant changes. Despite this, there remains a lack of systematic research capturing these recent developments. To address this gap, this study investigates the current medical ecology of Shanghai—one of the most representative cities in mainland China—and compares it with those observed in other regions.

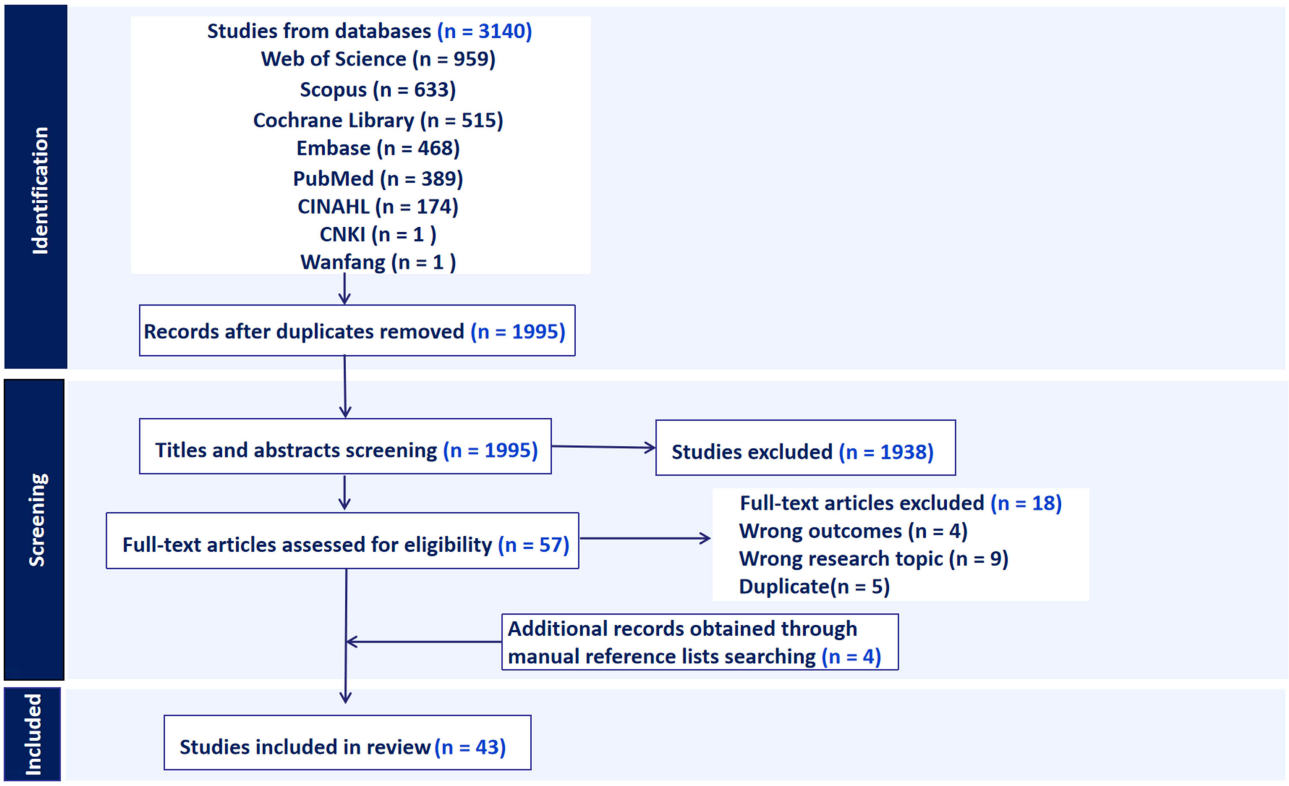

Figure 3 PRISMA diagram.

Compared to 2018, the number of self-reported illness cases, treatment seekers, and individuals engaging in self-medication per 1,000 population in Shanghai increased respectively in 2023. This shift is likely driven by population aging and an increase in the number of people with chronic diseases, leading to greater need for healthcare services.[50]

Table 7 Overview of the Encompassed Studies (n=43)

First author (year)	Region	Publication Type	Study Design	Population
White KL (1961)[1]	USA and UK	Conceptual articles	Not a specific study design	≥16 years
Thacker SB (1977)[29]	North Carolina	Primary research articles	Panel Study	≥16 years
Green LA (2001)[5]	USA	Primary research articles	Cross-sectional Study	All ages
Dovey S (2003)[18]	USA	Primary research articles	Cross-sectional Study	≤18 years
George E (2003)[30]	USA	Primary research articles	Cross-sectional Study	All ages
Bliss EB (2004)[14]	USA	Primary research articles	Cross-sectional Study	No mention
Yawn BP (2005)[31]	USA	Primary research articles	Case-Control Study	Asthmatic patients
Leung GM (2005)[32]	Hong Kong	Primary research articles	Cross-sectional Study	≥15 years
Fukui T (2005)[33]	Japan	Primary research articles	Cohort Study	All ages
No mention (2006)[34]	USA	Primary research articles	Cross-sectional Study	≥65 years
Chou LF (2006)[35]	Taiwan	Primary research articles	Cross-sectional Study	All ages
Tokunaga S (2011)[20]	Miyazaki	Primary research articles	Cross-sectional Study	Perinatal woman
Ferro A (2011)[36]	Sweden	Primary research articles	Cross-sectional Study	All ages
Shao C (2011)[37]	Taiwan	Primary research articles	Cross-sectional Study	All ages
Roncoletta A (2012)[38]	Sao Paulo	Primary research articles	Cross-sectional Study	Non-pregnant woman
Hansen AH (2012)[16]	Norway	Primary research articles	Cross-sectional Study	30-87 years
Ishida Y (2012)[39]	Japan	Primary research articles	Cohort Study	≤17 years

(*Continued*)

https://doi.org/10.2147/RMHP.S553882

Table 7 (Continued).

First author (year)	Region	Publication Type	Study Design	Population
Shao S (2013)[40]	Beijing	Primary research articles	Cross-sectional Study	≥15 years
Insua J T (2013)[41]	Santiago Del Estero	Conference abstracts	Cross-sectional Study	≥18 years
Duwe EA (2014)[13]	USA	Primary research articles	Not a specific study design	No mention
Chang CP (2014)[42]	Taiwan	Primary research articles	Cross-sectional Study	Woman: ≥18 years
Vo TL (2015)[8]	Belgian	Primary research articles	Cross-sectional Study	All ages
Pichlhöfer O (2015)[43]	Austria	Primary research articles	Cross-sectional Study	≥16 years
Stewart M (2015)[17]	Canada	Primary research articles	Cross-sectional Study	≥15 years
Sturmberg J P (2016)[44]	Australia	Primary research articles	Not a specific study design	No mention
Kim YS (2016)[15]	Korea	Primary research articles	Cross-sectional Study	≥18 years
Johansen ME (2016)[23]	USA	Letter to the Editor	Cross-sectional Study	All ages
Gordon B (2016)[19]	Israel	Primary research articles	Cross-sectional Study	Aviators:21–67 years
Fukui T (2017)[10]	Japan	Primary research articles	Cross-sectional Study	All ages
Johansen ME (2017)[12]	USA	Primary research articles	Cross-sectional Study	No mention
Kaneko M (2017)[6]	Okinawa	Primary research articles	Cohort Study	Patients
Namiki H (2018)[7]	Yonaguni	Primary research articles	Cross-sectional Study	Patients
Johansen ME (2019)[11]	USA	Primary research articles	Panel Study	All ages
Hoffmann K (2019)[3]	Austria	Primary research articles	Mixed-Methods Study	≥15 years
McAlister FA (2020)[45]	Alberta	Primary research articles	Cohort Study	≥18 years
Giezendanner S (2020)[9]	Switzerland	Primary research articles	Cross-sectional Study	≥18 years
Giezendanner S (2021)[46]	Switzerland	Primary research articles	Cross-sectional Study	18-79 years
Xiong X (2021)[24]	Shanghai	Primary research articles	Cross-sectional Study	All ages
Aoki T (2022)[2]	Japan	Primary research articles	Cross-sectional Study	20–75 years
Ryu DH (2022)[47]	Korea	Primary research articles	Cross-sectional Study	≤18 years
Yosef Y (2022)[48]	Israel	Primary research articles	Cross-sectional Study	>15 years
Lee J (2022)[49]	Korea	Primary research articles	Cross-sectional Study	≥19 years
Kaneko M (2022)[4]	Yokohama	Primary research articles	Cross-sectional Study	≥75 years

Table 8 Comparison of Differences in the Ecology of Medical Care Between This Study and Other Regions

Study Area	Self-Reported Illness	Receive Treatment	Visit a Health Care Facility	Visit a Primary Care Facility	Self-Medication	TCM	Hospitalization	Surgery
This study	503	495	228	144	98	31	6	3
Beijing[40]	295	217	_	43	_	78	15	_
Hong Kong[32]	567	_	_	372	90	54	_	_
Taiwan[37]	_	_	_	329	_	_	10	_
Japan[10]	794	_	265	206	447	117	6	_
Korea[49]	763	_	_	344	_	_	13	_
USA[11]	_	_	190	103	_	_	7	_
Austria[3]	_	460	_	337	_	_	35	_
Brazil[38]	398	_	292	34	_	_	63	_
Canada[17]	560	_	_	238	_	_	8	_
Israel[48]	495	352	_	_	_	_	15	_
Norway[16]	901	_	_	214	_	_	14	_
Sweden[36]	_	_	_	87	_	_	12	_
Switzerland[9]	546	243	_	164	_	_	21	_
Australia[44]	640	320	_	255	_	_	2	_
Belgian[8]	851	_	490	_	67	_	15	9

Improvements in healthcare resources—including the expansion of primary care, telemedicine, and insurance coverage—have further enhanced accessibility and reduced financial barriers.[51,52] The COVID-19 pandemic has also reinforced public health awareness and proactive self-management.[53] In contrast, outpatient service utilization, primary care visits,

and hospital admissions declined between 2018 and 2023. Several factors may explain this trend. The advancement of "Internet + Healthcare" technologies has enabled remote consultations, chronic disease management platforms, and mobile health applications, reducing the need for in-person visits.[54] Long-term prescription policies for chronic diseases have further decreased the frequency of consultations for medication renewals.[55] Enhanced chronic disease management and the expansion of community- and home-based care services may have reduced hospitalization demand by addressing conditions earlier.[56] Additionally, government-led efforts—such as promoting day surgeries, strengthening outpatient capacity, and enforcing stricter admission criteria—have likely contributed to declining hospitalization rates.[57]

Logistic regression analysis indicates that age significantly influences both illness and healthcare utilization: older individuals are more likely to report illness and seek medical care, consistent with previous studies on health ecology.[10] This reflects age-related functional decline and a higher prevalence of chronic and complex diseases,[58] which require long-term management and institutional support, leading to increased healthcare utilization.[59] Income also plays a role.

Individuals with higher incomes show lower risks of illness and hospitalization, consistent with earlier research,[24] likely because they engage in healthier behaviors, possess greater health literacy, and access preventive and early care.[60] In contrast, lower-income groups, constrained by financial barriers, are more likely to rely on primary healthcare services.[61] The tiered reimbursement structure of the medical insurance system may further reinforce these disparities. Consistent with prior findings,[24] individuals without local registration are more likely to self-medicate and less likely to seek professional care. A key reason is the incomplete integration of China's basic medical insurance system: although many institutions are now connected to the national information platform, gaps remain in interprovincial reimbursement capacity. Direct settlement is not universally available for inpatient, outpatient, or chronic disease services,[62] and reimbursement follows the principle of "local service catalog and home-region reimbursement policy", resulting in variation in coverage and rates.[63] These institutional barriers undermine timely benefit access for non-local residents, prompting greater reliance on low-cost alternatives such as self-medication. Notably, reforms in the Yangtze River Delta aim to integrate health insurance mechanisms and standardize service provision, which is expected to improve accessibility and equity for this population.[64]

Studies on the ecology of medical care have shown that healthcare utilization patterns differ across countries.[3] Compared with other countries, Shanghai reports relatively low self-reported illness, however, this may not solely indicate better overall health status. Instead, it could potentially reflect lower health awareness or a limited ability to recognize and report symptoms.[65] In addition, Shanghai exhibits a distinctive healthcare pattern characterized by higher engagement in treatment-seeking and self-medication, alongside lower utilization of outpatient services, primary care, TCM services, and hospitalizations, reflecting a reliance on informal or non-institutional care channels. This pattern may be explained by several factors: weak health awareness and easy access to over-the-counter medications;[66,67] limited public trust in primary care and TCM providers;[68,69] urban residents' preference for convenient, rapid care;[70] and systemic changes such as the expansion of day surgery, chronic disease management, and family doctor contracting under an "outpatient-led, inpatient-supported" model, which have collectively reduced dependence on inpatient services.[56,57] To address low health awareness, limited trust in primary and TCM services, and time constraints, targeted interventions are needed, including public health education, strengthening provider capacity and credibility, and expanding flexible service models such as online consultations and extended clinic hours. Additionally, future policies should consider the development of digital health and the needs of an aging population, in light of Shanghai's increasing shift toward a more informal healthcare strategy.

This study has several limitations. First, illness and treatment data were collected through a two-week recall period and extrapolated to a monthly scale, while hospitalization and surgery data were based on annual recall and similarly extrapolated. Such extrapolations inevitably carry a risk of bias, particularly if the incidence of illness or healthcare utilization fluctuates within a month or across the year. Although this approach follows standard practice in the existing literature and allows comparability with other studies, the estimates should be interpreted with caution. Second, the retrospective nature of the survey may introduce recall bias, as respondents may underreport or misclassify symptoms and healthcare use. While employing a shorter recall period of two weeks helps reduce this concern, it does not eliminate it entirely. Finally, the absence of longitudinal tracking at the individual level limits our ability to capture within-person changes over time, restricting inferences about causal relationships.

Conclusions

This study outlines the evolving ecology of medical care in Shanghai between 2018 and 2023. While illness reporting increased modestly, treatment-seeking, especially through self-care, also rose. However, utilization of institutional care declined. Compared with other countries, Shanghai exhibits a distinctive pattern characterized by high treatment responsiveness alongside relatively low formal service use. These findings underscore the need to improve primary care and TCM services and to address barriers related to awareness, trust, and accessibility to ensure more balanced health service use in Shanghai.

Abbreviations

UEBMI, Urban Employee Basic Medical Insurance; URRBMI, Urban and Rural Resident Basic Medical Insurance; OR, Odds Ratio; CI, Confidence Interval; USA, United States of America; UK, United Kingdom; TCM, traditional Chinese medicine; COVID-19, coronavirus disease-2019.

Data Sharing Statement

The health service survey data, funded by the municipal governments of Shanghai, China, cannot be publicly shared due to privacy protection restrictions imposed by the municipal authorities.

Ethics Approval and Consent to Participate

Ethical approval was not required for this study, as it was based on a secondary analysis of de-identified data obtained from a government-led health survey conducted by the Shanghai Municipal Government. The dataset did not contain any personally identifiable information. In accordance with both institutional guidelines and national regulations, formal ethical review was deemed unnecessary. The Institutional Review Board of the School of Public Health at Fudan University waived the requirement for ethics approval.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests in this work.

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