Utilization of Health Examination Services among Chinese Population Aged $ $45 Years: A National Cross-Sectional Survey Based on CHARLS 2018 Postprint

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Abstract

Background Research on the utilization of outpatient and inpatient healthcare services and their influencing factors among residents is well-established; however, studies analyzing preventive care-seeking behavior and health check-up service utilization among Chinese residents are relatively scarce.

Objective To investigate the utilization of health check-up services among Chinese residents aged $ $45 years and analyze its influencing factors.

Methods Data from the 2018 China Health and Retirement Longitudinal Study (CHARLS) were used to select individuals aged $ $45 years, and the health check-up participation rate and number of check-up items from 2015 to 2018 were calculated. Zero-inflated negative binomial regression was employed to analyze the influencing factors of the number of check-up items participated in by residents.

Results This study included a total of 17,203 participants with a mean age of $(62.4\$\pm10.0)years, and the health check-up participation rate was 47.73\pm9.9)years, and the median number of check-up items per person was 9(5, 12). The top three regions in terms of number of check-up items were Beijing(14items), Shanghai(14items), and Xinjiang Uygur Autonomous Region(13items), while parametric tests showed that the number of check-up items among urban residents was higher than that among rural 0.001). The ZINB model showed that economic region(central, western, northeastern), residence type(urban area items participated in by residents($P < 0.001$). Subgroup analysis according to urban and rural areas showed that$ years), and education level (junior high school and above) were common influencing factors for both urban and rural residents (P<0.05). Additionally, for urban residents, being married was an influencing factor (P<0.001); for rural residents, being male, having comorbidities, and having employee medical insurance were influencing factors (P<0.001).

Conclusion The utilization of health check-up services among Chinese residents aged $ $45 years is relatively low. Health check-up services are more utilized in urban areas and the eastern region. Age and education level are influencing factors of residents' utilization of health check-up services. Marital status is an influencing factor for urban residents' utilization of health check-up services. Gender, health status, and type of basic medical insurance are influencing factors for rural residents' utilization of health check-up services. Future efforts should further improve residents' utilization of health check-up services and formulate different policies and measures according to urban-rural and regional differences.

Full Text

The Utilization of Health Checkup Services among People Aged 45 and Above in China: A National Cross-sectional Survey Based on CHARLS 2018

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Abstract

Background: Research on the utilization of outpatient and inpatient health services and their influencing factors is well established, yet few studies have examined the utilization of preventive medical services such as health checkups among Chinese residents.

Objective: To investigate the utilization of health checkup services among Chinese residents aged 45 years and above and analyze its influencing factors.

Methods: Using data from the 2018 China Health and Retirement Longitudinal Study (CHARLS), we selected individuals aged $ $45 years and calculated their health checkup participation rate and the number of checkup items from 2015 to 2018. Zero-inflated negative binomial regression was used to analyze factors influencing the number of health checkup items utilized.

Results: A total of 17,203 samples were included with a mean age of $(62.4\$\pm10.0)years.Thehealthcheckupparticipationratewas47.73\pm\$9.9)$ years, with a median of 9 (5, 12) checkup items per person. The top three regions in number of checkup items were Beijing (14 items), Shanghai (14 items), and Xinjiang Uygur Autonomous Region (13 items), while the bottom three were Gansu Province (7 items), Anhui Province (7 items), and Liaoning Province

(7.5 items). Non-parametric tests showed that urban residents had significantly more checkup items than rural residents (10 vs. 8 items), the eastern region had significantly more than the central (10 vs. 8 items), western (10 vs. 9 items), and northeastern regions (10 vs. 8 items), and the western region had significantly more than the central region (9 vs. 8 items) (P<0.001). The ZINB model revealed that economic region (central, western, and northeastern), residence type (urban), gender (female), age (60 years and above), education level (junior high school and above), health status (comorbidity), and basic medical insurance type (employee health insurance) were significant influencing factors (P<0.001). Subgroup analysis by urban and rural residence showed that economic region (central, western, and northeastern), age (60 years and above), and education level (junior high school and above) were common influencing factors for both urban and rural residents (P<0.05). Additionally, for urban residents, being married was an influencing factor (P<0.001); for rural residents, being male, having comorbidities, and having employee medical insurance were influencing factors (P<0.001).

Conclusion: Health checkup service utilization among Chinese residents aged $ $45 years is relatively low. Urban areas and eastern regions have better access to health checkup services. Age and education level are influencing factors for health checkup utilization among all residents, while marital status is a factor for urban residents, and gender, health status, and basic medical insurance type are factors for rural residents. Future efforts should improve health checkup utilization and develop differentiated policies for urban/rural and regional contexts.

Keywords: Middle aged; Aged; Physical examination; Preventive health services; Health checkup; Root cause analysis

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Introduction

Population aging has become a global phenomenon. With socioeconomic development, life expectancy in China has increased annually while the degree of aging continues to intensify. According to the seventh national census data, the proportion of people aged 60 and above reached 18.70% in 2020, and those aged 65 and above reached 13.50%, indicating that China is entering a deeply aging society. Simultaneously, the middle-aged population ($ $45 years) in China is substantial and will gradually enter old age in the coming years, inevitably affecting future health resource allocation. This demographic shift brings numerous socioeconomic challenges, particularly by significantly increasing the incidence and prevalence of chronic non-communicable diseases, raising health expenditure costs, and imposing a heavy burden on medical resources.

Existing research on healthcare utilization behavior has primarily focused on residents' use of outpatient and inpatient services and their influencing factors, establishing healthcare utilization models. However, studies on residents' uti-

lization of preventive care services are relatively scarce, mostly targeting specific populations or limited to certain regions, lacking nationally representative data to reflect the overall situation of health checkup utilization among middle-aged and elderly populations in China. Under the guidance of the "prevention-first" policy, it is necessary to investigate the utilization of health checkup services among Chinese residents. Therefore, this study uses data from the 2018 China Health and Retirement Longitudinal Study (CHARLS) to examine health checkup participation among middle-aged and elderly populations in China and explore potential influencing factors to support rational allocation of health service resources.

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1. Materials and Methods

1.1 Study Subjects This study utilized data from CHARLS, a cohort study conducted by the National School of Development at Peking University. The project employed multi-stage Probability Proportionate to Size (PPS) sampling. The baseline survey in 2011 recruited middle-aged and elderly individuals aged $ $45 years from 150 counties and 450 villages/communities across 28 provinces (autonomous regions, municipalities), ultimately including 10,257 households and 17,708 participants. The project conducted three follow-up surveys in 2013, 2015, and 2018, with dynamic additions and removals from the cohort. This study used the 2018 survey data, including three datasets: sociodemographic information, health status and function, and medical services and insurance. The age range was set as $ $45 years as of August 2018. Individuals with mental disorders, memory impairments, or missing key variables were excluded, resulting in a final sample of 17,203 participants.

1.2 Variables 1.2.1 Health Checkup Service Utilization Indicators: This study measured preventive care service utilization using health checkup participation rate and number of checkup items. The participation rate assessed whether respondents had undergone health checkups in the past three years. The CHARLS questionnaire asked: "When was your most recent routine health checkup since the last interview (referring to August 2015)? Note: excluding CHARLS physical examinations." Responses were dichotomized to calculate the percentage of participants. The number of checkup items was assessed among those who participated, asking: "What items were included in this routine health checkup?" Options included: physical examination, blood routine, urine routine, liver function, kidney function, blood lipids, fasting blood glucose, surgery, internal medicine, ENT, ECG, abdominal ultrasound, chest X-ray, gender-specific examinations, and others—totaling 15 items. The number of items each respondent underwent was calculated, with non-participants coded as 0.

1.2.3 Covariates: (1) **Age:** Included individuals aged $ $45 years, categorized as middle-aged (45 - 59 years), young elderly (60 - 74 years), and older elderly ($75 years).

(2) **Marital Status:** Married and cohabiting individuals were defined as married; others as unmarried. (3) **Education Level:** Based on 2018 CHARLS options, education was categorized as primary school and below, junior high school, and high school (technical secondary school) and above. (4) **Residence Type:** Based on community type in CHARLS sampling, categorized as urban and rural. (5) **Economic Region:** According to National Bureau of Statistics standards, divided into eastern, central, western, and northeastern regions. (6) **Basic Medical Insurance:** Urban employee insurance and public medical insurance were defined as employee medical insurance; urban resident, urban-rural resident, and new rural cooperative medical schemes were defined as resident medical insurance; those with none were defined as uninsured. (7) **Health Status:** Comorbidity was used to measure health status, defined as having $ $2 chronic diseases simultaneously. The CHARLS questionnaire asked about 14 chronic conditions: hypertension, dyslipidemia, elevated blood glucose, malignant tumors, chronic lung disease, liver disease, heart disease, stroke, kidney disease, digestive disease, mental and emotional disorders, memory-related disorders, arthritis/rheumatism, and asthma. Individuals with mental/emotional disorders or memory-related disorders were excluded to avoid potential recall bias, leaving 12 chronic diseases for analysis.

1.3 Statistical Methods Categorical data were expressed as percentages. Normally distributed continuous data were expressed as ($\bar{x}\pm s$), while non-normally distributed data were expressed as median (P25, P75). Non-parametric tests were used to analyze geographic differences in health checkup utilization between urban/rural areas and economic regions. Zero-inflated negative binomial regression was employed to analyze influencing factors on the number of checkup items, as the outcome was count data with spatial and categorical biases and did not meet equidispersion assumptions. Data cleaning revealed many zero counts, which could reduce model estimation validity using traditional models, thus zero-inflated negative binomial regression was adopted. The zero model used logistic regression without covariates (constant-only), while the second stage included covariates with sample weighting. Subgroup analysis was conducted by urban/rural residence to examine differential influencing factors. All analyses used Stata 16.0 software with α=0.05 (two-tailed test), considering $P<0.05$ statistically significant.

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2. Results

2.1 Health Checkup Service Utilization in 28 Provinces/Autonomous Regions/Municipalities The study included 28 provinces/autonomous regions/municipalities (excluding Ningxia Hui Autonomous Region, Tibet Autonomous Region, Hainan Province, Hong Kong, Macau, and Taiwan due to absence from original data), covering 122 cities and 449 communities/villages, with 17,203 participants. The mean age was

$(62.4\$\pm10.0) years, with an average of (4.06\pm\$5.10)$ checkup items per person and a median of 0 (0, 9) items.

From 2015-2018, 8,211 individuals participated in routine health checkups, yielding a participation rate of 47.73%. The top three regions were Xinjiang Uygur Autonomous Region (96.47%), Shanghai Municipality (83.67%), and Beijing Municipality (82.05%), while the bottom three were Liaoning Province (35.41%), Qinghai Province (36.55%), and Fujian Province (36.94%). Among the 8,211 participants, the mean age was $(64.1\$\pm9.9) years, with (8.5\pm\$4.1)$ checkup items per person and a median of 9 (5, 12) items. The top three regions in checkup items were Beijing (14 items), Shanghai (14 items), and Xinjiang Uygur Autonomous Region (13 items), while the bottom three were Gansu Province (7 items), Anhui Province (7 items), and Liaoning Province (7.5 items). Detailed utilization by province is shown in .

2.2 Geographic Differences in Health Checkup Utilization Nonparametric tests revealed that urban residents participated in significantly more checkup items than rural residents (10 vs. 8 items), eastern region residents had significantly more than central (10 vs. 8 items), western (10 vs. 9 items), and northeastern regions (10 vs. 8 items), and western region residents had significantly more than central region residents (9 vs. 8 items) ($P<0.001$). Results are shown in .

2.3 Analysis of Influencing Factors on Preventive Care Utilization The Vuong test yielded $Z=43.66$, $P<0.001$, confirming that the ZINB model was superior to standard negative binomial regression. The ZINB model showed that economic region (central, western, and northeastern), residence type (urban), gender (female), age (60 years and above), education level (junior high school and above), health status (comorbidity), and basic medical insurance type (employee medical insurance) were significant influencing factors on the number of checkup items ($P<0.001$). Weighted analysis additionally identified marital status as an influencing factor ($P<0.001$), with other results remaining consistent. Details are shown in .

Subgroup analysis by urban/rural residence showed that economic region (central, western, and northeastern), age (60 years and above), and education level (junior high school and above) were common influencing factors for both urban and rural residents ($P<0.05$). Additionally, for urban residents, being married was an influencing factor ($P<0.001$); for rural residents, being male, having comorbidities, and having employee medical insurance were influencing factors ($P<0.001$). Results are shown in .

3. Discussion

3.1 Significant Geographic Disparities in Preventive Care Utilization Among the 28 provinces/autonomous regions/municipalities analyzed, Beijing, Shanghai, and Xinjiang showed the highest participation rates and numbers of checkup items. Previous studies suggest that regions with higher socioeconomic levels like Beijing and Shanghai have greater government health investment, leading to higher utilization. However, Xinjiang's results are inconsistent with this pattern. Two possible explanations exist: First, Xu et al. found that Xinjiang has well-developed public health services, promoting higher utilization [11]. Second, the sampling method used cluster random sampling at the village/community level, and Xinjiang's smaller sample size may introduce sampling bias, making results less reliable. Therefore, this conclusion should be interpreted cautiously and requires further investigation.

Regarding urban-rural distribution, urban residents utilized health checkup services more than rural residents, consistent with other studies. Compared to rural areas, urban residents have better access to healthcare services, stronger willingness to utilize checkup services, and greater ability to pay for healthcare costs, resulting in higher utilization [12-13].

By economic region, eastern region residents utilized checkup services most, followed by western region, with central and northeastern regions lowest. Previous research shows health checkup utilization correlates with economic level [14], and central regions have better economic conditions than western regions. However, this study found western region utilization significantly higher than central and northeastern regions. One possible explanation is that Ningxia and Tibet were excluded from this analysis, and these areas generally have lower economic levels, potentially leading to overestimation of western region results. This highlights the need to focus on health services in central regions in future analyses to identify specific reasons and inform policy development.

3.2 Differential Influencing Factors Between Urban and Rural Residents Previous studies indicate marital status is an independent factor in healthcare utilization, with divorced individuals hospitalized more frequently than married individuals, though preventive care was not analyzed [15]. This study found that married urban residents utilized more checkup services than those living alone, while no such difference existed in rural areas. The study also confirmed education level's impact on preventive care utilization. Higher education levels are associated with greater emphasis on early disease prevention and diagnosis, leading to higher checkup utilization [16-17].

Research shows women have stronger disease sensitivity and utilize more health services than men under the same health conditions. However, most such studies focus on outpatient and inpatient services rather than preventive care [18]. This study found that rural women utilized fewer checkup services than rural men, while no significant gender difference existed in urban areas. Gender is an

independent influencing factor for rural residents but not for urban residents, consistent with other findings [19-20].

This study found that rural residents with comorbidities utilized more checkup services than those without chronic diseases. Similarly, rural residents with employee medical insurance utilized more services than the uninsured. No such differences existed among urban residents. Possible explanations include: In rural areas with lower economic levels, medical insurance type and health status significantly affect checkup utilization. In contrast, urban areas with higher economic levels have better health service resources, greater equity and accessibility, ensuring most residents can utilize preventive care services regardless of health status or insurance type [21].

This study described overall health checkup utilization among populations in 28 provinces/autonomous regions/municipalities and analyzed influencing factors using 2018 CHARLS data, providing a reference for understanding preventive care utilization in China. Currently, significant urban-rural and regional disparities exist in health checkup utilization. Age and education level are influencing factors for all residents, while gender, comorbidity, and basic medical insurance type are factors specifically for rural residents. Future health policy development and resource allocation should prioritize key regions and populations to improve equity and accessibility of health services.

This study has limitations: First, variables were self-reported by respondents, potentially introducing recall bias for variables like health status. Second, chronic conditions such as hypertension and diabetes may be undiagnosed among those who did not participate in checkups.

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