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Inequalities in health care use among patients with arthritis in China: using Andersen's Behavioral Model

Jinyao Liu¹, Yi Tang¹, Peiyao Zheng³, Mingsheng Chen^{1,2*} and Lei Si⁴

Abstract

Background This study sought to assess socioeconomic-related inequalities in health care use among arthritis patients in China and to analyze factors associated with this disparity.

Methods This study used data from the 2018 China Health and Retirement Longitudinal Study. 3255 arthritis patients were included. The annual per capita household expenditure was used to divide individuals into five categories. We calculated actual, need-predicted, and need-standardized distributions of health care use by socioeconomic groups among people with arthritis. The concentration index (CI) was used to assess inequalities in health service use. Influencing factors of inequalities were measured with the decomposition method.

Results The outpatient and inpatient service use rates among 3255 arthritis patients were 23.13% and 21.41%, respectively. The CIs for actual outpatient and inpatient services use were 0.0449 and 0.0985, respectively. The standardized CIs for both outpatient and inpatient services use increase (CI for outpatient services use = 0.0537; CI for inpatient services use = 0.1260), indicating the emergence of a significant pro-rich inequity. Annual per capita household expenditure was the chief positive contributor to inequity for both outpatient (104.45%) and inpatient services use (105.74%), followed by infrequently social interaction (22.60% for outpatient services use) and Urban Employee Basic Medical Insurance (UEBMI) (11.90% for inpatient services use). By contrast, UEBMI also provided a high negative contribution to outpatient services use (-15.99%).

Conclusions There are significant pro-rich inequalities in outpatient and inpatient services use among patients with arthritis, which are exacerbated by widening economic gaps. Interventions to address inequalities should start by improving the economic situation of lower socioeconomic households.

Keywords Inequalities, Health care utilization, Arthritis, Concentration index, China

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Introduction

Arthritis is a prevalent chronic disease and a leading cause of disabling diseases worldwide, associated with joint damage and impaired quality of life [1, 2]. In China, arthritis or rheumatism is a leading chronic disease and a major comorbidity affecting 39.15% and 58.23% of middle-aged and older adults, respectively [3]. Arthritis places a significant burden on the health care system [3]. The second National Sample Survey on Disability in China in 2006 identified arthritis as the leading cause of physical injury in China, surpassing polio, cerebral palsy, and car accidents [4]. The 2017 Global Economic Burden of Disease Study showed that the global burden of disease due to rheumatoid arthritis was 3.49 million disability-adjusted life years [5]. The China Rheumatoid Arthritis Development Report 2020 reported the total annual economic burden of rheumatoid arthritis at \$902 million in China, with a per capita annual economic burden of \$15,717.91, taking into account the economic burden from the loss of DALYs (disability-adjusted life years) [6]. The expenditures associated with arthritis impose a significant economic burden globally, and its comorbidity increases dramatically with age [1, 7, 8]. Additionally, arthritis is associated with potential loss of wage income and employment opportunities due to its disabling nature [9]. Thus, the substantial risk of arthritis disease is greater than that of some fatal diseases.

Global health systems consistently prioritize health inequities. Additionally, several studies have contributed significantly to various inequality outcomes in arthritis, including economic burden, quality of life, and sex-related differences in health care use [10–12]. However, socioeconomic inequalities in health care use or behavior among arthritis patients remain largely unexplored, although this type of inequality has also been observed in some researches [13–16].

Previous studies have highlighted the economic burden of disease, community care, and pharmaco-economic evaluation in patients with arthritis. However, relatively little attention has been paid to the equity of health service use among these patients in China; to date, the effects of socioeconomic and need factors of patients with arthritis remain unclear. Furthermore, no systematic analysis of health care use inequality and influencing factors among arthritis patients in China has been published. Therefore, this study sought to close these gaps by assessing the equity of health service use among arthritis patients using nationally representative data from the CHARLS 2018. The main objectives of the study were to (1) assess health care use inequities, and (2) analyze the impact of their socioeconomic and need factors on inequalities in health care use. This analysis will help policymakers develop and improve health policies to reduce the economic burden of arthritis in China. To

our knowledge, this study is the first in China to measure health service use equity among patients with arthritis and to explore the impact of related socioeconomic and demand factors.

Materials and methods

Study design and data sources

Data for this study were obtained from the CHARLS 2018, which involved a survey of 28 provinces, 150 counties and districts, and 450 communities and villages in China. It employed a multistage stratified sampling method and conducted household surveys on middle-aged and older people aged 45 and above to collect micro-information data, with a comprehensive and representative sample coverage. This study considered middle-aged and elderly patients with arthritis aged 45 years and above in the CHARLS 2018 data for inclusion into this study. After removing those with missing relevant variables, 3255 individuals were finally included in this study.

Socioeconomic status

As a proxy for socioeconomic status, the annual per capita household expenditure was used in this study to divide individuals into five categories, from the lowest to the highest group [17]. Because the degree of economic development varied between sampling regions, the quintile of socioeconomic status categories was determined within each county or district before being averaged across all sampled counties and districts.

Variables

Dependent variables

We used two health service use variables: outpatient and inpatient services use. For outpatient services use, people with arthritis were asked if they had been to any health facility for an outpatient visit in the last month or had been visited by a health worker or doctor for outpatient care (excluding medical examinations). For inpatient services use, they were asked if they had received inpatient care during the last 12 months. The answers to these questions were coded as dummy variables (0=no, 1=yes).

Independent and control variables

The independent and control variables were selected based on Andersen's healthcare utilization model, which is frequently employed to analyze the associations between individual factors and health services use [18, 19]. The following variables were included to investigate the relationship between socioeconomic status and health care use: age (45–59, 60–74, or ≥75 years), gender (male or female), educational level (uneducated, primary school and below, high school and below, or college and

above), marital status (married and living with spouse, married and spouse do not live together, or no spouse), employment status (unemployed, employed, or retired), Hukou type (agricultural Hukou, non-agricultural Hukou or uniform resident Hukou)(Hukou is a system of population management in China. In the context of healthcare services, hukou often dictates the eligibility for specific types of medical insurance.), social activities (no social activities, daily, weekly, or infrequent), health insurance [none, UEBMI, Urban and Rural Resident Basic Medical Insurance (URRBMI), Urban Resident Basic Medical Insurance (URBMI), New Rural Cooperative Medical Scheme (NRCMS), or others], commercial medical insurance (no or yes), supplementary medical insurance (no or yes), pension (no or yes), self-reported health status (good, fair, or poor), disability (no or yes), mobility (good, fair, or poor), self-care ability (good, fair, or poor), ability to perform daily activities (good, fair, or poor), pain or discomfort (none, somewhat, quite a bit, or very much), anxiety or depression (none, somewhat, or very much), self-treatment (no or yes), sleep time (no or yes), smoking (no or yes), and alcohol consumption (no or yes).

Statistical analysis

Measurement of concentration index

The concentration index (CI) was used to evaluate the equity of health service use. The CI is an important indicator that can measure health and health service equity under different socioeconomic conditions [20]. The CI value equals twice the area between the concentration curve and the absolute equity line and ranges from -1 to 1. The CI is calculated as follows:

$$C = \frac{2}{\mu} \text{cov}(h_i, r_i)$$

where μ is the mean, h_i is the variable reflecting the level of health service use, r_i is the relative fractional rank of an individual i in the distribution of the annual per capita household expenditure, and cov is the covariance. A CI of zero indicates an absolutely fair health service; a negative CI indicates poor health service use, while a positive indicates the tendency for rich health service use. The higher the absolute value of the concentration index, the higher the degree of inequity in health service use.

Decomposition analysis of concentration index

Decomposition of CI was used to analyze the degree of contribution of each influencing factor to inequity [21]. The analysis is based on the level principle that people with the same or similar health service needs should be given the same rights to access health service use. The degree of inequity is quantified as the contribution of each factor to the impact of health services, and the main

cause of the variability is obtained using the measurement method. A positive contribution indicates that the factor increases distributional inequity, and a negative contribution indicates that the factor mitigates inequity.

The CI decomposition results in the following equation.

$$C = \sum_j (\beta_j^m x_j / \mu) C_j + \sum_k (\gamma_k^m z_k / \mu) C_k + GC_z / \mu$$

All analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA) and Stata version 16.0 (Stata Corp., College Station, TX, USA). Two-sided p -value values < 0.05 were considered statistically significant.

Results

Sociodemographic characteristics of patients with arthritis

Table 1 shows the sociodemographic characteristics of the study participants. The outpatient and inpatient services use rates among the 3255 arthritis patients were 23.13% and 21.41%, respectively. The participants were predominantly women ($n=1998$, 61.38%, aged 60–75 years old (49.15%), had medical insurance coverage (96.30%), and had NRCMS as the type of basic medical insurance (66.91%). Notably, patients with lower socioeconomic status were more likely to seek outpatient services than patients with higher socioeconomic status. Significant differences ($p < 0.05$) in various variables, including age, gender, annual per capita household expenditure, social interaction, medical insurance, supplementary medical insurance, health status, disability, mobility, self-care ability, ability to perform daily activities, pain or discomfort, anxiety or depression, self-treatment, sleep time, smoking and alcohol consumption, were observed between individuals who used outpatient services and those who have not. The following variables were observed statistically differences ($p < 0.05$) between individuals who used inpatient services and those who have not: age, marital status, working status, annual per capita household expenditure, medical insurance, supplementary medical insurance, health status, disability, mobility, self-care ability, ability to perform daily activities, pain or discomfort, anxiety or depression, self-treatment, sleep time, smoking and alcohol consumption.

Distribution of health care use among arthritis patients

Table 2 displays the distribution of health care use among arthritis patients. The CIs for actual health service use among arthritis patients were all positive. The indices for inpatient services use were significantly higher than those for outpatient services use (CI for inpatient services use = 0.0985, $p < 0.001$; CI for outpatient services use = 0.0449, $p < 0.05$).

Regarding need-expected, CIs for both outpatient and inpatient services use were negative and statistically

Table 1 Socio-demographic characteristics of the arthritis patients

| | Outpatient services use, n (%) | | P value | Inpatient services use, n (%) | | P value | Total, n = 3255 |
|--|--------------------------------|----------------------|---------|-------------------------------|----------------------|---------|-----------------|
| | No, n = 2502(76.86%) | Yes, n = 753(23.13%) | | No, n = 2558(78.58%) | Yes, n = 697(21.41%) | | |
| Age, years | | | 0.006 | | | < 0.001 | |
| 45–59 | 892(73.84%) | 316(26.16%) | | 997(82.53%) | 211(17.47%) | | 1208 (37.11%) |
| 60–74 | 1263(78.94%) | 337(21.06%) | | 1250(78.13%) | 350(21.88%) | | 1600(49.15%) |
| ≥ 75 | 347(77.63%) | 100(22.37%) | | 311(69.57%) | 136(30.43%) | | 447(13.73%) |
| Gender | | | 0.007 | | | 0.715 | |
| Male | 998(79.40%) | 259(20.60%) | | 992(78.92%) | 265(21.08%) | | 1257(38.61%) |
| Female | 1504(75.28%) | 494(24.72%) | | 1566(78.38%) | 432(21.62%) | | 1998(61.38%) |
| Education level | | | 0.934 | | | 0.275 | |
| Uneducated | 619(76.89%) | 186(23.11%) | | 620(77.02%) | 185(22.98%) | | 805 (24.73%) |
| Primary school and below | 1197(76.93%) | 359(23.07%) | | 1217(78.21%) | 339(21.79%) | | 1556 (47.80%) |
| High School and below | 654(76.94%) | 196(23.06%) | | 687(80.82%) | 163(19.18%) | | 850 (26.11%) |
| College and above | 32(72.73%) | 12(27.27%) | | 34(77.27%) | 10(22.73%) | | 44 (1.35%) |
| Marital status | | | 0.260 | | | 0.001 | |
| Married living with spouse | 1578(76.20%) | 493(23.80%) | | 1652(79.77%) | 419(20.23%) | | 2071(63.62%) |
| Married, not living together with spouse | 178(80.91%) | 42(19.09%) | | 185(84.09%) | 35(15.91%) | | 220(6.75%) |
| No spouse | 746(77.39%) | 218(22.61%) | | 721(74.79%) | 243(25.21%) | | 964 (29.61%) |
| Working status | | | 0.114 | | | < 0.001 | |
| Unemployed | 935(75.89%) | 297(24.11%) | | 898(72.89%) | 334(27.11%) | | 1232 (37.84%) |
| Employed | 1474(77.05%) | 439(22.95%) | | 1579(82.54%) | 334(17.46%) | | 1913 (58.77%) |
| Retired | 93(84.55%) | 17(15.45%) | | 81(73.64%) | 29(26.36%) | | 110(3.37%) |
| Annual per capita household expenditure | | | 0.014 | | | < 0.001 | |
| Quintile 1 (lowest) | 503(80.22%) | 124(19.78%) | | 520(82.93%) | 107(17.07%) | | 627 (19.26%) |
| Quintile 2 | 495(79.84%) | 125(20.16%) | | 508(81.94%) | 112(18.06%) | | 620(19.05%) |
| Quintile 3 | 522(73.83%) | 185(26.17%) | | 565(79.92%) | 142(20.08%) | | 707(21.72%) |
| Quintile 4 | 518(76.18%) | 162(23.82%) | | 505(74.26%) | 175(25.74%) | | 680 (20.89%) |
| Quintile 5 (highest) | 464(74.72%) | 157(25.28%) | | 460(74.07%) | 161(25.93%) | | 621(19.07%) |
| Hukou type | | | 0.778 | | | 0.114 | |
| Agriculture | 2026(76.66%) | 617(23.34%) | | 2086(78.93%) | 557(21.07%) | | 2643(81.20%) |
| Non-agricultural | 451(77.62%) | 130(22.38%) | | 444(76.42%) | 137(23.58%) | | 581(17.85%) |
| Uniform resident households | 25(80.65%) | 6(19.35%) | | 28(90.32%) | 3(9.68%) | | 31(0.95%) |
| Social interaction | | | 0.018 | | | 0.825 | |
| No social activities | 1230(79.20%) | 323(20.80%) | | 1230(79.20%) | 323(20.80%) | | 1553(47.71%) |
| Daily | 636(74.30%) | 220(25.70%) | | 671(78.39%) | 185(21.61%) | | 856(26.30%) |
| Weekly | 260(73.65%) | 93(26.35%) | | 276(78.19%) | 77(21.81%) | | 353(10.84%) |
| Infrequently | 376(76.27%) | 117(23.73%) | | 381(77.28%) | 112(22.72%) | | 493 (15.15%) |
| Medical insurance | | | 0.035 | | | 0.004 | |
| No | 101(84.87%) | 18(15.13%) | | 106(89.08%) | 13(10.92%) | | 119(3.70%) |
| Yes | 2401(76.56%) | 735(23.44%) | | 2452(78.19%) | 684(21.81%) | | 3136(96.30%) |
| Types of basic medical insurance | | | 0.382 | | | 0.085 | |
| No | 121(82.31%) | 26(17.69%) | | 127(86.39%) | 20(13.61%) | | 147(4.52%) |
| UEBMI | 290(78.80%) | 78(21.20%) | | 283(76.90%) | 85(23.10%) | | 368(11.31%) |
| URRBMI | 325(78.13%) | 91(21.88%) | | 338(81.25%) | 78(18.75%) | | 416 (12.80%) |
| URBMI | 91(75.83%) | 29(24.17%) | | 90(75.00%) | 30(25.00%) | | 120 (3.69%) |
| NRCMS | 1657(76.08%) | 521(23.92%) | | 1698(77.96%) | 480(22.04%) | | 2178 (66.91%) |
| Othert | 18(69.23%) | 8(30.77%) | | 22(84.62%) | 4(15.38%) | | 26(0.80%) |
| Commercial medical insurance | | | 0.265 | | | 0.575 | |
| No | 2432(77.01%) | 726(22.99%) | | 2484(78.66%) | 674(21.34%) | | 3158(97.02%) |
| Yes | 70(72.16%) | 27(27.84%) | | 74(76.29%) | 23(23.71%) | | 97(2.98%) |
| Supplementary medical insurance | | | 0.019 | | | 0.012 | |
| No | 2310(77.39%) | 675(22.61%) | | 2362(79.13%) | 623(20.87%) | | 2985(91.71%) |
| Yes | 192(71.11%) | 78(28.89%) | | 196(72.59%) | 74(27.41%) | | 270 (8.29%) |

Table 1 (continued)

| | Outpatient services use, n (%) | | P value | Inpatient services use, n (%) | | P value | Total, n = 3255 |
|--|--------------------------------|----------------------|---------|-------------------------------|----------------------|---------|-----------------|
| | No, n = 2502(76.86%) | Yes, n = 753(23.13%) | | No, n = 2558(78.58%) | Yes, n = 697(21.41%) | | |
| Pension | | | 0.507 | | | 0.677 | |
| No | 267(78.30%) | 74(21.70%) | | 265(77.71%) | 76(22.29%) | | 341(10.48%) |
| Yes | 2235(76.70%) | 679(23.30%) | | 2293(78.69%) | 621(21.31%) | | 2914 (89.52%) |
| Health status | | | < 0.001 | | | < 0.001 | |
| Good | 430(88.84%) | 54(11.16%) | | 430(88.84%) | 54(11.16%) | | 484(14.87%) |
| Fair | 1171(77.86%) | 333(22.14%) | | 1256(83.51%) | 248(16.49%) | | 1504(46.22%) |
| Poor | 901(71.11%) | 366(28.89%) | | 872(68.82%) | 395(31.18%) | | 1267 (38.92%) |
| Disability | | | 0.001 | | | < 0.001 | |
| No | 1406(79.21%) | 369(20.79%) | | 1474(83.04%) | 301(16.96%) | | 1775(54.53%) |
| Yes | 1096(74.05%) | 384(25.95%) | | 1084(73.24%) | 396(26.76%) | | 1480 (45.47%) |
| Mobility | | | 0.001 | | | < 0.001 | |
| Good | 1185(79.91%) | 298(20.09%) | | 1234(83.21%) | 249(16.79%) | | 1483 (45.56%) |
| Fair | 887(74.85%) | 298(25.15%) | | 912(76.96%) | 273(23.04%) | | 1185(36.41%) |
| Poor | 430(73.25%) | 157(26.75%) | | 412(70.19%) | 175(29.81%) | | 587(18.03%) |
| Self-care ability | | | 0.013 | | | < 0.001 | |
| Good | 2168(77.54%) | 628(22.46%) | | 2268(81.12%) | 528(18.88%) | | 2581(85.90%) |
| Fair | 219(70.19%) | 93(29.81%) | | 199(63.78%) | 113(36.22%) | | 512 (9.59%) |
| Poor | 115(78.23%) | 32(21.77%) | | 91(61.90%) | 56(38.10%) | | 162 (4.52%) |
| Ability to perform daily activities | | | < 0.001 | | | < 0.001 | |
| Good | 2022(78.34%) | 559(21.66%) | | 2119(82.10%) | 462(17.90%) | | 2796 (79.29%) |
| Fair | 358(69.92%) | 154(30.08%) | | 352(68.75%) | 160(31.25%) | | 312(15.73%) |
| Poor | 122(75.31%) | 40(24.69%) | | 87(53.70%) | 75(46.30%) | | 147(4.98%) |
| Pain or discomfort | | | < 0.001 | | | < 0.001 | |
| None | 552(84.40%) | 102(15.60%) | | 554(84.71%) | 100(15.29%) | | 654(20.09%) |
| Somewhat | 1216(77.50%) | 353(22.50%) | | 1257(80.11%) | 312(19.89%) | | 1569 (48.20%) |
| Very much | 734(71.12%) | 298(28.88%) | | 747(72.38%) | 285(27.62%) | | 1032 (31.71%) |
| Anxiety or depression | | | < 0.001 | | | < 0.001 | |
| None | 1042(79.54%) | 268(20.46%) | | 1067(81.45%) | 243(18.55%) | | 1310 (40.25%) |
| Somewhat | 1033(77.32%) | 303(22.68%) | | 1069(80.01%) | 267(19.99%) | | 1336 (41.04%) |
| Very much | 427(70.11%) | 182(29.89%) | | 422(69.29%) | 187(30.71%) | | 609(18.71%) |
| Self-treatment | | | < 0.001 | | | 0.006 | |
| No | 829(81.43%) | 189(18.57%) | | 830(81.53%) | 188(18.47%) | | 1018(31.27%) |
| Yes | 1673(74.79%) | 564(25.21%) | | 1728(77.25%) | 509(22.75%) | | 2237 (68.73%) |
| Sleep time | | | 0.043 | | | 0.028 | |
| <6 h | 1572(75.54%) | 509(24.46%) | | 1611(77.41%) | 470(22.59%) | | 2081 (63.93%) |
| 6–8 h | 721(78.71%) | 195(21.29%) | | 748(81.66%) | 168(18.34%) | | 916 (28.14%) |
| >8 h | 209(81.01%) | 49(18.99%) | | 199(77.13%) | 59(22.87%) | | 258(7.93%) |
| Smoking | | | < 0.001 | | | < 0.001 | |
| No | 1864(75.31%) | 611(24.69%) | | 1910(77.17%) | 565(22.83%) | | 2475(76.04%) |
| Yes | 638(81.79%) | 142(18.21%) | | 648(83.08%) | 132(16.92%) | | 780 (23.96%) |
| Alcohol consumption | | | 0.032 | | | < 0.001 | |
| No | 1770(75.87%) | 563(24.13%) | | 1790(76.73%) | 543(23.27%) | | 2333 (71.67%) |
| Yes | 732(79.39%) | 190(20.61%) | | 768(83.30%) | 154(16.70%) | | 922 (28.33%) |

†Represents Government Employee Health Insurance Abbreviations: UEBMI, Urban Employee Basic Medical Insurance; URBMI, Urban Resident Basic Medical Insurance; URRBBI, Urban and Rural Resident Basic Medical Insurance; NRCMS, New Rural Cooperative Medical Scheme

significant (CI for outpatient services use = -0.0089, $p < 0.05$; CI for inpatient services use = -0.0281, $p < 0.001$), indicating that low-income populations have higher needs for both outpatient and inpatient services than high-income populations. After adjusting for health needs, the CIs for both outpatient and inpatient services

use increased (CI for outpatient services use = 0.0537, $p < 0.05$; CI for inpatient services use = 0.1260, $p < 0.001$). Combining the distribution of CIs for actual use and need-standardized showed that inequity in health services was exacerbated after removing the need for health services (Table 2). The gap in health service use between

Table 2 Distribution of actual, need-expected, and need-standardized use of outpatient and inpatient services use among patients with arthritis by socioeconomic status

| Socioeconomic status | Outpatient services use | | | Inpatient services use | | |
|----------------------|-------------------------|---------------|-------------------|------------------------|---------------|-------------------|
| | Actual use | Need-Expected | Need-Standardized | Actual use | Need-Expected | Need-Standardized |
| Quintile 1 (lowest) | 19.97% | 22.90% | 20.05% | 17.23% | 21.90% | 16.31% |
| Quintile 2 | 20.16% | 22.83% | 20.31% | 18.06% | 21.25% | 17.79% |
| Quintile 3 | 26.17% | 23.31% | 25.83% | 20.08% | 20.98% | 20.08% |
| Quintile 4 | 23.82% | 23.18% | 23.63% | 25.74% | 20.63% | 26.07% |
| Quintile 5 (highest) | 25.28% | 22.62% | 25.64% | 25.93% | 20.15% | 26.76% |
| All | 23.18% | 22.98% | 23.18% | 21.45% | 20.97% | 21.45% |
| CI | 0.0449* | -0.0089* | 0.0537* | 0.0985** | -0.0281** | 0.1260** |

Abbreviation CI, concentration index. * $p < 0.05$, ** $p < 0.001$

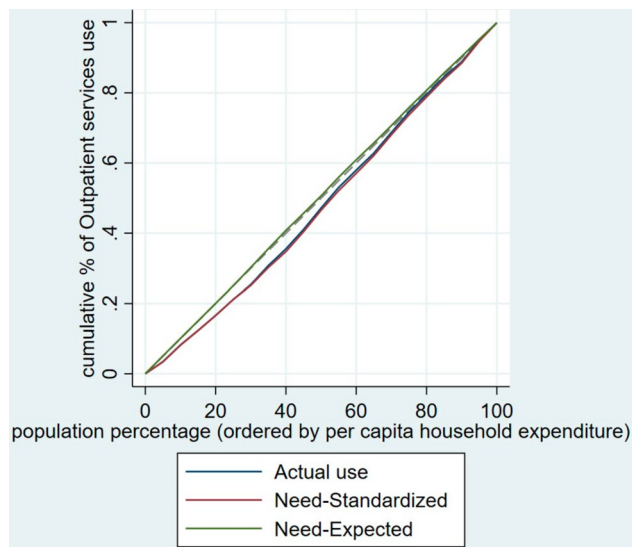


Fig. 1 Concentration curve for the use of outpatient services use among arthritis patients. The figure shows actual cumulative concentration curve for the use of outpatient services use among arthritis patients (including those associated actual use, need-standardized and need-expected)

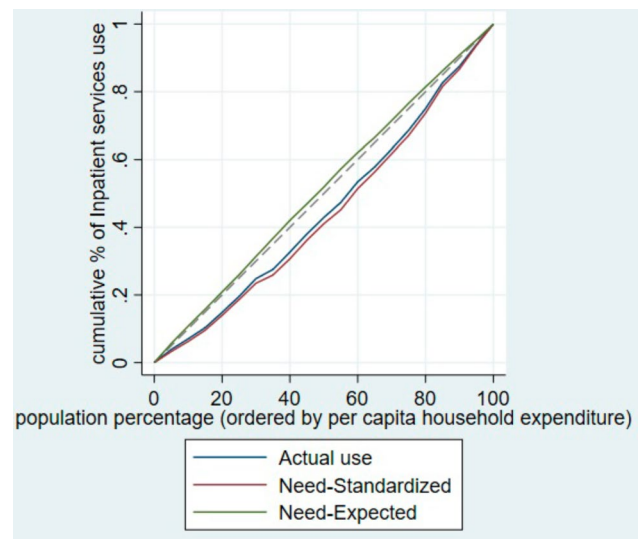


Fig. 2 Concentration curve for the use of inpatient services use among arthritis patients. The figure shows actual cumulative concentration curve for the use of inpatient services use among arthritis patients (including those associated actual use, need-standardized and need-expected)

the groups further widened with economic level, and a significant pro-rich inequity emerged. As shown in Figs. 1 and 2, the concentration curves of actual and standardized outpatient and inpatient services use were all below the line of equality.

Decomposition of inequality in health service use among patients with arthritis

Table 3 presents the decomposition results and the contribution of each influencing factor to inequitable health service use among patients with arthritis. Socioeconomic status was the primary positive contributor to inequity for both outpatient and inpatient services use (104.45% for outpatient services use, 105.74% for inpatient services use), followed respectively by infrequent social interaction (22.60% for outpatient services use) and UEBMI (11.90% for inpatient services use). It is worth noting that UEBMI had a high negative contribution to outpatient services use (-15.99%) but a significant positive

contribution to inpatient services use (11.90%). By contrast, NRCMS had the opposite effect and had a more significant contribution (17.79% for outpatient services use; -13.98% for inpatient services use). Age 60–74 (10.40%), retirement (-16.31%), and supplementary health insurance (11.09%) also had significant contributions to inequitable use of outpatient services use. Among the need variables, a “fair-health” status (11.02%) promoted pro-wealth inequality in outpatient services use, but a “poor-health” status mitigated pro-wealth inequality (-18.87% for outpatient services use). The remaining variables contributed relatively insignificantly to inequitable provision (Table 3).

Discussion

To our knowledge, this is the first study in China to examine equity in health service use among patients with arthritis. From an equity standpoint, this study examined the association between socioeconomic status and

Table 3 Decomposition of inequality in health service use for patients with arthritis

| Variable | Outpatient services use | | | Inpatient services use | | |
|--|-------------------------|---------|--------------------|------------------------|---------|--------------------|
| | Elasticity | CI | Contribution to CI | Elasticity | CI | Contribution to CI |
| Age (Ref: 45–59) | | | | | | |
| 60–74 | -0.1136 | -0.0411 | 10.40% | 0.0466 | -0.0411 | -1.94% |
| ≥ 75 | -0.0176 | -0.0340 | 1.33% | 0.0470 | -0.0340 | -1.62% |
| Gender (Ref: Male) | | | | | | |
| Female | -0.0165 | 0.0105 | -0.39% | -0.1814 | 0.0105 | -1.93% |
| Education level (Ref: uneducated) | | | | | | |
| Primary school and below | 0.0071 | -0.0338 | -0.54% | 0.0098 | -0.0338 | -0.34% |
| High School and below | 0.0096 | 0.1807 | 3.87% | 0.0035 | 0.1807 | 0.65% |
| College and above | 0.0033 | 0.6118 | 4.53% | 0.0007 | 0.6118 | 0.44% |
| Marital status (Ref: married living with spouse) | | | | | | |
| Married not living with spouse | -0.0209 | 0.1687 | -7.84% | -0.0170 | 0.1687 | -2.92% |
| No spouse | -0.0272 | 0.0037 | -0.22% | -0.0082 | 0.0037 | -0.03% |
| Employment status (Ref: unemployed) | | | | | | |
| Employed | 0.0343 | -0.0705 | -5.39% | -0.0803 | -0.0705 | 5.74% |
| Retired | -0.0140 | 0.5240 | -16.31% | -0.0017 | 0.5240 | -0.93% |
| Annual per capita household expenditure | | | | | | |
| | 0.7673 | 0.0611 | 104.45% | 1.7060 | 0.0611 | 105.74% |
| Hukou type (Ref: Agriculture) | | | | | | |
| Non-agricultural | -0.0032 | 0.3930 | -2.80% | 0.0139 | 0.3930 | 5.55% |
| Uniform resident households | -0.0028 | 0.0994 | -0.61% | -0.0061 | 0.0994 | -0.61% |
| Social interaction (Ref: No social activities) | | | | | | |
| Infrequently | 0.0723 | 0.1402 | 22.6% | 0.0452 | 0.1402 | 6.43% |
| Daily | 0.0270 | 0.0261 | 1.57% | 0.0215 | 0.0261 | 0.57% |
| Weekly | 0.0148 | 0.0072 | 0.24% | 0.0302 | 0.0072 | 0.22% |
| Medical insurance (Ref: No) | | | | | | |
| Yes | 0.4021 | 0.0077 | 6.89% | 0.4417 | 0.0077 | 3.44% |
| Types of medical insurance (Ref: No) | | | | | | |
| UEBMI | -0.0156 | 0.4603 | -15.99% | 0.0255 | 0.4603 | 11.90% |
| URRBMI | -0.0246 | -0.0627 | 3.44% | 0.0099 | -0.0627 | -0.63% |
| URBMI | -0.0048 | 0.3177 | -3.38% | 0.0113 | 0.3177 | 3.65% |
| NRCMS | -0.0967 | -0.0825 | 17.79% | 0.1669 | -0.0825 | -13.98% |
| Other† | 0.0016 | 0.4777 | 1.67% | -0.0027 | 0.4777 | -1.30% |
| Commercial Medical Insurance (Ref: No) | | | | | | |
| Yes | -0.0041 | 0.3493 | -3.18% | -0.0061 | 0.3493 | -2.18% |
| Supplementary Medical Insurance (Ref: No) | | | | | | |
| Yes | 0.0256 | 0.1944 | 11.09% | 0.0394 | 0.1944 | 7.78% |
| Pension (Ref: None) | | | | | | |
| Yes | -0.0162 | 0.0108 | -0.39% | -0.1402 | 0.0108 | -1.54% |
| Health Status (Ref: good) | | | | | | |
| Fair | 0.2177 | 0.0227 | 11.02% | 0.0961 | 0.0227 | 2.22% |
| Poor | 0.2565 | -0.033 | -18.87% | 0.2532 | -0.0330 | -8.48% |
| Disability (Ref: No) | | | | | | |
| Yes | 0.0669 | -0.0596 | -8.89% | 0.1061 | -0.0596 | -6.41% |
| Mobility (Ref: No problem) | | | | | | |
| There are some questions | 0.0201 | -0.0119 | -0.53% | 0.0180 | -0.0119 | -0.22% |
| There are serious problems | 0.0197 | -0.0623 | -2.74% | 0.0173 | -0.0623 | -1.09% |
| Self-care ability (Ref: No problem) | | | | | | |
| There are some questions | 0.0026 | -0.0883 | -0.51% | 0.0297 | -0.0883 | -2.67% |
| There are serious problems | -0.0107 | 0.0401 | -0.96% | -0.0083 | 0.0401 | -0.34% |
| Ability to perform daily activities (Ref: No problem) | | | | | | |
| There are some questions | 0.0232 | -0.0629 | -3.25% | 0.0241 | -0.0629 | -1.54% |
| There are serious problems | 0.0029 | 0.0141 | 0.09% | 0.0385 | 0.0141 | 0.55% |
| Anxiety or depression (Ref: No problem) | | | | | | |

Table 3 (continued)

| Variable | Outpatient services use | | | Inpatient services use | | |
|--|-------------------------|---------|--------------------|------------------------|---------|--------------------|
| | Elasticity | CI | Contribution to CI | Elasticity | CI | Contribution to CI |
| Age (Ref: 45–59) | | | | | | |
| There are some questions | -0.0282 | 0.0009 | -0.06% | -0.0127 | 0.0009 | -0.01% |
| There are serious problems | 0.0337 | -0.0759 | -5.70% | 0.0416 | -0.0759 | -3.21% |
| Pain or discomfort (Ref: No problem) | | | | | | |
| There are some questions | 0.0692 | 0.0124 | 1.91% | 0.0533 | 0.0124 | 0.67% |
| There are serious problems | 0.0800 | -0.0544 | -9.69% | 0.0475 | -0.0544 | -2.62% |
| Self-treatment (Self-purchased medication, Ref: No) | | | | | | |
| Yes | 0.1092 | 0.0040 | 0.97% | 0.0113 | 0.0040 | 0.05% |
| Sleep time (Ref: <6 h) | | | | | | |
| 6–8 h | -0.0093 | -0.0214 | 0.44% | -0.0055 | -0.0214 | 0.12% |
| > 8 h | -0.0084 | -0.1460 | 2.75% | 0.0101 | -0.1460 | -1.49% |
| Smoking (Ref: No) | | | | | | |
| Yes | -0.0565 | -0.0434 | 5.47% | -0.0634 | -0.0434 | 2.79% |
| Drinking (Ref: No) | | | | | | |
| Yes | -0.0228 | 0.0376 | -1.91% | -0.0631 | 0.0376 | -2.41% |

†Represents Government Employee Health Insurance. *Abbreviations* UEBMI, Urban Employee Basic Medical Insurance; URBMI, Urban Resident Basic Medical Insurance; URRBBI, Urban and Rural Resident Basic Medical Insurance; NRCMS, New Rural Cooperative Medical Scheme

health service use among Chinese patients with arthritis. The results indicate that patients with a higher socioeconomic status are more likely to access health care services than those with a lower socioeconomic status; the gap widened after controlling for age, gender, and other need factors.

We found that the need-expected CIs of the study participants were all negative, indicating that people with lower incomes had greater levels of need for health services than those with higher incomes. The needs-expected CIs of the participants decreased with improvements in their economic status, resulting in an inverted triangular distribution. However, both the actual and standard use of health services exhibited a positive triangular distribution. This indicates a disparity between the need and use of health services in the population, demonstrating the inequitable phenomenon of “high need, low utilization” and “low need, high utilization” consistent with the findings of previous research [22]. After adjustment for health needs, the CI increased marginally, indicating that health services are increasingly skewed toward the wealthy and that health use inequity increases with economic disparities.

In the present study, the decomposition of the CIs revealed that socioeconomic status was the most significant factor positively influencing equity in health service use [23–25]. In China, the economic disparities among patients with arthritis widened the disparities their use of health services. Notably, about 37.84% of patients in the present study were unemployed, and 45.47% were persons with disabilities. A study examining the relationship between socioeconomic status and functional status in patients with rheumatoid arthritis revealed that patients with a lower socioeconomic status had a worse

functional status, which deteriorated more quickly over time [13]. Compared to other chronic diseases, arthritis has a higher disability rate but a lower mortality rate [4], which has a significant influence on the quality of life and employment status of patients with arthritis [14, 16, 26]. Another study on the socioeconomic status of individuals with arthritis found substantial socioeconomic disparities among people with rheumatoid arthritis [15]. Most individuals with rheumatism have a lower socioeconomic status. Arthritis imposes a significant financial burden on patients and their families due to the low disability and tenacity of the disease. Hence, economically disadvantaged families are likely to enter a vicious cycle of “poverty due to illness and illness due to poverty” [27].

Varied utilization between inpatient and outpatient service among Chinese patients with arthritis was found in these study, which could be because hospitalization is notably more expensive than outpatient care [28, 29]. The medical expenses (including medical and surgical treatment) and non-medical costs (including transportation, caregiver costs, lost productivity, and reduction of household income) of hospitalization exacerbate the burden of health care use. Households with lower socioeconomic status have difficulty affording the high cost of hospitalization and tend to seek outpatient services instead, which are less expensive [30]. Therefore, more attention should be paid to inequalities in arthritis patients’ use of inpatient services.

It is well-known that health insurance schemes are associated with health care use. This study found that health insurance contributed positively to inequalities in health service use, indicating that insured individuals were more likely to use health services than uninsured individuals. This result is consistent with findings from

prior studies [31, 32]. However, when looking at specific types of health insurance, the contribution of health insurance to health service uses is not significant for outpatient or inpatient services use, except for UEBMI with NRCMS. This finding could be related to the reimbursement mechanisms of the various health insurance plan categories [33]. A study of rheumatoid arthritis patients in the United States revealed that Medicaid patients received less care from rheumatologists and fewer prescriptions than patients with private insurance [34]. Hence, it is crucial to reduce the gap in reimbursement across various insurance policies, and the benefit package should be tailored to the actual income level and health requirements of patients.

UEBMI has a protective effect on outpatients by reducing their financial burden, but it increases inequality in inpatient use. This outcome may be because the reimbursement rate of UEBMI is higher than that of other insurances, so UEBMI enrollees are more likely to use more expensive medical services. Additionally, from the perspective of the patients' socioeconomic status, patients with arthritis who were covered by UEBMI were typically urban employees with higher levels of income and education than those enrolled in other health insurance plans [35]. Hence, they had a stronger incentive to use health care. However, the findings of this study indicate that NRCMS has a protective effect on inpatients, but it increases inequality in outpatient use. Inpatient services use generates a greater economic risk than outpatient services use when considering the economic risk associated with illness [36]. Most NRCMS enrollees tend to have lower socioeconomic status. Hence, the NRCMS protects low-income patients from incurring catastrophic hospitalization expenses.

In our study, we found that age had a limited contribution to healthcare utilization, with only the 60–74 age group providing a 10.40% contribution to outpatient service utilization, which is different from previous studies [37, 38]. One potential explanation for this outcome may lie in the demographic composition of the sample, given that only 13.73% of participants were aged ≥ 75 years. We have also observed that infrequent social interaction and fair health status contribute to the inequality in the use of outpatient services, which may be interrelated. We inferred that the fair health status partially constrains the social interaction activities of arthritis patients and impedes their access to outpatient services. Compared to individuals in good or poor health status, those with fair health status often have their healthcare needs overlooked, potentially resulting in inadequate utilization of outpatient services. This could provide a more comprehensive explanation for why 60–74 age group contributes to the inequality in outpatient services use. However, poor health status mitigated this disparity, indicating

that arthritis patients with poor health status are more inclined to seek healthcare services [39].

Consistent with the findings of previous studies, socioeconomic status, type of health insurance, and educational level all contributed to disparities in health care use among patients with arthritis [40]. Higher-income groups have greater access to higher-quality education, health care, and dietary practices. Due to the significant socioeconomic disparity between patients with arthritis, the low-income group is initially drawn into a vicious cycle of “poverty due to illness and illness due to poverty”. This factor also adequately explains the pro-rich contribution of socioeconomic status to arthritis patients' use of health care services. To promote health equity, policy-makers should focus on narrowing the gap between the wealthy and poor and reducing socioeconomic status inequality.

The findings of this study provide some evidence for promoting equity in the use of health services by patients with arthritis. However, there are some limitations to our investigation. First, because the information on the diagnosis of disease and related health services was self-reported, recall bias cannot be eliminated, which can bias the prevalence estimates of arthritis. Future studies should use additional data sources and methods to compensate for these biases. The cross-sectional nature of this study precludes us from discussing the results in terms of causal inference.

Conclusions

In China, there are significant differences in the use of health services among patients with arthritis of varying socioeconomic status, with a skew toward those in higher socioeconomic groups. Socioeconomic status and health insurance are correlated with inequality.

Abbreviations

| | |
|-------------|---|
| CHARLS 2018 | 2018 China Health and Retirement Longitudinal Study |
| CI | Concentration Index |
| UEBMI | Urban Employee Basic Medical Insurance |
| URRBMI | Urban and Rural Resident Basic Medical Insurance |
| URBMI | Urban Resident Basic Medical Insurance |
| NRCMS | New Rural Cooperative Medical Scheme |

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Author contributions

JinYao Liu contributed to the Formal analysis, Validation, Visualization, Writing – original draft, Writing – review & editing. Mingsheng Chen contributed to the Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. Yi Tang contributed to the Formal analysis, Validation, Visualization Writing – review & editing. Peiyao Zheng & Lei Si contributed to the Project administration, Supervision, Validation, Writing – review & editing. All authors reviewed and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations**Ethical approval**

This article does not contain any research conducted by the authors involving human participants or animals. Informed consent was obtained from all participants in the study. Ethical approval for all the CHARLS waves was granted from the Institutional Review Board at Peking University. The IRB approval number for the main household survey, including anthropometrics, is IRB00001052-11015; the IRB approval number for biomarker collection, was IRB00001052-11014.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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