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Dynamic effects of outpatient pooling scheme on socioeconomic inequality in healthcare utilization in China from 2011 to 2020

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Despite achieving universal health coverage (UHC), socioeconomic inequalities in healthcare utilization persist in China, particularly in outpatient care, due to limited financial protection. To address this gap, the Chinese government introduced an outpatient pooling scheme under the Urban Employee Basic Medical Insurance (UEBMI), aimed at reducing cost-sharing burdens. This study evaluates the policy's impact on socioeconomic disparities in outpatient care utilization from 2011 to 2020, providing critical insights into the role of insurance reforms in promoting health equity. Leveraging nationally representative longitudinal data from five waves (2011–2020) of the China Health and Retirement Longitudinal Study (CHARLS), we employed a quasi-experimental design to assess outpatient care utilization across multiple dimensions: visit probability, facility type (hospitals vs. primary care), expenditures, and out-of-pocket (OOP) payments. Propensity score matching (PSM) was utilized to mitigate selection bias, creating balanced cohorts between policy-implementing and non-implementing regions. Socioeconomic inequality was quantified using concentration indices (CI), and decomposition analyses were conducted to isolate the policy's contribution to temporal changes in inequality. The outpatient pooling scheme significantly reduced pro-rich inequality in outpatient visits, with the CI decreasing from 0.1142 in 2011 to 0.0972 in 2020, and the policy contributing 4.14% to this decline. However, disparities in facility utilization widened: the CI for hospital visits increased from 0.0069 to 0.0431, while primary care visits shifted from 0.0064 to -0.1091, indicating growing pro-poor inequality in primary care use. Despite persistent pro-rich inequalities in expenditures and OOP payments, their CI values declined substantially, with the policy playing a key role in driving this equitable trend. Notably, the policy's counteractive effects mitigated the worsening disparities in facility utilization over time. The outpatient pooling scheme effectively reduced pro-rich inequalities in outpatient care access and expenditures, demonstrating its potential to enhance financial protection for low-income populations. However, the widening gaps in facility utilization highlight the need for complementary interventions, such as improving primary care quality and optimizing resource allocation, to address systemic inequalities. These findings underscore the importance of integrating financial reforms with structural improvements to achieve equitable healthcare delivery in China and other low- and middle-income countries.

Keywords Outpatient pooling scheme, Health equity, Socioeconomic inequality, Healthcare utilization, China, Insurance reform

Abbreviations

OOP	out-of-pocket
CI	concentration index
UHC	universal health coverage
SHI	social health insurance
UEBMI	Employee Basic Medical Insurance

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NCMS	the New Cooperative Medical Scheme
URBMI	Urban Resident Basic Medical Insurance
MSAs	medical savings accounts
SPAs	social-risk pooling accounts
CHARLS	China Health and Retirement Longitudinal Study
SES	socio-economic status
SMI	supplementary medical insurance
PSM	Propensity Score Matching
ATE	average treatment effect. IMR: inverse Mills ratio
GP	general practice

Background

Ensuring universal health coverage (UHC) with equitable access to healthcare and mitigating financial risks has consistently constituted the fundamental objective of healthcare policies[1,2]. Over the preceding decades, the Chinese government has undertaken a sequence of healthcare reforms with the aim of achieving UHC. Presently, over 95% of the population is encompassed within one of the three distinct social health insurance schemes (SHI) in China: The Urban Employee Basic Medical Insurance (UEBMI), the New Cooperative Medical Scheme (NCMS), and the Urban Resident Basic Medical Insurance (URBMI)[3]. Notably, the Chinese SHI system is distinguished by its commitment to equity, wherein all enrollees are entitled to an identical level of compensation for medical expenses and an equivalent benefit package[3].

Despite the notable achievements of the Chinese SHI in enhancing the accessibility, affordability, and appropriateness of healthcare, discernible disparities persist in both the quantity and nature of outpatient care utilization[4]. Notably, individuals with higher incomes exhibit a greater propensity for specialist visits, while those with lower incomes tend to favor general practitioner consultations[5]. This variance is, in part, attributable to the inadequately low compensation levels designated for outpatient expenses[6,7].

During its initial phases, the benefit package of the Chinese SHI system predominantly prioritized inpatient care, deeming it a primary contributor to households' catastrophic health expenditure. However, this approach overlooked the imperative need for financial support directed towards outpatient services. Consequently, individuals possessing social or economic advantages tend to derive greater benefits from SHI in comparison to their disadvantaged counterparts. This stems from the fact that the high out-of-pocket (OOP) payments associated with outpatient care impede access for low-income groups[7].

In contrast to inpatient services, outpatient care exhibits a heightened frequency of utilization and holds the capacity to address a majority of healthcare needs, particularly for individuals contending with chronic diseases and the elderly[8,9]. Timely access to outpatient care stands as a pivotal factor in mitigating delays in disease treatment, thereby optimizing the effectiveness of early prevention and intervention strategies[10–12]. Evidently, the presence of financial impediments to outpatient care for disadvantaged populations presents a formidable challenge in ensuring healthcare equity.

In an effort to enhance financial protection for outpatient care, certain municipalities, such as Beijing and Shanghai, have undertaken initiatives to implement an outpatient pooling scheme within China's Urban Employee Basic Medical Insurance (UEBMI) framework. Preceding the introduction of the outpatient pooling scheme, UEBMI enrollees covered their outpatient expenses through medical savings accounts (MSAs), while inpatient expenditures were addressed through social-risk pooling accounts (SPAs). In cases where outpatient charges exceeded the available funds in MSAs, patients were ineligible for additional insurance reimbursement[13]. Subsequent to the reform, the average reimbursement rate for outpatient care witnessed a substantial increase, rising from 0% to approximately 60%, and enrollees were exempted from additional premium payments. In April 2021, the Chinese government formally issued a guideline outlining the establishment of a mutual assistance security mechanism for outpatient care under UEBMI[14]. The central focus of this guideline is the gradual establishment of a pooling scheme for the costs associated with outpatient services. The implementation of the outpatient pooling scheme entails that outpatient expenditures become eligible for reimbursement, thereby substantially mitigating financial barriers to outpatient care, particularly for the low-income groups. Nevertheless, the question remains as to whether persistent disparities in outpatient care will be effectively alleviated.

While substantial research has examined how reduced cost-sharing affects outpatient care utilization, health outcomes, and medical expenditures[15–18], few studies have specifically investigated its implications for healthcare equity. From a theoretical perspective, decreasing patients' financial burden for outpatient services should disproportionately benefit economically disadvantaged populations due to their greater price elasticity of demand for healthcare services[19]. This price sensitivity suggests that cost-sharing reductions could potentially narrow utilization gaps between socioeconomic groups.

However, this theoretical benefit must be considered alongside persistent structural inequalities in healthcare systems. Wealthier individuals typically enjoy superior access to health-enabling resources, including comprehensive insurance coverage, proximity to high-quality facilities, and greater health literacy[20]. These systemic advantages may attenuate the equity-enhancing potential of financial reforms. This tension between financial accessibility and structural barriers creates a crucial research gap that our study addresses.

The Chinese context presents additional complexity due to pronounced disparities in resource distribution between tertiary hospitals and primary care facilities[21]. While reduced cost-sharing might improve overall access, it could simultaneously exacerbate inequalities in service quality. Higher-income patients may leverage decreased financial barriers to preferentially access advanced services at tertiary hospitals, while lower-income groups remain constrained to primary care facilities with more limited resources. This potential divergence underscores the need to examine not just whether utilization increases, but how it changes across different facility types and socioeconomic groups.

This study empirically evaluates how China's outpatient pooling scheme affected socioeconomic inequalities in outpatient care utilization using nationally representative longitudinal data (2011–2020). We employed advanced econometric methods to: (1) quantify the policy's overall contribution to healthcare equity, and (2) examine differential effects across facility types (hospitals vs. primary care centers). Our longitudinal approach provides novel insights into the temporal dynamics between cost-sharing reforms and equity outcomes, addressing critical gaps in the literature on financial protection policies. The findings offer evidence-based guidance for optimizing China's insurance benefit design while serving as a valuable reference for other countries pursuing equitable healthcare reforms.

Methods
Data source
The data for this study were sourced from the China Health and Retirement Longitudinal Study (CHARLS), a comprehensive survey conducted every 2–3 years, targeting a nationally representative sample of individuals aged 45 and above in China[22]. CHARLS is a true longitudinal panel survey that follows the same nationally representative sample of Chinese community-dwelling individuals aged 45 years and older, including their spouses, across successive waves starting from the 2011 baseline. It captures longitudinal information on health, socio-economic status (SES), and social and family networks. Ethical approval for the survey was granted by the Peking University Biomedical Ethics Review Committee (approval number: IRB00001052-11015), and detailed procedures of CHARLS have been previously outlined[22].

For this study, we utilized data from five waves (2011, 2013, 2015, 2018, and 2020) of CHARLS. Given the focus on evaluating the impact of outpatient pooling in the UEBMI on healthcare equity, participants not covered by UEBMI or with missing health insurance status were excluded. Respondents with missing values in key covariates (e.g., gender, age, marital status) were also excluded. The final dataset comprised 13,667 individual-level observations, distributed across 105 prefectures (2011 wave: 2,242; 2013 wave: 2,640; 2015 wave: 2,977; 2018 wave: 3,075; 2020 wave: 2,733). Figure S1 provided details on sample selection.

Measures
Outcome variables
Our study examined five key outcome variables measuring outpatient service utilization, derived from the CHARLS survey instruments and aligned with established literature[15,16,23]. The binary indicator of any outpatient visits within the previous month (1 = yes, 0 = no) served as our primary outcome, analyzed across all available CHARLS waves (2011, 2013, 2015, 2018, and 2020). For respondents reporting outpatient visits, we examined three additional dimensions of care utilization, all limited to waves 2011–2018 since the 2020 CHARLS wave only collected data on visit occurrence: (1) Hospital-based visits (1 = any hospital visits in previous month, 0 = no), (2) Primary care facility visits (1 = any community health center/clinic visit, 0 = no), (3) continuous measures of total outpatient expenditures and OOP payments (log-transformed to address right-skewness). While the CHARLS dataset does include information on the number of visits, these variables are not suitable for using concentration indices and decomposition techniques. Additionally, the outpatient expenditure variable captures the intensity of outpatient utilization, as reflected by the number of treatments. These variables capture both the extensive margin (access) and intensive margin (utilization intensity) of outpatient care.

Explanatory variable
The rollout of the outpatient pooling scheme followed a staggered, pilot-and-expansion approach, typically initiated in more economically developed prefectures before expanding to others, creating the geographic and temporal variation essential for our identification strategy. To operationalize the outpatient pooling scheme intervention, we constructed a treatment variable through the following procedure: First, we systematically collected policy implementation dates for each prefecture from official government publications and municipal health bureau announcements. By cross-referencing these implementation timelines with respondents' prefecture of residence (available in CHARLS data), we created a time-varying treatment indicator. This binary variable was coded as 1 for respondents residing in prefectures that had implemented the scheme by the survey year, and 0 for those in non-implementing prefectures or surveyed before their prefecture's implementation date. As of 2020, the scheme had been adopted in 31 prefectures (Supplementary Table S1), creating a natural experimental setting with geographic and temporal variation in policy exposure. This approach enabled us to compare outcomes between treated and control groups while accounting for the staggered adoption of the reform.

Covariates
Following the Anderson Health Services Utilization Model[24–26], three categories of variables were included in the empirical analysis: predisposing characteristics (age, gender, marital status), enabling resources (education status, employment status, socioeconomic status [SES], residency, supplementary medical insurance [SMI], pension insurance), and need factors (chronic disease status, self-reported health status, functional disability) (Fig. 1). Prefecture-level variables (GDP per capita, health workers, and beds per 1,000 people) obtained from provincial health statistics reports were also controlled. Supplementary Table S2 provides a concise overview of the variables.

Notably, individual SES is a principal focus in this study. Recognizing the stability of self-reported consumption expenditures as a superior indicator of household economic status in developing countries

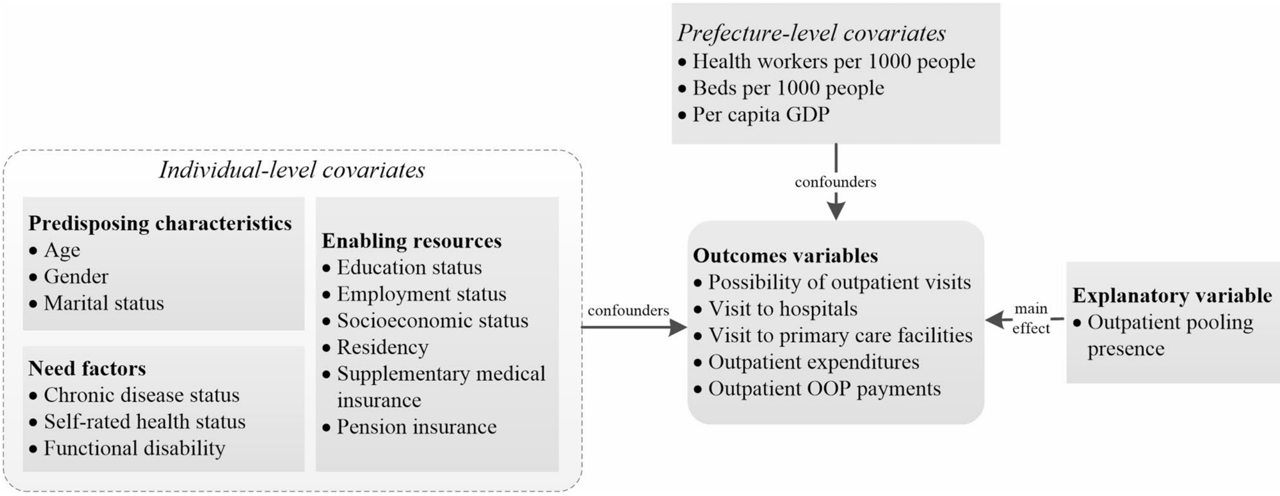

Fig. 1. Framework for variable construction by category.

compared to income[27,28], CHARLS data on household consumption expenditures were considered. To account for economies of scale and the differing needs of household members, we used the OECD-modified equivalence scale to calculate per capita household consumption expenditure. This scale assigns a value of 1 to the first adult, 0.5 to each subsequent adult (aged 14 and over), and 0.3 to each child (aged 13 and under). The total household consumption expenditure was then divided by the sum of these equivalence values to obtain the equivalized expenditure per adult, served as the SES measure[29]. Observations were subsequently categorized into five equally sized groups representing socioeconomic levels, ranging from the lowest (quintile 1) to the highest (quintile 5), based on household expenditure per equivalent adult.

Statistical analyses
Propensity score matching (PSM)
Owing to the differences of pretreatment characteristics between the treated (prefectures where outpatient pooling was implemented) and the control group (prefectures where outpatient pooling was not implemented), a direct comparison could overlook potential confounding factors that affect health care equity. The propensity score matching (PSM) was implemented separately for each wave to reduce potential confounding effects and eliminate the influence of selection bias[30].

To match the treated and control group, the propensity scores from logistic regression were estimated using covariates. Then, based on propensity scores, the nearest-neighbor matching was adopted to select enrollees who are on common support for data analysis and others are excluded. After matching, the average treatment effect (ATE) was calculated following the formula[31]:

$$ATE = E_{P(X)T=1}\left\{E\left[Y^{T}|T=1,P(X)\right]-E\left[Y^{C}|T=0,P(X)\right]\right\}$$

Where ATE is the average treatment effect on the treated coefficient for outcome Y. T and C represent the treatment and the control group respectively. $P\left(X\right)$ is the propensity index.

It is worth noting that data are truncated in our sample, that is, only those had outpatient visit in the past month were asked about types of medical facilities and outpatient expenditures. Considering selection bias, we used a maximum likelihood estimation based on Heckman's method to calculate inverse Mills ratio (IMR)[32]. We firstly estimated a probit selection equation for outpatient visit probability, and calculated the IMR. When calculating the propensity score using types of medical facilities and outpatient expenditures as outcomes, an IMR served as a correction factor was introduced into the model[33]. The IMR, estimated from a first-stage probit model predicting visit probability, captures the correlation between unobserved factors affecting visit likelihood and outcomes. By including it in the outcome regression post-PSM, we sought to adjust for these unobservable selection biases while leveraging PSM's strength in balancing observed confounders. Supplementary Figure S2 provides the distribution of IMR.

Measuring inequality
The concentration index (CI) quantifies the degree of socioeconomic related inequality in outpatient care utilization. Using matched sample, we respectively calculated the (CI) of dependent variables in treated and control group for each wave. The value of CI ranges between − 1 and 1 with a negative value indicating that individuals with a lower SES use more health care services and vice versa[34,35]. The CI formula is as follows:

$$\mathrm{C}=\frac{2}{\mu}COV(y,\gamma)$$

y represents the healthcare utilization indicators, r is a fractional rank in the socioeconomic distribution, μ represents the mean of y, and $cov$is the covariance between the healthcare utilization variable and the fractional rank of SES.

Decomposing inequality and changes in inequality

In order to quantify the contribution of outpatient pooling scheme to the healthcare inequality, we followed the method proposed by Wagstaff et al. to decompose CI[36]. Firstly, regression model on the outcome variable was established:

$$y_i = a^m + \sum_k \beta_k^m x_{ki} + \mu_i$$

Where β_k^m is the marginal effect $(\mathrm{dy/dx})$ of each x; μ_i indicates the error term generated by the regression model. In this study, the Ordinary Least Squares-based linear regression for continuous variables and logistic regression for binary variables were established separately.

The CI of outcome variables can be expressed as:

$$\mathrm{C} = \sum_k (\beta_k \bar{x_k} / \mu) c_k + GC_\epsilon / \mu$$

Where β_k is the marginal effect of x_k; $\bar{x_k}$ and $c_k$are the mean and the concentration index of x_k; μ is the mean of y; GC_ϵ is the generalized concentration index for ε. The contribution of outpatient pooling scheme to the inequity was presented as an absolute value and a percentage value.

Additionally, we also performed the Oaxaca-type decomposition method to determine the contribution of outpatient pooling scheme to the changes of the CI of outpatient care utilization over the period from 2011 to 2020[37]. The decomposition formula is as follows:

$$\Delta \mathrm{C} = \sum_k \eta_{kt}(c_{kt} - c_{kt-1}) + \sum_k c_{kt-1}\left(\eta_{kt} - \eta_{kt-1}\right) + \Delta\left(GC_{\epsilon t} \Big/ \mu_t\right)$$

Where η_{kt-1} and η_{kt} represent the elasticities of explanatory variables in initial period (2011 wave) and final period (2013 wave, 2015 wave, 2018 wave and 2020 wave), respectively. Accordingly, c_{kt} and c_{kt-1} are the normalized CIs of explanatory variables in these two periods, respectively. The changes in inequality can be attributed to two changes: $(\Delta\ \mathrm{c}^*\eta\ \mathrm{k})$as a result of distribution differences of the explanatory variables in different years; and (2) elasticity change $(\Delta\ \mathrm{c}^*\eta\ \mathrm{k})$ as a result of differential responses of the outcome variable to the explanatory variables in different years[38]. This decomposition technology allows us to observe the long-term impacts of outpatient pooling on health care equity.

All data management and statistical analysis were performed on STATA version 15.0 and a p-value of less than 0.05 was considered to be statistically significant.

Results

Descriptive statistics

Table 1 presents the characteristics of the study participants. Regarding the outcome variables, approximately 20% of respondents reported outpatient visits in the past month during each wave of investigation. Among these outpatient visits, the majority opted for hospital treatment, while around one-third chose primary healthcare facilities. Outpatient expenditures and OOP payments exhibited an increase from 523.47 (231.56) yuan and 253.07 (121.35) yuan in 2011 to 1361.42 (414.09) yuan and 870.26 (334.51) yuan in 2018, respectively. The proportion of observations from prefectures implementing the outpatient pooling scheme ranged from 22.3% to 32.5%.

The mean age of all participants was 60.68 (10.26) years in 2011, rising to 62.38 (10.24) years in 2020. The majority of respondents were male (56.7–59.6%), married (86.5–90.3%), middle school graduates (59.1–65.2%), unemployed (52.3–60.9%), and residing in urban areas (82.2–89.3%). Additionally, about half of the individuals (47.8–56.9%) rated their health as fair, with the proportion of participants reporting chronic diseases and functional disability increasing over the observation period.

Inequality in outpatient care utilization in treatment and control groups

Utilizing the PSM approach helped mitigate potential confounding effects. Supplementary Tables S3 presents an evaluation of the matching quality for the main variables of interest in our study. We can observe that the pseudo-R2 is substantially reduced after matching. Thus, the distribution of these variables between the control and treated groups does not differ after matching. Furthermore, matching substantially reduced the mean biases in the observed covariates included in the models. As recommended, Rubin's B is <25 and Rubin's R is between 1 and 2 for all variables. Table S4 shows the non-overlapping observations after matching. We excluded these samples and conducted covariates balance tests. Results indicate the two subsamples can be considered sufficiently balanced (Table S5).

With the matched samples, PSM estimated the disparities in outpatient care utilization between prefectures implementing and not implementing the outpatient pooling scheme (Table 2). Respondents in prefectures implementing the scheme exhibited a higher likelihood of outpatient visitation, with corresponding increases in hospital and primary healthcare facility visits. Moreover, a noteworthy reduction in outpatient expenditures and OOP payments was observed in the treated group.

Variables	2011 wave (*n* = 2242)	2013 wave (*n* = 2640)	2015 wave (*n* = 2977)	2018 wave (*n* = 3075)	2020 wave (*n* = 2733)
Possibility of outpatient visits					
No	1835 (81.8)	2065(78.2)	2385(80.1)	2545 (82.2)	2145(78.5)
Yes	407 (18.2)	575(21.8)	592(19.9)	530(17.2)	588(21.5)
Visit to hospitals					
No	131 (32.2)	168(29.2)	183(30.9)	128(24.2)	N/A
Yes	276 (67.8)	407(70.8)	409(69.1)	402(75.8)	N/A
Visit to primary healthcare facilities					
No	268 (65.8)	382(66.4)	395(66.7)	385(72.6)	N/A
Yes	139 (34.2)	193(33.6)	197(33.3)	145(27.4)	N/A
Outpatient expenditures	523.47 ± 231.56	710.12 ± 209.68	1017.98 ± 489.92	1361.42 ± 414.09	N/A
Outpatient OOP payments	253.07 ± 121.35	405.39 ± 112.59	637.45 ± 352.54	870.26 ± 334.51	N/A
Outpatient pooling presence					
No	1743 (77.7)	1999(75.7)	2008(67.5)	2093(68.1)	1892(69.2)
Yes	499 (22.3)	641(24.3)	969(32.5)	982(31.9)	841(30.8)
Gender					
Male	1322 (59.0)	1574(59.6)	1750(58.8)	1780(57.9)	1549(56.7)
Female	920 (41.0)	1066(40.4)	1227(41.2)	1295(42.1)	1184(43.3)
Age	60.68 ± 10.26	61.45 ± 10.24	60.92 ± 10.74	62.87 ± 10.79	62.38 ± 10.24
Marital status					
Married	1939 (86.5)	2383(90.3)	2566(89.2)	2689(87.4)	2352(86.1)
Others	303 (13.5)	257(9.7)	322(10.8)	386(12.6)	381(13.9)
Education					
Illiteracy	105 (4.7)	102(3.9)	135(4.5)	136(4.4)	104(3.8)
Primary school	457 (20.4)	458(17.3)	599(20.1)	695(22.6)	612(22.4)
Middle school	1325 (59.1)	1721(65.2)	1763(59.2)	1867(60.7)	1684(61.4)
College or above	355 (15.8)	359(13.6)	480(16.1)	377(12.3)	333(12.2)
Being employed					
No	1365 (60.9)	1532(58.0)	1557(52.3)	1748(56.8)	1609(58.9)
Yes	877 (39.1)	1108(42.0)	1420(47.7)	1327(43.2)	1124(41.1)
Socioeconomic group					
Quintile1	448 (20.0)	526(19.9)	599(20.1)	615 (20.0)	547(20.0)
Quintile2	449 (20.0)	538(20.3)	593(19.9)	615(20.0)	545(19.9)
Quintile3	449 (20.0)	523(19.8)	593(19.9)	614(20.0)	548(20.1)
Quintile4	448 (20.0)	525(19.9)	598(20.1)	616(20.0)	547(20.0)
Quintile5	448 (20.0)	528(20.0)	594(20.0)	615(20.0)	546(20.0)
Residency					
Rural	241 (10.7)	324(12.3)	535(18.0)	437(15.4)	363(13.3)
Urban	2001 (89.3)	2316(87.7)	2442(82.2)	2602(84.6)	2370(86.7)
SMI					
No	2171 (96.8)	2035 (77.1)	2716(91.2)	2451(79.7)	2080(76.1)
Yes	71 (3.2)	605(22.9)	261(8.8)	624(20.3)	653(23.9)
Pension insurance					
No	280 (12.5)	254 (9.6)	1381(46.4)	72(2.3)	129(4.7)
Yes	1962 (87.5)	2386 (90.4)	1596(53.6)	3003(97.7)	2604(95.3)
Self-rated health					
Very poor	21 (0.9)	54 (2.0)	256(8.6)	100(3.3)	79(2.9)
Poor	371 (16.5)	373(14.1)	394(13.2)	335(10.9)	614(22.5)
Fair	1191 (53.1)	1436(54.4)	1484(49.8)	1749(56.9)	1307(47.8)
Good	445 (19.8)	450(17.0)	463(15.6)	529(17.2)	460(16.8)
Very good	214 (9.5)	327(12.4)	380(12.8)	362(11.8)	273(10.0)
Chronic disease status					
None	714 (31.8)	1795(68.0)	1466(49.2)	608(19.8)	1628(59.6)
One	601 (26.8)	506(19.2)	644(21.6)	641(20.8)	685(25.1)
Two or above	927 (41.3)	339(12.8)	867(29.1)	1826(59.4)	420(15.4)
Functional disability					
Continued					

Variables	2011 wave (n = 2242)	2013 wave (n = 2640)	2015 wave (n = 2977)	2018 wave (n = 3075)	2020 wave (n = 2733)
No	2023 (90.2)	2325(88.1)	2582(86.7)	2723(88.6)	2332(85.3)
Yes	219 (9.8)	315(11.9)	395(13.3)	352(11.4)	401(14.7)
Health workers per 1000 people	5.03 ± 2.11	5.70 ± 2.06	5.93 ± 0.92	6.91 ± 1.09	7.71 ± 0.94
Beds per 1000 people	3.99 ± 1.00	4.61 ± 0.50	5.15 ± 0.56	6.05 ± 0.67	6.55 ± 0.81
Per capita GDP	33,758 ± 14,659	49,116 ± 18,137	54,984 ± 20,272	65,794 ± 25,460	69,400 ± 26,642

Table 1. Characteristics of study participants, 2011–2020 (n (%)/Mean ± SD). Note: N/A: not applicable.

Outcomes	2011 wave	2013 wave	2015 wave	2018 wave	2020 wave
	ATE (S.E.)	ATE (S.E.)	ATE (S.E.)	ATE (S.E.)	ATE (S.E.)
Possibility of outpatient visits	0.052** (0.021)	0.061** (0.030)	0.052** (0.016)	0.048** (0.015)	0.041** (0.017)
Visit to hospitals	0.042** (0.018)	0.033* (0.016)	0.025** (0.011)	0.015 (0.013)	N/A
Visit to primary healthcare facilities	0.018 (0.013)	0.027* (0.011)	0.016 (0.013)	0.038*** (0.009)	N/A
Outpatient expenditures (log)	0.332 (0.301)	−0.601* (0.301)	−0.133 (0.232)	−0.144 (0.173)	N/A
Outpatient OOP payments (log)	−0.588* (0.266)	−0.961** (0.327)	−0.416* (0.120)	−0.774* (0.177)	N/A

Table 2. The effects of outpatient pooling scheme on outpatient care utilization, 2011–2020. Note: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$; N/A: not applicable.

Outcomes	2011 wave		2013 wave		2015 wave		2018 wave		2020 wave	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Possibility of outpatient visits	0.1502* (0.0602)	0.1365** (0.0435)	0.0347 (0.0366)	0.0286 (0.0306)	0.0484 (0.0343)	0.0726** (0.0260)	0.0651 (0.1042)	0.1322*** (0.0282)	0.0745* (0.0349)	0.1081*** (0.0254)
Visit to hospitals	0.1632* (0.0733)	0.0984* (0.0445)	0.0487 (0.0301)	0.0235 (0.0184)	0.0800*** (0.0238)	0.0770*** (0.0196)	0.1564*** (0.0445)	0.1732*** (0.0322)	N/A	N/A
Visit to primary healthcare facilities	0.0228 (0.0772)	0.0020 (0.0451)	−0.1487* (0.0663)	−0.0429 (0.0397)	−0.1747** (0.0564)	−0.1247** (0.0395)	−0.0790 (0.0544)	−0.1492** (0.0564)	N/A	N/A
Outpatient expenditures (log)	0.1533* (0.0694)	0.0993* (0.0452)	0.0881 (0.1002)	0.1281 (0.0802)	0.2991* (0.1337)	0.4702*** (0.1331)	0.1450 (0.1193)	0.2763** (0.0932)	N/A	N/A
Outpatient OOP payments (log)	0.1170 (0.0756)	0.1119* (0.0506)	0.1096 (0.0764)	0.1301 (0.0924)	0.3866* (0.1865)	0.5177** (0.1635)	0.0844 (0.1687)	0.3301** (0.1113)	N/A	N/A

Table 3. The CI of outpatient care utilization between treatment and control groups, 2011–2020. Note: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$; N/A: not applicable.

To assess the robustness of our primary PSM estimates and to address concerns regarding potential time-invariant unobserved confounders, we conducted a supplementary sensitivity analysis using a two-way fixed-effects panel regression model. This model leverages the longitudinal structure of the CHARLS data by including individual fixed effects (to control for all time-invariant individual characteristics) and year fixed effects. The results of this analysis, presented in Supplementary Table S6, yield estimates for the impact of the outpatient pooling scheme that are consistent in both direction and statistical significance with our main PSM findings.

Using matched samples, we calculated concentration indices (CIs) for outpatient care utilization separately for the treated and control groups (Table 3). Descriptive comparisons suggest that during the later observation period (2015–2020), the treated group exhibited higher CI values (with standard errors) for outpatient visit likelihood compared to the control group. Conversely, during the early period (2011–2013), the control group showed marginally higher CI values.

Similar patterns were observed in outpatient care equity across healthcare facility types. For hospital visits, the treated group demonstrated more pronounced pro-rich inequality during the first three survey waves (2011–2013), while the control group showed a shift toward greater pro-rich inequality by 2018. For primary healthcare facility visits, the treated group exhibited stronger pro-poor inequality in the initial phase. With the exception of 2011, the treated group consistently showed lower CI values (with smaller absolute magnitudes) for outpatient expenditures and OOP payments compared to the control group across all observation years.

Decomposing the contribution of the outpatient pooling scheme to inequality levels
Figure 2 presents the results of the Wagstaff decomposition analysis, which quantifies the contribution of outpatient pooling policy to the observed socioeconomic inequality (CI) in each specific healthcare utilization outcome (2011–2020). The findings reveal that the policy's association with inequality evolved differently across outcomes over time. For the overall likelihood of an outpatient visit, the policy's contribution to pro-rich inequality was marginal. However, for facility-specific utilization, its role was more pronounced and dynamic: its contribution to inequality in hospital visits shifted from reinforcing pro-rich inequality (a positive contribution of 26.47% in 2011) toward reducing it (a negative contribution of −6.05% in 2018). In contrast, for primary care facility visits, the policy was consistently associated with a reduction in inequality (negative contributions ranging from − 41.89% to −6.82%), indicating a pro-poor effect. Regarding financial measures, the outpatient pooling scheme was associated with a substantial reduction in inequality for both outpatient expenditures and OOP payments in the later periods, demonstrating an increasingly equalizing effect over time. Further detailed information on the contributions of each determinant is provided in Supplementary Tables S7 to S11.

Decomposing the contribution of the outpatient pooling scheme to changes in inequality
Using 2011 as baseline, we conducted decomposition analysis across successive periods (2011–2013, 2011–2015, 2011–2018, 2011–2020) to examine counterfactual associations between outpatient pooling implementation and changes in concentration indices (CI) for outpatient care utilization (Fig. 3). Pro-rich inequality in outpatient visit likelihood showed a decreasing trend across the decade. While decomposition indicated a temporary negative counterfactual association (−6.4%) during 2011–2013, the policy demonstrated an overall positive counterfactual association with inequality reduction over the full period. For hospital visits, although pro-rich inequality increased over time, decomposition suggested outpatient pooling had a mitigating counterfactual effect on this expansion. Conversely, while pro-poor inequality in primary care facility visits escalated during implementation, decomposition indicated the policy alleviated this trend. Across all periods, CI values for outpatient expenditures and OOP payments showed decline trends, with decomposition attributing substantial counterfactual association to outpatient pooling in driving these changes. Additional comprehensive details on Oaxaca-type decomposition results can be found in Supplementary Tables S12 to S16.

Discussion
This study examined the effect of outpatient pooling scheme in UEBMI on the socioeconomic inequality in outpatient care utilization and further explored contribution of this policy to the changes in the inequality over the period from 2011 to 2020 in China. To our best knowledge, this study is the first attempt to empirically evaluate the impact of the outpatient cost-sharing reduction on healthcare equity in China.

Our findings indicate that the introduction of the outpatient pooling scheme initially had a limited, or even counterproductive, effect on reducing inequalities in outpatient care utilization. A primary reason for this

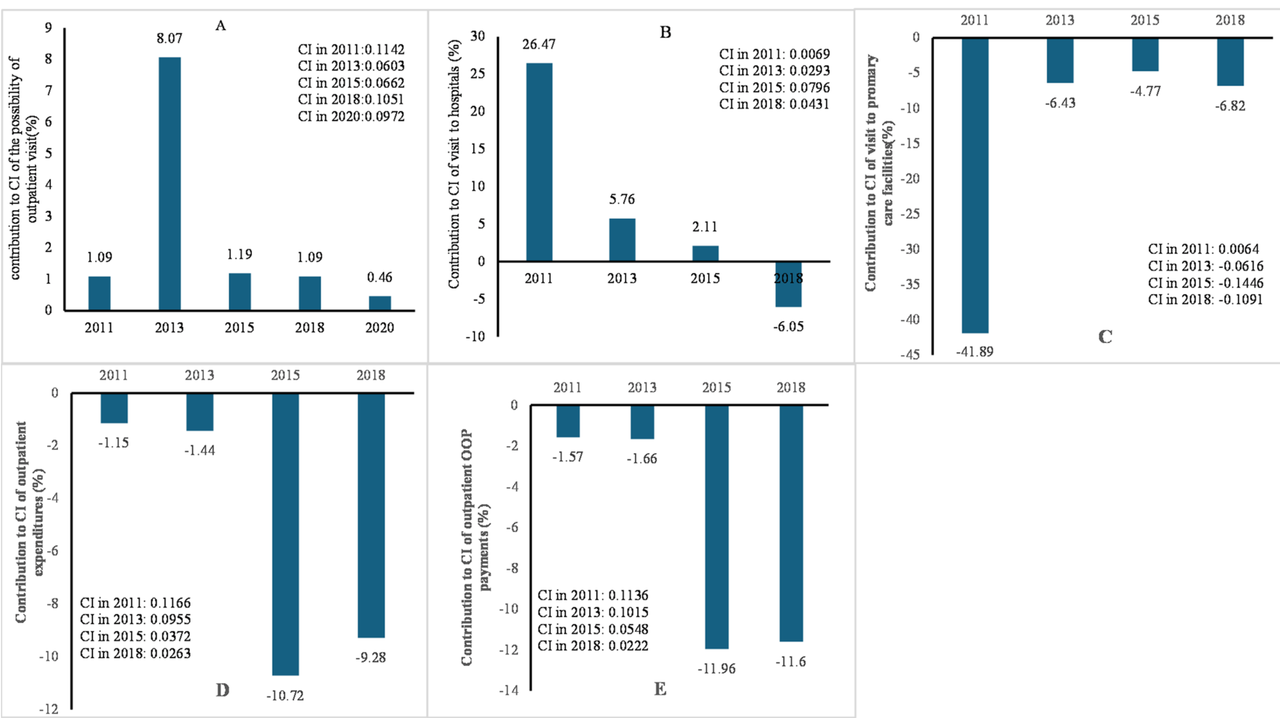

Fig. 2. Decomposition of the CI of outpatient visits (**A**), visit to hospitals (**B**), primary healthcare facilities (**C**), outpatient expenditures (**D**) and OOP payments (**E**): The contribution percentage of the outpatient pooling scheme, 2011–2020.

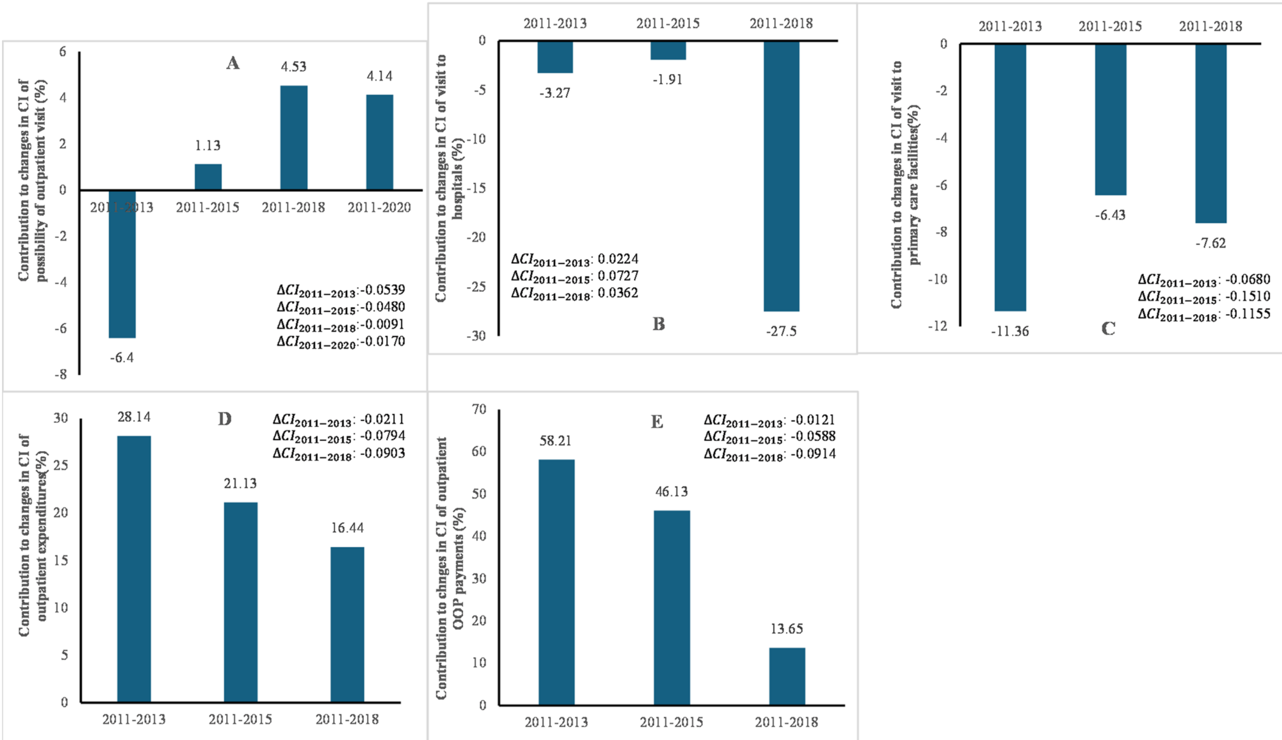

Fig. 3. The contribution percentage of outpatient pooling to changes in CI of possibility of outpatient visits (**A**), visit to hospitals (**B**), primary healthcare facilities (**C**), outpatient expenditures (**D**) and OOP payments (**E**) over the period from 2011 to 2020.

outcome was inadequate outpatient reimbursement. During the early implementation phase, constrained by insufficient pooled funds, China's SHI system prioritized financial coverage for inpatient care over outpatient services[39]. Consequently, although the scheme reduced patients' direct payments for outpatient care, the reimbursement ratios remained low and were further restricted by deductibles and payment caps. Previous research demonstrates that such modest reductions in patient cost-sharing often fail to significantly alter healthcare utilization patterns[40,41]. As a result, substantial financial barriers to accessing outpatient care persisted, particularly for low-income populations.

The decade-long progressive redistributive impact of China's outpatient pooling scheme stemmed directly from two interlinked drivers: the Chinese government's sustained fiscal commitment to enhancing medical insurance coverage and the strategic expansion of consolidated insurance fund pools. Initially piloted in affluent urban centers like Beijing and Shanghai using SPAs, the policy gradually expanded to less developed regions as funding pools grew. This geographic diffusion was accompanied by significant improvements in insurance generosity[42], particularly through higher reimbursement rates and expanded benefit packages. For example, reimbursement rates for outpatient care rose from 60% to 85% for chronic diseases, and benefit packages expanded to include previously uncovered services, directly addressing gaps in vulnerable populations' access. As insurance generosity increased through expanded reimbursement rates and benefit packages, previously underserved populations not only gained meaningful access to outpatient services but also experienced a progressive alignment of utilization patterns with health needs. Over time, this cumulative improvement in access equity also amplified the policy's redistributive impact.

Our analysis reveals that the outpatient pooling scheme's impact on utilization inequalities evolved differently for hospitals versus primary care facilities over time. In China's tiered system, hospital specialist services command higher fees than primary care GP services. Evidence suggests affluent groups exhibit greater preference for costly specialist care, while lower-income populations are more responsive to GP services' affordability[5]. Furthermore, beyond the initial decision to seek care, pro-rich inequalities may manifest in the intensity of service use. Specifically, socioeconomic status may influence the frequency of consultations, adherence to follow-up schedules, and the propensity to seek more frequent or intensive specialist care, even for comparable health needs. During initial implementation, the policy featured a modest reduction in patient cost-sharing, coupled with differentiated reimbursement ratios: lower for hospitals and higher for primary care[43]. This design had two key consequences: (1) Low-income groups saw limited improvement in specialist access due to persistently high OOP costs at hospitals. Their utilization shifted toward primary care, where higher reimbursement enhanced GP affordability. (2) Socioeconomically advantaged groups could benefit from reduced cost-sharing at hospitals, amplifying their existing preference for specialist services[5]. Consequently, the reform simultaneously intensified pro-rich inequality in hospital visits and pro-poor inequality in primary care utilization.

China's outpatient pooling scheme initially exacerbated inequalities due to inadequate reimbursement and inpatient care prioritization, with modest cost-sharing reductions failing to overcome financial barriers[40,41]. Early differentiated reimbursement (lower for hospitals and higher for primary care) combined with income-based preferences drove: pro-rich inequality in hospital visits and pro-poor inequality in primary care use[5]. Subsequent design enhancements with higher reimbursement and expanded coverage reversed inequalities, disproportionately benefiting price-sensitive low-income groups through increased hospital access[13,44]. This redistribution toward hospitals, while demonstrating cost-sharing's efficacy in reducing tiered disparities, raises sustainability concerns regarding hospital capacity and primary care underutilization.

Our longitudinal analysis also reveals a persistent but diminishing pro-rich inequality in both outpatient expenditures and OOP payments over the study period. This trend reflects two concurrent developments: First, progressive reforms, including expanded benefit packages and higher reimbursement rates, directly reduced financial barriers for low-income populations. By consolidating risk pools, the scheme enabled cross-subsidization between high- and low-need groups, aligning resource distribution with equity goals. Second, complementary policies like the Health Poverty Alleviation Program and County Healthcare Consortia improved physical access to care for vulnerable groups. For example, The Health Poverty Alleviation Program reduced catastrophic health expenditure risks for low-income groups through deductible/coinsurance exemptions[45], while County Healthcare Consortia enhanced geographic equity and reduced overutilization of high-level facilities by vertically integrating facilities into tiered service networks[46].

These interventions effectively addressed the dual affordability-accessibility barriers constraining healthcare use among disadvantaged populations[47,48]. The observed expenditure patterns align with economic theory[44]: enhanced financial protection enabled price-sensitive low-income groups to increase utilization more substantially than wealthier counterparts. However, our study design, focused on binary access measures, cannot directly test these dynamics of utilization intensity, this represents a critical area for future inquiry. Subsequent research employing data on visit frequency, treatment complexity, and care pathways is needed to determine whether reduced financial barriers primarily enable appropriate care for the poor or facilitate intensified, and potentially excessive, service consumption by the rich.

Several limitations in this study merit acknowledgment. Firstly, the phased implementation of the outpatient pooling scheme, beginning typically in more affluent prefectures, may introduce bias if these regions also possess superior healthcare infrastructure, transportation access, or unobserved institutional capacities that independently facilitate healthcare utilization. For instance, the higher density of hospital beds in early-adopting prefectures could partly explain the greater utilization of hospital services, potentially overstating the policy's effect. While our PSM and two-way fixed effects models aimed to control for many of these factors, residual confounding due to unobserved or imperfectly measured variables remains a limitation. Future studies could leverage natural experiments or instrumental variable approaches to further isolate causal pathways. Secondly, reliance on self-reported information for healthcare utilization introduces the potential for recall bias, particularly concerning outpatient expenditures and OOP payments. Thirdly, this study focuses specifically on the UEBMI population, it is important to consider the fragmented nature of China's social health insurance system. These schemes differ substantially in financing mechanisms, benefit packages, and enrolled populations. Therefore, our findings may not be directly generalizable to non-UEBMI populations. However, the underlying mechanism of outpatient pooling in the UEBMI through which reduced cost-sharing improves financial protection and influences utilization patterns, especially for low-income and price-sensitive groups, may offer insights for other insurance schemes. Future reforms in URBMI that incorporate similar outpatient pooling mechanisms could potentially narrow socioeconomic disparities in outpatient use. Fourthly, our study findings must be interpreted with awareness of CHARLS' age-specific design (45+), which systematically excludes younger workers and concentrates on a population with inherently higher healthcare utilization. Fifth, outcomes like expenditures and facility type are conditional on outpatient visits, limiting generalizability to all enrollees. While we incorporated the inverse IMR via a Heckman model to adjust for selection bias, this correction relies on the assumption of no unmeasured confounders affecting both visit likelihood and outcomes. Residual selection bias may persist if unobserved factors (e.g., health awareness, access barriers) influence care-seeking behavior.

Conclusion

Our findings reveal that while China's outpatient pooling scheme has significantly reduced pro-rich inequalities in outpatient care access, disparities in facility utilization persist. The policy successfully improved financial protection, yet pro-rich inequality in hospital visits and pro-poor inequality in primary care utilization continued to widen during 2011–2018. These results highlight that financial reforms alone are insufficient to address structural inequalities in healthcare access. Achieving equitable utilization across different levels of care requires complementary interventions, including optimizing resource allocation between tertiary and primary facilities and designing more equitable insurance benefit packages.

Data availability

Data are available at http://charls.pku.edu.cn/.

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Author contributions
TZ and JL conceptualized this study. MY and BL collected and analyzed the data. TZ and BL wrote the first draft of the manuscript. MY and JL reviewed and edited this paper. The final version submitted for publication was read and approved by all authors.

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Declarations

Ethics approval and consent to participate
Ethical approval was not required, as this study was a secondary analysis conducted using public data sets from the CHARLS. The original survey was approved by the Biomedical Ethics Review Committee of Peking University (IRB00001052–11015).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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