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Socioeconomic differences in self-medication among middle-aged and older people: data from the China health and retirement longitudinal study

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ABSTRACT

Objectives Self-medication with over-the-counter medicines (OTCs) and prescription-only medicines (POMs) are both pervasive in China, although the latter is an inappropriate practice. We examined the relationship between socioeconomic status (SES) and self-medication with OTCs versus POMs.

Methods Multivariate logistic regressions based on the Andersen framework were estimated using a subsample of respondents aged 45 years and over from the China Health and Retirement Longitudinal Study collected between 2011 and 2013 (n=23 699). As dependent variables, we used OTC and POM consumption without a medical prescription. SES was operationalised by household income per capita and education. Control variables included health indicators, demographic characteristics, and health behaviours.

Results In our study sample, 32.69% and 15.02% of people aged 45 years and over had self-medicated with OTCs and POMs in the 4 weeks before the survey, respectively. OTC use by income exhibited an inverse U shape. Respondents from middle income groups were more likely to self-medicate with OTCs compared with those from the lowest and highest income groups. In contrast, respondents from the lowest income group were more inclined to self-medicate with POMs. There was a clear trend towards more self-medication with OTCs, but not POMs, among those with higher educational attainment.

Conclusion People with low income tended to rely on self-medication with POMs for treatment, which is risky and of low quality. A health education programme for older people, particularly those living in low-income households, aimed at improving the quality of self-medication behaviour is warranted. Urgent measures are needed to address the issue of easy access to POMs at community pharmacies, and to improve access to formal medical care among the low-income population.

Strengths and limitations of this study

- ► We reveal the prevalence of self-medication with over-the-counter medicines (OTCs) and prescription only medicines (POMs) in a nationally representative middle-aged and older population of China.
- ► We provide essential knowledge for promoting responsible self-medication and curbing inappropriate self-medication by examining the socioeconomic differences in self-medication with OTCs versus POMs.
- ► The indicators of self-medication behaviours were self-reported and may be subject to recall bias.

INTRODUCTION

Self-medication is a pervasive practice worldwide, particularly among older people, as an alternative to professional medical care.[1–4] It has been acknowledged worldwide that self-medication among older adults represents a public health concern, and that this demographic is the most vulnerable to the risks of self-medication.[1] Self-oriented use of over-the-counter medicines (OTCs) has its merits, and 'responsible self-medication' for minor ailments can facilitate access to medicines and save limited healthcare resources[5]; however, the use of prescription-only medicines (POMs) without medical supervision largely increases the risk of multiple adverse consequences, including misdiagnosis, and adverse drug reactions and drug–drug interactions.[6 7]

Understanding the socioeconomic characteristics of self-medication is essential to inform public policy aimed not only at deterring undesirable self-medication and promoting the quality of responsible self-medication, but also at promoting equitable access to medical care. Prior studies on the socioeconomic status (SES) determinants of self-medication have largely focused on use of OTCs, and the findings have been inconsistent.[2 3 8–13] Multiple large-scale surveys conducted in high-income countries have demonstrated a relationship between higher income and education and increased use of OTCs.[14–17] Studies conducted in low and middle income countries showed that income

and health insurance coverage were inversely correlated with the propensity to self-medicate, which suggests self-medication is an inferior good.[18 19] Furthermore, given that the purchase of POMs without prescription is common in many countries, few of these studies distinguished between OTC and POM self-medication. Much of the extant literature has focused on self-medication with specific medicines that should not be self-administered.

In China, self-medication, as the main form of self-treatment, is common.[13] The National Health Services Survey (NHSS) conducted in 2013 showed that 14.1% of the Chinese population opts for self-treatment to cope with illness.[20] OTCs are widely accessible at convenient locations across the nation. The number of community pharmacies in urban and rural areas has increased rapidly and has reached nearly 0.45 million in 2015.[21] Although regulations that categorise drugs as prescription only or suitable for OTC sales exist in China, they are not adequately enforced. Many POMs can be purchased without a prescription, including antibiotics.[22 23] It has been documented that out-of-pocket payments constituted the main proportion of the cost of self-medication.[4] Recent evidence showed that social health insurance was much less likely to be used for self-treatment of disease episodes compared with inpatient and outpatient services.[24]

To date, there has been less investigation of the socioeconomic differences in self-medication in China. In this article, we report and analyse self-medication with OTCs and POMs using a nationally representative sample of middle-aged and older people in China, and we examine the relationships between SES and self-medication. To our knowledge, this is the first national study in China on self-medication with POMs and the relationship between SES and self-medication with OTCs or POMs that controls for differences in a wide range of covariates associated with self-medication based on a multivariate framework.

METHODS

Data

This study used data derived from the China Health and Retirement Longitudinal Study (CHARLS) 2011 and 2013. CHARLS comprises a nationally representative sample of Chinese residents aged 45 and above.[25] The questionnaire covers seven sections: demographic background; health status and functioning; healthcare and insurance; work; retirement and pension; income, expenditure and assets; and interviewer observation. The data have been described in further detail previously.[26]

Using multi-stage stratified probability-proportionate-to-size sampling, the population in CHARLS belonged to approximately 10 000 households in 150 counties/districts (a total of 450 villages/resident communities). The baseline survey was conducted between June 2011 and March 2012 and included a total sample of 17 545 respondents. A total of 15 020 (85.61%) respondents participated in a follow-up survey in 2013, and 2525 (14.39%) respondents died or dropped out of the study. The 2013 CHARLS sample included 3413 new respondents and a total of 18 433 respondents. We pooled cross-sectional surveys with complete information for all relevant variables. The final sample size was 23 699. This survey was approved by the ethics committee of the Institutional Review Board of Peking University.

MEASURES

Dependent variables- self-medication

We defined self-medication with OTCs and POMs as consuming over-the-counter modern medicines without a medical prescription and consuming prescription medicines without a medical prescription respectively. The measures were based on the CHARLS question 'How did you treat yourself during the past month (Cautions: Does not include obtaining medicines with a medical prescription)?' The answer options are as follows: (1) Consumed over-the-counter modern medicines; (2)Consumed prescription medicines; (3) Consumed traditional herbs or traditional medicines as treatment; (4) Consumed tonics/health supplements; (5) Used healthcare equipment; (6) Others; and (7) None. Those who reported having used option one to self-treat were regarded as having taken self-medication with OTCs in the past 4 weeks and encoded 1, otherwise 0. Similarly, a variable to measure self-medication with POMs was constructed: respondents who reported option two for self-treatment were encoded 1, otherwise 0.

Conceptual framework and independent variables

Andersen's model was used to identify the determinants of self-treatment healthcare-seeking behaviours.[27] According to Andersen's model, patient healthcare-seeking behaviours can be defined as a function of their enabling factors, predisposing characteristics for using healthcare, and their actual needs for care.

Enabling resources included the individual's SES and health insurance status. Education and income are important and easily measured indicators of SES, which were our primary predictors of interest. Educational attainment in the data was defined at four levels: informal education, informal education but can read and write, primary school, and junior high school and above. We constructed four dummy variables for educational attainment, with informal education serving as the reference group. Household income was divided by the number of household members. Subsequently, household income per capita was ranked and divided into five tertiles, with the lowest group serving as a reference. Job status was categorised into three groups: unemployed, self-employed and wage earner. It is noted that the unemployed category included those who were retired. As for health insurance coverage, three social health insurance schemes provide coverage for most of the Chinese population, namely, the rural new cooperative medical scheme (NCMS), the urban resident-based basic medical insurance scheme (URBMI), and the Urban Employee

Basic Medical Insurance (UEBMI).[28] Therefore, respondents were recoded into three dummy variables: UEBMI, NCMS and URBMI, with uninsured patients as the reference group.

In our analysis, predisposing factors included gender (reference group: female), marital status (reference group: married with spouse present (common-law marriage was considered as married)), log of age, urban/rural residence (reference group: living in rural area), and health behaviours. Two variables that served as proxies of health behaviours were controlled. The first was smoking status: each respondent was classified as a 'current smoker' or a 'non-smoker'. The second pertained to alcohol consumption: respondents were asked if they drank beer or any other alcoholic beverage during the previous 12 months. A respondent who drank in the past 12 months was identified as a 'current drinker'.

Need factors were used to measure individuals' perceived healthcare needs, including illness in the previous month, the presence of chronic diseases, and self-reported health status. Respondents were asked if a doctor had diagnosed them with a chronic disease. If the answer was 'yes', the respondent was asked to name the chronic disease. The number of chronic diseases was categorised into three groups: 0, 1, and 2 and above. The variable measuring illness in the last month was assigned a score of 1 if the respondent reported having been ill in the month before the survey, otherwise 0. To measure self-reported health status, the CHARLS survey asked: 'How would you evaluate your health—Excellent, very good, good, fair, or poor?' We constructed a variable for self-reported health status that equaled 2 if the respondent reported their health as 'excellent', 'very good', or 'good', 1 if the respondent selected 'fair', and 0 otherwise.

Statistical analysis

Descriptive analysis was performed to compare sample characteristics by type of self-medication practice. Weighted prevalence of OTCs and POMs by age, gender and living areas were calculated. The weights took account of the representativeness of the results and no response.[29–31] Inferential statistics were estimated by two-sided χ^2 tests.

Next, weighted multivariate logistic regression was used to identify socioeconomic differences in self-medication. The regression equations were operationalised as follows:

$$logit\left(p\left(y=1 \mid X\right)\right)=\beta_0+\beta_1 X_1+\beta_2 X_2+\varepsilon$$

where y indicates self-medication with OTCs or POMs: y=1 indicates individuals reported OTC or POM use; X_1 indicates individuals' SES measured by income and education; X_2 represents individuals' characteristics such as age, sex, marital status, job status, insurance status, living areas, health outcomes and health behaviours; β_0, β_1, β_2 are coefficients; ε is the idiosyncratic error term.

Additionally, we conducted regression analysis, adjusted for confounders based on Anderson's framework, separately according to respondents' actual needs for care. All regression models were weighted using sample weights to correct for the multistage stratified sampling design and non-response issue.[30 31] Odds ratios (ORs) with 95% confidence intervals (CIs) were reported. Analyses were conducted using Stata 14.0 (StataCorp LP, College Station, TX).

Table 1 Weighted prevalence of OTCs and POMs by age, gender and living areas (%)

	OTCs	P value	POMs	P value
All sample	32.69	–	15.02	—
Age		<0.001		<0.001
45–49	31.94		12.46	
50–54	30.79		12.80	
55–59	32.12		13.14	
60–64	35.23		17.16	
65–70	35.30		17.16	
>70	31.98		18.38	
Gender		<0.001		<0.001
Female	31.82		14.30	
Male	33.22		15.45	
Living areas		<0.001		0.168
Urban	34.67		15.58	
Rural	30.98		14.53	

P values were calculated by χ^2 test.
OTCs, over-the-counter medicines; POMs, prescription-only medicines.

RESULTS

Weighted prevalence of OTCs and POMs by age, gender and living areas

Table 1 presents the weighted prevalence of self-medication with OTCs and POMs by age, gender and living areas. The proportion of self-medication with OTCs among the total population was 32.69%, and 15.02% for POMs. The proportion of self-medication with OTCs and POMs was higher among older people, except for the OTC use in the age group above 70. The proportion of self-medication with OTCs among the group decreased to 31.98%, which was lower than that of the age groups 55–59, 60–64 and 65–70. For female respondents, the proportion of self-medication with OTCs and POMs was lower than that for the male group. With regard to self-medication with OTC and POM disparities between rural and urban areas, the prevalence of OTC use was higher in urban areas, however the differences in self-medication with POMs between urban and rural areas were insignificant.

Characteristics of the respondents

Table 2 shows sample respondent characteristics. Overall, the average household income per capita was

Table 2 Sample characteristics by self-medication with OTCs and POMs, China Health and Retirement Longitudinal Study 2011–2013 (%)

	All sample (n=23 699)	Respondents consuming OTCs for self-medication (n=7833)	Respondents consuming POMs for self-medication (n=3467)
Socioeconomic status			
Income*	7731.29 (13511.09)	7676.45 (10661.54)	7423.42 (10379.36)
Education level			
Informal education	30.11	27.49	31.44
Informal education but can read and write	17.68	18.69	17.58
Primary school	21.05	21.97	21.62
Junior high school and above	31.16	31.85	29.37
Demographics			
Occupation			
Unemployed	32.41	33.95	39.57
Self-employed	43.66	43.86	40.73
Wage earner	23.73	22.20	19.70
Insurance status			
Uninsured	5.38	5.09	4.44
NCMS or URBMI	80.42	79.95	79.29
UEBMI	14.19	14.97	16.27
Age*	59.46 (9.98)	59.48 (9.71)	60.93 (10.00)
Male	37.66	35.62	34.27
Unmarried	13.06	12.63	14.37
Living in urban area	37.99	40.40	39.11
Health profile			
No. of chronic diseases			
0	32.89	23.69	17.68
1	29.78	29.36	28.43
2 and above	37.33	46.95	53.89
Self-report health			
Good	22.91	15.65	13.11
Fair	47.76	48.51	43.00
Poor	29.33	35.84	43.89
Being ill in last month	16.22	18.36	26.07
Health behaviour			
Drinker	28.54	27.52	24.14
Smoker	20.63	18.87	16.50

*Mean (SD).
NCMS, rural new cooperative medical scheme; OTC, over-the-counter medicine; POM, prescription-only medicine; UEBMI, urban employee-based basic medical insurance scheme; URBMI, urban resident-based basic medical insurance scheme.

7731 Chinese Yuan. A proportion of 47.79% of respondents had no formal education, 21.05% had primary school education, and 31.16% had junior high school education and above. A total of 32.41% of respondents were unemployed and 80.42% were covered by NCMS or URBMI. Compared with OTC consumers, POM consumers were more likely to have lower SES as measured by income and education level.

Associations between SES and self-medication

Table 3 shows the correlations of SES with self-medication with OTCs and POMs. In general, SES, as measured by

Table 3 Association between self-medication practice with OTCs and POMs in the Chinese population aged 50 years and over, and socioeconomic, socio-demographic, health profile, and health behavioural variables

	All sample		Respondents had been ill in the last month		Respondents with chronic diseases	
	OTCs OR (95% CI)	POMs OR (95 %CI)	OTCs OR (95% CI)	POMs OR (95% CI)	OTCs OR (95% CI)	POMs OR (95% CI)
Socioeconomic status						
Household income per capita						
The lowest income group	Reference	Reference	Reference	Reference	Reference	Reference
Low income group	1.11*	0.83***	0.92	0.67***	1.11*	0.78***
	(0.99 to 1.25)	(0.73 to 0.95)	(0.74 to 1.14)	(0.51 to 0.89)	(0.99 to 1.25)	(0.68 to 0.90)
Middle income group	1.16**	0.89	1.26**	0.70**	1.11	0.86**
	(1.02 to 1.32)	(0.78 to 1.03)	(1.02 to 1.56)	(0.52 to 0.94)	(0.98 to 1.27)	(0.73 to 1.00)
High income group	1.11	1.07	1.24*	1.18	1.08	1.00
	(0.96 to 1.29)	(0.90 to 1.29)	(1.00 to 1.55)	(0.81 to 1.71)	(0.92 to 1.27)	(0.82 to 1.22)
The highest income group	0.84**	1.01	0.92	0.75	0.86	1.00
	(0.71 to 0.99)	(0.82 to 1.25)	(0.72 to 1.17)	(0.51 to 1.10)	(0.71 to 1.04)	(0.79 to 1.28)
Education level						
Informal education	Reference	Reference	Reference	Reference	Reference	Reference
Informal education but can read and write	1.19***	0.93	1.24**	0.94	1.20***	0.96
	(1.06 to 1.33)	(0.80 to 1.08)	(1.02 to 1.52)	(0.69 to 1.27)	(1.06 to 1.37)	(0.81 to 1.13)
Primary school	1.27***	1.06	1.13	1.28	1.26***	1.09
	(1.12 to 1.44)	(0.89 to 1.26)	(0.93 to 1.39)	(0.93 to 1.76)	(1.09 to 1.47)	(0.89 to 1.33)
Junior high school and above	1.38***	1.14	1.32***	1.15	1.35***	1.11
	(1.20 to 1.58)	(0.95 to 1.38)	(1.08 to 1.63)	(0.86 to 1.53)	(1.16 to 1.58)	(0.88 to 1.39)
Demographics						
Occupation						
Unemployed	Reference	Reference	Reference	Reference	Reference	Reference
Self-employed	1.07	0.88*	1.00	1.12	1.02	0.88
	(0.96 to 1.19)	(0.76 to 1.02)	(0.85 to 1.18)	(0.85 to 1.49)	(0.90 to 1.15)	(0.76 to 1.03)
Wage earner	1.01	0.84	0.96	1.07	1.02	0.91
	(0.88 to 1.15)	(0.69 to 1.04)	(0.78 to 1.18)	(0.77 to 1.47)	(0.87 to 1.19)	(0.73 to 1.13)
Health insurance status						
Uninsured	Reference	Reference	Reference	Reference	Reference	Reference

Continued

Table 3 Continued

	All sample		Respondents had been ill in the last month		Respondents with chronic diseases	
	OTCs OR (95% CI)	POMs OR (95 %CI)	OTCs OR (95% CI)	POMs OR (95% CI)	OTCs OR (95% CI)	POMs OR (95% CI)
NCMS and URBMI	1.21*	1.15	1.00	1.43	1.10	1.04
	(1.00 to 1.47)	(0.83 to 1.60)	(0.70 to 1.43)	(0.76 to 2.69)	(0.88 to 1.39)	(0.70 to 1.55)
UEBMI	1.26*	1.21	0.87	1.77	1.17	1.10
	(1.00 to 1.59)	(0.80 to 1.84)	(0.58 to 1.30)	(0.86 to 3.64)	(0.88 to 1.55)	(0.67 to 1.82)
Age†	0.95	1.59*	0.78	1.27	0.98	1.79*
	(0.68 to 1.34)	(0.96 to 2.65)	(0.47 to 1.29)	(0.52 to 3.12)	(0.65 to 1.46)	(0.99 to 3.25)
Male	1.03	0.98	1.10	0.96	1.05	0.96
	(0.89 to 1.19)	(0.80 to 1.19)	(0.90 to 1.34)	(0.67 to 1.37)	(0.91 to 1.22)	(0.76 to 1.21)
Unmarried	1.00	0.90	0.86	1.23	0.95	0.95
	(0.87 to 1.15)	(0.75 to 1.09)	(0.70 to 1.05)	(0.84 to 1.82)	(0.81 to 1.12)	(0.77 to 1.18)
Living in urban area	1.28***	1.03	1.13	1.12	1.19***	1.10
	(1.16 to 1.42)	(0.90 to 1.18)	(0.96 to 1.32)	(0.85 to 1.48)	(1.06 to 1.34)	(0.95 to 1.28)
Health profile						
No. of chronic diseases						
0	Reference	Reference	Reference	Reference		
1	1.46***	1.77***	1.20*	1.49**	–	–
	(1.30 to 1.63)	(1.50 to 2.09)	(0.98 to 1.47)	(1.06 to 2.09)		
2 and above	1.96***	2.41***	1.71***	1.48	–	–
	(1.76 to 2.17)	(2.06 to 2.82)	(1.42 to 2.06)	(1.13 to 1.93)		
Self-report health						
Good	Reference	Reference	Reference	Reference	Reference	Reference
Fair	1.52***	1.47***	1.18	1.17	1.46***	1.36***
	(1.35 to 1.70)	(1.25 to 1.72)	(0.94 to 1.48)	(0.79 to 1.73)	(1.26 to 1.68)	(1.12 to 1.65)
Poor	1.92***	2.23***	1.28**	2.17***	1.91***	2.11***
	(1.69 to 2.17)	(1.89 to 2.63)	(1.01 to 1.62)	(1.45 to 3.24)	(1.65 to 2.21)	(1.76 to 2.53)
Being ill in last month	0.93	1.54***	–	–	0.88*	1.46***
	(0.83 to 1.04)	(1.34 to 1.78)			(0.77 to 1.00)	(1.25 to 1.70)
Health behaviour						
Drinker	1.08	0.89	1.23**	1.21	1.10	0.83**
	(0.97 to 1.20)	(0.77 to 1.04)	(1.04 to 1.47)	(0.91 to 1.60)	(0.98 to 1.23)	(0.70 to 0.99)

Continued

Table 3 Continued

	All sample		Respondents had been ill in the last month		Respondents with chronic diseases	
	OTCs OR (95% CI)	POMs OR (95 %CI)	OTCs OR (95% CI)	POMs OR (95% CI)	OTCs OR (95% CI)	POMs OR (95% CI)
Smoker	1.05	0.92	0.93	0.94	1.02	0.91
	(0.92 to 1.21)	(0.77 to 1.09)	(0.75 to 1.16)	(0.67 to 1.34)	(0.88 to 1.18)	(0.74 to 1.11)
2013 wave	1.31***	1.25***	1.29***	1.40***	1.16***	1.24***
	(1.19 to 1.44)	(1.10 to 1.42)	(1.11 to 1.49)	(1.09 to 1.79)	(1.04 to 1.30)	(1.07 to 1.44)
Observations	23 699	23 699	3894	3894	15 908	15 908

Wave dummy variable was included.
***P<0.01, **P<0.05, *P<0.1.
†Age was log transformed in the analyses.
NCMS, rural new cooperative medical scheme; OTC, over-the-counter medicine; POM, prescription-only medicine; UEBMI, urban employee-based basic medical insurance scheme; URBMI, urban resident-based basic medical insurance scheme.

income and education, was positively associated with OTC use. The relationship between OTC use and income was inverse U-shaped, with those in the middle of the income gradient showing the higher rates of use. Compared with the lowest income group, respondents with low income were related to a higher OR (1.11) of OTC use (95% CI 0.99 to 1.25); the OR for middle respondents was 1.16 (95% CI 1.02 to 1.32). The highest income group was least likely to use OTCs. Respondents with a higher education level were more likely to use OTCs. Respondents with junior high school and above used the most OTCs (OR 1.38; 95% CI 1.20 to 1.57), followed by respondents having primary school (OR 1.27; 95% CI 1.12 to 1.44) or informal education but can read and write (OR: 1.19; 95% CI: 1.06 to 1.33). However, the results were reversed for POM use by SES; POM use by income showed a U shape; no significant association between POMs and education was observed.

When the analysis was stratified according to respondents' health needs, the results regarding association between SES and self-medication were generally consistent. OTC use by income also exhibited an inverse U shape among respondents who had been ill in the last month and with chronic diseases, whereas U-shaped relationships between POM use and income were revealed in both subgroups. Respondents with higher education were more likely to use OTCs but not POMs in both subgroups.

DISCUSSION

To our knowledge, this is the first published article to elucidate the roles of SES in self-medication with OTCs versus POMs using a nationally representative dataset of the middle-aged and older Chinese population. Our findings contribute to a comprehensive understanding of the SES determinants of self-medication, which could generate valuable insights for the design of policies and programmes to enhance the quality of responsible self-medication and curb the practices of self-medication with POMs in China.

Our results show that the prevalence of self-medication among middle-aged and older people was high in China, with 32.69% and 15.02% of the respondents having reported self-medication with OTCs and POMs, respectively, in the 4 weeks before the survey. Few studies had reported and analysed self-medication with POMs previously. A study conducted in Spain, where POMs could also be obtained without a prescription at community pharmacies, reported a prevalence of self-medication with POMs of 2.5% in the general population for the 2 weeks prior to the study.[9]

As for age, gender and health needs, our results are mainly in agreement with previous studies. Our key findings regarding the relationship between SES and self-medication are as follows: (1) OTC use by income exhibited an inverse U shape, whereas POM use by income showed a U shape; (2) education was positively related to self-medication with OTCs.

Regarding income, interestingly, we found that the use patterns of self-medication with OTCs and POMs with respect to the income gradient were opposing, and additional analyses of subsamples of different health needs also confirmed this. Only a few previous studies on self-medication distinguished between OTCs and POMs when examining the relationship between medicine use and SES.[14–17] A Danish study showed that individuals with low income used more POMs, whereas those with high income tended to use more OTCs.[15] Another study, conducted in Austria, revealed a very similar pattern: high income was associated with the use of OTCs, but not POMs.[14] The authors of those studies proposed that the increased financial means of the affluent enable them to opt for timely treatment, whereas those who were less affluent had to rely on doctor consultations and were prescribed medication. However, based on the national welfare model in Denmark and social insurance model in Austria, outpatient consultations are free in those countries.[14 15] Furthermore, prescription-only regulations in those countries are strictly implemented.[14 15] Therefore, the patterns of self-medication in China and in countries such as Denmark and Austria are similar but have different underlying influences.

In China, copayment and deductibles remain high for outpatient and inpatient medical services,[28] and the reimbursement process can be lengthy and complicated.[24] As was made evident in the most recent round of the NHSS, financial difficulties and the inconvenience of consulting a doctor are the main reasons for opting for self-treatment instead of seeking medical care for perceived non-severe illnesses.[20] Coupled with the limited enforcement of the existing prescription-only regulations, the increasing number of community pharmacies in both urban and rural China has drastically increased the availability of POMs without prescription. Therefore, for the underprivileged in China, it is easy and cost effective to purchase POMs from community pharmacies for self-medication to cope with minor health problems. Similar trends can be observed in many low and middle income countries where purchase of POMs without prescription at retail pharmacies is common,[18] and where the prevalence of pharmacy visits increases with decreasing income.[18 19]

Unlike the use pattern of prescribed medicines, several studies conducted in high-income countries concluded that those with relatively higher income in a given population have a greater tendency towards OTC use.[14–16] Our results partly correspond with this trend (with the exception of the high income group and highest income group). Taken together, these findings suggest that older adults in China with higher purchasing power also tend to have a higher preference for timely, self-initiated treatment strategies. However, unlike the situation in high-income countries, where self-medication is often a preferred alternative rather than a low-cost option, in China, a substantial portion of the population chooses to self-medicate with OTCs to circumvent the barriers of seeking formal medical care. It is plausible to assume that the proportion of such people is lower in the higher income group; thus, we speculate this to be the reason why OTC use by income groups exhibited an inverse U shape instead of continued positive correlations. Another possible explanation is that, according to one line of evidence in previous studies, self-medication is an inferior good.[18 19] Following this logic, the consumption of self-medication would decrease above a certain threshold of income.

As for education, there was a clear trend towards more OTC use among groups with higher educational attainment. This finding is consistent with those of previous studies conducted in developed and developing countries.[2 10–12 14 17] According to those studies, those with higher educational attainment tend to have better health literacy, greater knowledge about diseases and medicines, enhanced self-efficacy in making appropriate decisions about self-diagnosis and self-treatment, and less confidence in the quality of formal health services; therefore, they would be more likely to self-medicate. In our study, the positive effect of education on self-medication with POMs was weak compared with the explicit association between education and self-medication with OTCs, which further supports the aforementioned interpretation about the effect of education. The results also indicate that there are different attitudes towards self-medication with OTCs and POMs, as the latter is perceived to be risky and of low quality.

The finding of a positive correlation between social insurance coverage and self-medication stands in contrast with theory and previous empirical evidence.[18 19] Theoretically, health insurance coverage lowers the price of professional care and increases the relative price of self-medication to professional care; thus, health insurance is expected to divert the demand for self-medication. However, China's UEBMI reimburses costs of medicines formally purchased from designated community pharmacies,[32] which may promote the use of OTCs. Moreover, the NCMS and URBMI, which cover most of the rural and urban population, were initially designed to reimburse inpatient service costs and offer limited benefits packages for outpatient service use.[28] Therefore, the limited benefits packages, particularly for outpatient services, and the inconveniences of the reimbursement process, likely explain the absence of the theoretical negative effect of health insurance coverage on self-medication.

Our results have important health policy implications for China. First, health education programmes on appropriate medication use targeting older adults with low income are highly recommended. Second, the quality of pharmacy services needs to be enhanced, including stricter implementation of prescription-only regulations. Third, the findings suggest that further lowering copayment and deductibles for outpatient services, facilitating the process of reimbursement, and promoting public awareness about reimbursement policies would help decrease the prevalence of self-medication with POMs and increase professional medical care

use. Regarding the generalisability of our findings in other settings, the relationship between education and self-medication, which is mainly driven by individual factors such as health literacy, self-efficacy, and trust in professional healthcare, might be able to generalise to other developing and developed countries. However, as the correlates between income and self-medication are subject to a China-specific context, including the health system and its reform, and the fact that people can purchase POMs without prescriptions at community pharmacies, we should be cautious in applying this finding in other settings. Nevertheless, we believe the interpretation of the finding about the relationship between income and self-medication could be meaningful for other low and middle income countries that are experiencing a similar situation.

Our research has several limitations. First, the indicators of self-medication behaviour were reported by respondents, and may therefore be subject to recall bias. However, unlike data on formal healthcare service use, systematic records about self-medication behaviours are not currently available in China. A national-level pharmacoepidemiology study on actual self-medication behaviours would be very costly, and we are not aware of the existence or development of any such survey. Thus, despite this limitation, as the first study to assess the SES of self-medication behaviours systematically, our study is uniquely valuable. Second, specific information about the locations where the respondents purchased the OTCs and POMs was not collected. Nonetheless, community pharmacies are the main source for residents purchasing medicines without a prescription under China's current pharmaceutical supply chain.[33 34]

In conclusion, self-medication is prevalent among middle-aged and older people in China. Those of a lower income tended to rely more on self-medication with POMs for treatment compared with their more affluent counterparts. A health education programme for older people aimed at improving the quality of self-medication is warranted, particularly for those living in low-income households. Urgent measures are needed to address the current situation of easy access to POMs at community pharmacies and to improve access to formal health services among the low income population.

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