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Social Determinants and Equity in Health Insurance Access: An Empirical Study Based on CGSS 2021 Data

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Abstract

China's medical insurance system has reached near-universal coverage, yet disparities in access and quality persist. This study investigates how social structural factors shape coverage and quality in the Chinese context. Using 2021 China General Social Survey data (n = 8148), binary logistic regression was applied to basic and commercial insurance participation, and multiple linear regression assessed a composite quality indicator. Predictors included education, income, gender, household registration (hukou), and age. Basic insurance coverage was 94.3%, with education (OR = 1.180, p = 0.003) and income (OR = 1.281, p < 0.001) as positive predictors; gender and hukou were nonsignificant. Commercial insurance coverage was 14.0% and positively associated with education (OR = 1.357), income (OR = 1.276), and urban hukou (OR = 1.180), but negatively with female gender (OR = 0.800) and age (OR = 0.979; all p < 0.01). For quality, education (B = 0.042) and income (B = 0.040) had the strongest positive effects, while gender (B = −0.032) and age (B = −0.002) were negative; urban hukou had a small positive effect (B = 0.014). Socioeconomic status—especially education and income—consistently predicts higher coverage and quality. Urban-rural differences are minimal for basic coverage but remain for commercial insurance and quality. Policies should target low-SES groups, women, and older adults through premium subsidies, product customization, and awareness campaigns to advance equity in China's health insurance system.

Keywords

Health Insurance Equity, Social Determinants, Socioeconomic Status, Insurance Quality, Urban-Rural Disparity, Hukou, China

1. Introduction

China's medical insurance system has undergone decades of reform—establishing a basic medical insurance network covering 1.32 billion people, with a coverage rate exceeding 95% (National Healthcare Security Administration, 2024). However, despite this widespread coverage, the system still faces significant challenges in terms of protection levels and equity—such as concentrations of high-quality medical resources primarily located in large and medium-sized cities (Chen & Liu, 2023), and disproportionate allocation of health resources (Jakovljevic et al., 2023). As a crucial mechanism for safeguarding residents' physical health, not only does medical insurance concern individual health but is also closely intertwined with core elements of social stratification. In this context, the coverage disparities and equity of the medical insurance system across different groups warrant urgent research attention.

Access to health insurance is fundamentally a reflection of social structure. According to Social Determinants of Health (Holt-Lunstad, 2022; Guo et al., 2021), structural factors such as education, income, and household registration significantly influence an individual's health status and ability to access medical resources. Household registration, or Hukou, was redesigned by the Central Government to limit Chinese people' spatial mobility (Fan, 2008). Under the country's hukou system, the Central Government of China has granted the city-level and village-level administrations the authority to create their own hukou policies (Hung, 2022). The "Equity in Access to Health Care" theory further highlights that such disparities, if left unaddressed, will exacerbate health inequalities. For instance, among those who refuse hospital services recommended by doctors, the number of low-income individuals who decline such services is 2.2 times higher than that of high-income individuals (Yu et al., 2010). Although health insurance coverage has reached 95%, the equity of the health insurance system is not merely about "equal opportunity" but also requires attention to "equal outcomes".

Researching the social determinants of access to medical insurance and its equity is of great significance both theoretically and practically. Access to medical treatment significantly influences a community's overall health and well-being by encouraging individuals to seek both curative and preventive care, thereby helping to prevent disease proliferation and improve public health outcomes (Hoffman et al., 2024; Tzenios, 2019). Addressing key determinants of health can foster health and well-being while guaranteeing that everyone has access to healthcare services (Munyambu, 2024).

To the best of my knowledge, existing studies have confirmed the prediction of socioeconomic factors on medical insurance coverage (Cho et al., 2019; Wang et al., 2016), but there are still limitations: for example, timeliness of data is inadequate, making it difficult to reflect new challenges brought about by digital transformation (such as online enrollment) (Li et al., 2020); Wang et al. (2023) found that 44% of enrollees underestimate health insurance benefits due to information asymmetry. To address this research gap, this study utilizes data from 2021 China

General Social Survey (CGSS 2021), focusing on health insurance ownership status and type. Through descriptive statistics, chi-square tests, and logistic regression, it examines the influence of social determinants on access to health insurance and assesses the equity of health insurance distribution across urban-rural, gender, income, and education groups. The study not only provides the latest empirical evidence for research on the equity of medical insurance but also provides a scientific basis for optimizing policy design, helping to achieve the transition from "universal coverage" to "universal equity".

2. Literature Review

2.1. Social Determinants of Health Insurance Access in China

There are merely 3.15% Chinese adults lacking coverage of health insurance, but most participants were enrolled in low-level insurance plans (64.82%), followed by those with medium-level coverage (16.70%), while only a small portion had high-level insurance coverage (15.33%) (Lee et al., 2022). Early studies focused on single dimensions such as income and education on Health Insurance Access in China. Using CHARLS data, Zhang et al. (2017) found that "higher education and household expenditure significantly increase the probability of having insurance". Jin et al. (2016) further differentiated between different types of insurance, noting that public insurance uptake is driven by age and chronic conditions, while private insurance is more sensitive to income and perceived risk. These studies outline how socioeconomic gradients influence health insurance ownership but lack exploration of the interactive effects between urban and rural areas and gender.

In recent years, researchers have begun to focus on complex factors and intersectional inequalities. Zhou et al. (2021) found that women in rural areas have the lowest coverage rates and the highest out-of-pocket burden. Using systematically integrated data, Yang et al. (2022) noted, "We find no evidence that the urban-rural gap in these measures has narrowed as a result of the consolidation, at least in the near term." This means that while institutional integration improves "equality of opportunity", it fails to achieve "equality of outcome" due to disparities in treatment.

Despite the expansion of universal health coverage in China, persistent urban-rural and income-based disparities in healthcare costs and outcomes highlight the need to shift focus from access alone to the equity and quality of coverage. As Liu et al. (2020) pointed out in their mixed-methods study, the elevated premiums result in an economic strain. These problems were the factors contributing to the divergent views on the difference in premiums between urban and rural policyholders. This urban-rural difference reminds us that "equal opportunity" at the institutional level does not necessarily lead to "equal outcomes". A ten-year review by Yip et al. (2019) also confirmed that significant disparities persist in reimbursement rates and measures of catastrophic health spending between the highest and lowest income groups. Therefore, the research focus has shifted from "whether universal coverage is available" to "whether the quality of universal coverage is

fair".

Emerging research indicates that institutional trust and information transparency are critical social determinants influencing rural residents' willingness to participate in health insurance schemes. Zuo et al.'s (2025) research reveals that rural residents often withdraw from insurance due to distrust in local governance and poor communication of benefits. Yu et al. (2025) further demonstrate that policy awareness and institutional trust are significant predictors of willingness to enroll. These findings expand upon traditional research by incorporating institutional trust and information transparency into the framework of social determinants.

Given that the social determinants theory emphasizes that health status is closely related to the social structural position of individuals, existing studies have pointed out that factors such as income, education, occupation, household registration and gender significantly predict access to medical insurance. However, comprehensive empirical studies on how these structural variables systematically predict the participation behavior of medical insurance is still limited. Therefore, we propose the following research question:

RQ1: In the Chinese context, how do social structural variables (such as educational level, income level, gender, and household registration) systematically predict the coverage and quality of individual medical insurance?

2.2. Equity in Health Insurance Access in China

China's national medical insurance system is nearly completed in terms of "full coverage of the system". However, "equal opportunity" doesn't mean "equal ending". The new evidence shows that there are still significant differences in many places, such as treatment levels, protection in economic risks and individual feelings of gain. The unfair health safeguard is becoming a core issue in next stage of innovation.

Firstly, in regard to difference in treatment levels, Zhang et al. (2017) evaluated the "benefit equity" of social health insurance by using data from five representative provinces from 2014 to 2020, which made them found that lower-income quintiles experienced worse health outcomes but received less proportion of social health insurance advantages in relation to the wealthier quintiles. Although low-income individuals nominally have same qualification in health insurance, their actual reimbursement amounts and ratios are significantly lower than high-income individuals which means the phenomenon of reverse fund is still prominent.

Furthermore, the inequity in the dimension of economic risk protection is more visualized. According to the study of Liu et al. (2021), catastrophic health expenditure incidence was highest among rural residents and those covered by the New Cooperative Medical Scheme. After institutional integration, the disparity of the catastrophic expenditure has not quickly constricted, which means that rural patients still need to pay a higher proportion of medical costs.

Meanwhile, urban-rural differences in individual feelings of gain have also been verified. Cheng et al. established a satisfaction index model, which showed that

rural respondents reported significantly lower satisfaction with benefit adequacy and reimbursement convenience than their urban counterparts. The reason is that hysteresis of the basal information system, complicated reimbursement process and spatial mismatch of high quality medical resources, making it difficult for rural residents to acquire timely and enough compensation even if they take part in insurance.

As far as concerned whether integration reforms help reduce the gap, studies have shown that the integration of medical insurance for urban and rural residents can reduce the gap in the utilization of inpatient services between urban and rural residents (Li et al., 2020; Zhou et al., 2021). However, there are still significant differences in outpatient services and chronic disease management. Li & Jian further pointed out that after insurance integration, low-income rural residents still faced higher out-of-pocket payments for outpatient care, remanding policy dividends are unevenly distributed among different income groups.

Finally, the multiple inequalities faced by tender groups need to pay attention. Zhou et al. (2021) found that rural women had the lowest effective coverage and the highest financial burden. The superposition of triple disadvantages—gender, household registration and income, which makes them become the most remarkable subgroup in the assessment of health insurance equity.

Based on the Social Determinants of Health theory and the research findings of Zhang et al. (2017) on the relationship between education and medical insurance, we propose that:

H1: Individuals with higher educational levels have observably higher medical insurance coverage and quality than those with lower educational levels.

H2: Individuals with higher income levels have markedly higher medical insurance coverage and quality than those with lower income levels.

H3: The medical insurance coverage and quality of individuals with agricultural household registration are dramatically lower than those with non-agricultural household registration.

3. Methods

3.1. Data Source

The China General Social Survey (CGSS) launched in 2003 which is China's first national, comprehensive, and continuous large-scale social survey project. CGSS is implemented, managed, and data released by the National Survey Research Center (NSRC) of Renmin University of China. The 2021 data was open to the public on March 31, 2023 (National Survey Research Center, 2023).

As a consecutive cross-sectional survey, CGSS comprehensively analyzes China's social changes through annual data, covering multiple fields such as economy, politics, and society. It reveals the status of social members and groups, promotes longitudinal and cross national comparative studies, facilitates the open sharing of research data, and provides basic data support for scientific research, teaching and so on.

From 2003 to 2022, CGSS covered 162,036 people through 15 surveys. The 2021 survey was the 14th. Overcoming the influence of the COVID-19 pandemic, the project team cooperated with the "National University Investigators Alliance" and completed the survey in nearly 5 months.

The 2021 data contains 700 variables. The core module and theme module are for all respondents: the core module covers elements such as social demographics, housing, and health; the theme module focuses on the comprehensive prediction of the COVID-19 pandemic, attitudes toward marriage, childbearing, and occupation, etc. The additional East Asian Social Survey (EASS) health module and International Social Survey Program (ISSP) health and environment module each randomly selected 1/3 of the objects to participate. The core module can vertically compare social changes through 8 years of data, while the additional modules support longitudinal comparison with 2010/2011 data and cross-national comparison.

3.2. Participants

According to the CGSS 2021 data, this study included 8148 respondents. In terms of gender composition, females accounted for 54.8% (4469 people) and males for 45.2% (3679 people), indicating that there were slightly more females than males in the survey sample.

In terms of age, participants ranged from 18 to 99 years old, with an average age of 51.64 years and a standard deviation of 17.57, which means the sample covers all age groups from youth to old age, having strong representativeness.

In terms of ethnic composition, Han Chinese respondents accounted for 92.6% (7548 people), being the absolute majority. Among ethnic minorities, Hui accounted for 2.0% (165 people), Zhuang for 1.8% (143 people), Manchu for 0.5% (42 people), Mongolian for 0.2% (19 people), Tibetan for 0.1% (6 people), and other ethnic groups totaled 225 people, accounting for 2.8%. Overall, the sample basically reflects the basic characteristics of China's population in terms of gender, age, and ethnic structure, which provide a reliable basis for exploring the influence of social factors on access to health insurance.

3.3. Measurement

3.3.1. Dependent Variable

Although the CGSS questionnaire also includes other measurement items related to the types of medical insurance (such as E30 "Which form of medical insurance do you enjoy?" and D28 "What medical insurance do you have now?"). However, the proportion of lack values in these questions is extremely high, reaching 67.2% and 67.0% respectively, which means the effective sample is less than one-third of the total sample. The large-scale missing values may not only bias estimation results but also weaken the representativeness and robustness of statistical analyses. Therefore, this study excluded these items and instead used the A61 measurement—with fewer missing values and higher validity—as the main data source for basic and commercial health insurance participation. Based on this, three depend-

ent variables were generated for logistic and linear regression: basic health insurance participation; commercial health insurance participation; and the "Medical insurance level" variable.

1) Basic health insurance participation

In this study, basic health insurance participation was measured by questionnaire item A61 ("Do you currently participate in the following social security programs—urban basic medical insurance/New Rural Cooperative Medical Scheme/public medical care?"). A total of 8148 respondents participated, with 8074 providing valid responses (a validity rate of 99.1%). Results showed that 461 respondents (5.7% of the total sample; 5.7% of valid samples) did not participate in any form of basic health insurance, while 7613 respondents (93.4% of the total sample; 94.3% of valid samples) were insured. Additionally, 74 questionnaires (0.9% of the total sample) had missing values for this item. This distribution indicates a high coverage rate of basic health insurance in the sample, providing a solid foundation for subsequent analysis of how different sociodemographic characteristics predict insurance participation.

2) Commercial health insurance participation

In this study, commercial health insurance participation was measured by questionnaire item A61 ("Do you currently participate in the following social security programs—commercial health insurance?"). A total of 8148 respondents participated, with 7960 providing valid responses (a validity rate of 97.7%). Results showed that 6844 respondents (84.0% of the total sample; 86.0% of valid samples) did not participate in commercial health insurance, while 1116 respondents (13.7% of the total sample; 14.0% of valid samples) were insured. Additionally, 188 questionnaires (2.3% of the total sample) had missing values for this item. Overall, the coverage rate of commercial medical insurance in the sample is signally lower than that of basic medical insurance, which reflects that within China's medical security system, the popularity of commercial insurance remains limited.

3) Medical insurance level

In this study, the two variables of basic medical insurance and commercial medical insurance were combined to generate a new variable which named "Medical insurance level". To improve conceptual clarity, this study explicitly define the construction of the "medical insurance level" variable. Based on respondents' participation in basic and commercial insurance, we classified individuals into three ordered categories: (0) no insurance; (1) low-level insurance—participation in either basic insurance or commercial insurance only; and (2) high-level insurance—simultaneous participation in both basic and commercial insurance. This composite indicator captures the gradient of protection within China's multi-layered insurance system. In the sample of this study, there were 8148 respondents, whom 7916 provided valid responses to the question on the medical insurance level variable, with an effective response rate of 97.2%. The results showed that 4.8% of the respondents did not participate in any type of medical insurance; 82.1% had low-level medical insurance (including "urban basic medical insurance/new rural co-

operative medical insurance/public medical care" or "commercial medical insurance"); and 13.1% had high-level medical insurance (including "urban basic medical insurance/new rural cooperative medical insurance/public medical care" and "commercial medical insurance"). Additionally, 232 questionnaires (accounting for 2.8% of the total sample) had missing data for this question. These distribution characteristics indicate that although the vast majority of respondents are covered by the basic medical security system, the coverage proportion of medium and high-level medical insurance remains limited.

3.3.2. Independent Variables

1) Educational Level

In this study, the variable of educational level (A7a) was recoded based on the respondents' "current highest level of education" to facilitate subsequent statistical analysis. In the original questionnaire, this item included 14 options ranging from "no education received" to "postgraduate or higher". To simplify the analysis and reflect the progressive relationship of educational levels, this study recoded them into five levels: Code 1 includes "no education received" and "private traditional schools, literacy classes"; Code 2 refers to "primary school"; Code 3 refers to "junior high school"; Code 4 includes "vocational high schools", "regular high schools", "secondary specialized schools" and "technical schools"; Code 5 includes "junior college (adult or regular higher education)", "undergraduate (adult or regular higher education)" and "postgraduate or higher".

The distribution of the recoded variable shows that among the 8127 valid samples, there were 905 respondents with educational level coded as 1, accounting for 11.1% of the total sample; 1751 respondents with Code 2, accounting for 21.5%; 2311 respondents with Code 3, accounting for 28.4%; 1489 respondents with Code 4, accounting for 18.3%; and 1671 respondents with Code 5, accounting for 20.6%. Another 21 questionnaires (0.3% of the total sample) had missing data for this item. This distribution indicates that the overall educational level of the respondents in the sample is characterized by a middle to high structure. Among them, those with junior high school and primary school education account for a relatively large proportion, while the proportion of those with higher education backgrounds (Code 5) also reaches one-fifth.

2) Gender

In the sample of this study, the gender variable (A2) was recorded by interviewers on-site, included a total of 8148 valid respondents. Among them, 4469 are female, accounting for 54.8% of the total sample; 3679 are male, accounting for 45.2%. The distribution of gender ratio shows that there are slightly more females than males, but the overall gender composition is relatively balanced, which provides a basis for comparability for subsequent analysis of the prediction of gender differences on the accessibility and level of medical insurance.

3) Household registration type

In the CGSS 2021, the household registration type is measured by questionnaire item A18 ("What is your current household registration status?"), which covers var-

ious registration categories as follows: agricultural hukou (coded as 1), non-agricultural hukou (coded as 2), residential hukou [previously agricultural hukou] (coded as 3), residential hukou [previously non-agricultural hukou] (coded as 4), military registration (coded as 5), no hukou (coded as 6), and other types (coded as 7).

In this study, hukou types were recoded into three categories based on respondents' registration status: agricultural hukou (coded as 0), residential hukou [previously agricultural hukou] (coded as 1), and urban hukou group (including non-agricultural hukou and residential hukou [previously non-agricultural hukou], coded as 2). Among them, agricultural hukou refers to groups with traditional rural household registration status; residential hukou [previously agricultural hukou] refers to groups converted from rural hukou to residential hukou. Although their registration is nominally residential hukou, they may still retain certain rural attributes in terms of policy entitlements, land contractual rights, etc.; the urban hukou group covers groups originally with urban household registration, regardless of whether they are currently registered as non-agricultural hukou or residential hukou [previously non-agricultural hukou].

Among the 8148 respondents, there were 8055 valid respondents, accounting for 98.9% of the total sample. The results show that there were 4842 individuals with agricultural hukou, accounting for 60.1% of the valid samples; 755 individuals with residential hukou [previously agricultural hukou], accounting for 9.4%; and 2458 individuals in the urban hukou group, accounting for 30.5%. Additionally, 93 questionnaires (1.1% of the total sample) had missing data for this item. Overall, rural household registration groups (including agricultural hukou and residential hukou [previously agricultural hukou]) account for nearly 70% of the sample, reflecting the unbalanced distribution of urban and rural household registration.

4) Personal annual income

In the CGSS 2021, personal annual income was measured by questionnaire item A8a ("What was your total personal income for the entire last year [2020]?"). This item requires respondents to directly report the actual total income amount of the previous year and fill it in the corresponding blank with Arabic numerals. To ensure data completeness and comparability, interviewers must follow specific recording rules, including handling by padding zeros in higher digit positions. Meanwhile, the questionnaire sets specific codes for special cases: for example, 9,999,996 indicates that the individual's annual total income exceeds one million; 9,999,997 indicates "not applicable"; 9,999,998 indicates "don't know"; and 9999999 indicates "refuse to answer." This method of combining direct amount reporting with standardized coding helps retain precise continuous variable information during subsequent data processing, while also enabling the identification and handling of invalid or missing data.

Based on the results of quintile grouping, the income variable was divided into five levels: Group 1 (lowest income group) includes those with an income of 0-1000 yuan (inclusive), with a total of 1595 people, accounting for 21.8% of all valid samples; Group 2 includes those with an income of 1001 - 10,000 yuan (inclusive), with 1405 people, accounting for 19.2%; Group 3 includes those with an income

of 10,001-30,000 yuan (inclusive), with 1465 people, accounting for 20.0%; Group 4 includes those with an income of 30,001- 60,000 yuan (inclusive), with 1590 people, accounting for 21.7%; Group 5 (highest income group) includes those with an income of 60,001 yuan and above, with 1278 people, accounting for 17.4%. In this statistics, 815 questionnaires (accounting for 10.0% of the total sample) had missing personal income data.

3.3.3. Control Variables

In this study, the age variable was derived by converting respondents' year of birth (A3), specifically by subtracting the year of birth from the survey year 2021 to obtain the actual age. Results show that a total of 8148 respondents provided valid age information, with an age range of 18 to 99 years old, a mean age of 51.64 years (standard deviation = 17.57). This covers various groups from young to elderly individuals, reflecting the broad representativeness of the sample in terms of age structure, which provides a solid foundation for analyzing differences in the accessibility and level of medical insurance among individuals in different age groups.

3.4. Interaction Effects Model

To examine intersectional inequalities suggested in prior literature, this constructed models incorporating interaction terms capturing compounded disadvantages. Specifically, this study added Gender × Hukou, Gender × Income, and Hukou × Income interactions in both logistic regression models and in the medical insurance level model. These terms allow us to test whether social structural disadvantages reinforce each other for subgroups such as rural women and low-income rural residents.

4.Results

4.1. Binary Logistic Regression Analysis with Basic Medical Insurance Participation as the Dependent Variable

In the binary logistic regression analysis (Table 1), a total of 8148 sample data points were collected, among which 7190 (88.2%) were included in the analysis due to complete key variables, and 958 (11.8%) were excluded due to missing values (Case Processing Summary). The dependent variable is whether one has basic medical insurance, where 0 indicates "no basic medical insurance" and 1 indicates "has basic medical insurance" (Dependent Variable Encoding). In the baseline model (Step 0), which includes only the constant term, the prediction results classify all individuals as "having medical insurance", with an overall classification accuracy rate of 94.3%, but the prediction accuracy rate for the "no medical insurance" group is 0%. This reflects that the sample has an extremely high medical insurance coverage rate and an unbalanced category distribution. At this point, the constant term B = 2.813 ($p < 0.001$) and Exp(B) = 16.666, meaning that when no explanatory variables are considered, the odds ratio of an individual having medical insurance is approximately 16.67.

The Univariate Score Test (Variables not in the Equation) shows that educa-

tional level ($\chi^2 = 17.308$, $p < 0.001$), household registration type ($\chi^2 = 6.189$, $p = 0.013$), and personal annual income ($\chi^2 = 49.291$, $p < 0.001$) are significantly associated with the possession of medical insurance, while gender ($p = 0.236$) and age ($p = 0.745$) are not significant. The overall chi-square statistic is 59.135 ($p < 0.001$), indicating that at least one explanatory variable has a significant effect on the dependent variable.

In Step 1, five variables—educational level, gender, household registration type, personal annual income, and age—were introduced. The Omnibus test yielded a chi-square value of 60.412 ($df = 5$, $p < 0.001$), indicating that this model is significantly better than the baseline model containing only the constant term. However, the model's Nagelkerke R^2 is only 0.024, with low explanatory power, which may be related to the near-saturation of medical insurance coverage leading to insufficient variability.

Results of the multivariate regression analysis show that educational level ($B = 0.165$, $p = 0.003$, $Exp(B) = 1.180$) and personal annual income ($B = 0.247$, $p < 0.001$, $Exp(B) = 1.281$) have a significant positive prediction on the likelihood of having medical insurance. Specifically, for each one-level increase in educational level, the odds of having insurance increase by approximately 18.0%; for each one-level increase in income, the odds increase by approximately 28.1%. The prediction of age is also significant ($B = 0.01$, $p = 0.006$, $Exp(B) = 1.010$); for each additional year of age, the odds of having insurance increase by approximately 1.0%. Gender ($B = -0.097$, $p = 0.366$) and household registration type ($B = -0.077$, $p = 0.248$) are insignificant after controlling for other variables, indicating that their effects may be explained by socioeconomic factors such as education and income within the multivariate framework.

Table 1. Determinants of basic medical insurance participation: parameter estimates from logistic regression model.

Variables	B	SE	Sig.	Sig. Exp(B)
Education level	0.165	0.056	0.003**	1.180
Gender	−0.097	0.108	0.366	0.907
Residents' Hukou	−0.077	0.067	0.248	0.926
Individual Annual Income	0.247	0.043	<0.001***	1.281
Age	0.010	0.004	0.006**	1.010
Constant	1.217	0.305	<0.001	3.376
Nagelkerke R Square		0.024		

Note: *Significant at the 0.05 level, and **Significant at the 0.01 level, and ***Significant at the 0.001 level.

4.2. Binary Logistic Regression Analysis with the Dependent Variable as Whether or Not to Have Commercial Medical Insurance

In the binary logistic regression analysis (Table 2), this model takes whether one

has commercial medical insurance as the dependent variable (0 = no commercial medical insurance, 1 = has commercial medical insurance). A total of 8,148 samples were collected, among which 7083 (86.9%) were included in the analysis due to complete key variables, and the remaining 1065 (13.1%) were excluded due to missing values (Case Processing Summary). In the baseline model (Step 0), which includes only the constant term, the model predicts all individuals as "having no commercial medical insurance", with an overall classification accuracy rate of 85.8%. However, it fails to correctly identify any samples of "having commercial medical insurance" (with a prediction accuracy rate of 0%), reflecting a high proportion of "no commercial medical insurance" in the sample. At this point, the constant term $B = -1.800$ ($p < 0.001$) and $Exp(B) = 0.165$, indicating that without any explanatory variables, the odds ratio of an individual having commercial medical insurance is only 0.165.

The Univariate Score Test (Variables not in the Equation) shows that educational level ($\chi^2 = 439.216$, $p < 0.001$), household registration type ($\chi^2 = 152.053$, $p < 0.001$), personal annual income ($\chi^2 = 263.512$, $p < 0.001$), and age ($\chi^2 = 293.492$, $p < 0.001$) are all significantly associated with whether one has commercial medical insurance, while gender ($p = 0.831$) is not significant. The overall chi-square statistic is 589.007 ($p < 0.001$), indicating that at least one variable has a significant effect on the dependent variable.

In Step 1, five variables—educational level, gender, household registration type, personal annual income, and age—were simultaneously included in the model. The Omnibus test yielded a chi-square value of 611.223 ($df = 5$, $p < 0.001$), indicating that the overall model is significantly better than the baseline model. The model's Nagelkerke R^2 is 0.148, with higher explanatory power than the basic medical insurance model, though still limited.

Results of the multivariate regression analysis show that educational level ($B = 0.305$, $p < 0.001$, $Exp(B) = 1.357$), household registration type ($B = 0.165$, $p < 0.001$, $Exp(B) = 1.180$), and personal annual income ($B = 0.244$, $p < 0.001$, $Exp(B) = 1.276$) have a significant positive prediction on the likelihood of having commercial medical insurance. Specifically, for each one-level increase in educational level, the odds of having insurance increase by approximately 35.7%; for each one-level increase in income, the odds increase by approximately 27.6%; and individuals who have converted from rural household registration to urban household registration have an approximately 18.0% higher likelihood of having insurance. Gender also reaches a significant level ($B = -0.224$, $p = 0.002$, $Exp(B) = 0.800$), indicating that after controlling for other factors, the likelihood of women having commercial medical insurance is approximately 20% lower than that of men. The prediction of age is significantly negative ($B = -0.022$, $p < 0.001$, $Exp(B) = 0.979$); that is, for each additional year of age, the likelihood of having commercial medical insurance decreases by approximately 2.1%. The constant term $B = -2.645$ ($p < 0.001$, $Exp(B) = 0.071$) reflects an extremely low baseline odds ratio when all independent variables take the value of zero.

Table 2. Determinants of basic medical insurance participation: parameter estimates from logistic regression model.

Variables	B	SE	Sig.	Sig. Exp(B)
Education level	0.305	0.041	<0.001***	1.357
Gender	−0.224	0.073	0.002**	0.800
Residents' Hukou	0.165	0.043	<0.001***	1.180
Individual Annual Income	0.244	0.029	<0.001***	1.276
Age	−0.022	0.003	<0.001***	0.979
Constant	−2.645	0.223	<0.001	0.071
Nagelkerke R Square			0.148	

Note: *Significant at the 0.05 level, and **Significant at the 0.01 level, and ***Significant at the 0.001 level.

Multiple linear regression analysis with medical insurance level as the dependent variable

Although the resulting variable is ordinal, its three levels are approximately equally spaced and reflect a cumulative increase in coverage. Following established methodological practice, we use multiple linear regression for ease of interpretation and because the distribution satisfies assumptions of approximate continuity. To ensure robustness, an ordered logistic regression was also conducted, and the direction and significance of key predictors remained unchanged. In the multiple linear regression analysis (Table 3), this model takes "Medical insurance level" as the dependent variable, with independent variables including educational level, gender, household registration type, personal annual income, and age (Variables Entered/Removed). The overall model fit shows that $R = 0.276$, $R^2 = 0.076$, and adjusted $R^2 = 0.075$, indicating that the model can explain approximately 7.5% of the variance in medical insurance level, with a standard error of the estimate of 0.40053 (Model Summary).

Results of the ANOVA indicate that the regression model is overall significant ($F = 115.949$, $df = 5$, $p < 0.001$), suggesting that the five included sociodemographic variables have statistically significant combined explanatory power for medical insurance level (ANOVA).

In terms of regression coefficients (Coefficients), educational level has a significant positive prediction on medical insurance level ($B = 0.042$, $p < 0.001$, Beta = 0.129), meaning that for each one-level increase in educational level, medical insurance level increases by 0.042 units. Personal annual income also has a significant positive prediction ($B = 0.040$, $p < 0.001$, Beta = 0.136), indicating that for each one-level increase in income, medical insurance level rises by 0.040 units. Household registration type also exerts a significant positive effect ($B = 0.014$, $p = 0.020$, Beta = 0.031), showing that urban or non-agricultural household registration has a slight advantage in medical insurance level compared to rural household registration.

The gender variable shows a significant negative prediction in this model ($B = -0.032$, $p = 0.001$, Beta = −0.038), indicating that after controlling for other factors,

women's medical insurance level is slightly lower than that of men. Age also exhibits a significant negative effect (B = −0.002, p < 0.001, Beta = −0.076), meaning that for each additional year of age, medical insurance level decreases by approximately 0.002 units. The constant term B = 0.933 (p < 0.001) represents the baseline medical insurance level when all independent variables take the value of zero.

Under multivariate conditions, aging and female identity have a weak but significant negative association with medical insurance level, while household registration type, though exerting a positive effect, has a relatively small prediction. This is consistent with the distribution differences of China's medical security system among different social groups and the characteristics of structural resource allocation.

Table 3. Logistic regression predicting medical insurance level.

	B	Exp(B)	t	Sig.
(Constant)	0.933	0.029	32.010	<0.001
Education level	0.042***	0.005	8.032	<0.001
Gender	−0.032***	0.010	−3.206	0.001
Residents' Hukou	0.014**	0.006	2.324	0.020
Individual Annual Income	0.040***	0.004	10.202	<0.001
Age	−0.002***	0.000	−5.404	<0.001
Adj R SQUARE		0.075		

*p < 0.05. **p < 0.01. ***p < 0.001.

Interaction Effects Model

Table 4. Interaction effects model.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Gender	−0.071	0.107	0.436	1	0.509	0.932
	Official Registration	0.371	0.108	11.703	1	<0.001	1.449
	Individual Annual Income	0.275	0.039	50.264	1	<0.001	1.317
	Age	−0.021	0.003	66.489	1	<0.001	0.979
	Education	0.303	0.041	54.180	1	<0.001	1.354
	Gender_Hukou	−0.156	0.078	3.997	1	0.046	0.856
	Hukou_Income	−0.038	0.029	1.678	1	0.195	0.963
	Constant	−2.817	0.246	131.533	1	<0.001	0.060

a. Variable(s) entered on step 1: Gender, Official Registration, Individual Annual Income, Age, Education, Gender_Hukou, Hukou_Income.

Interaction effect models reveal notable intersectional disparities, as shown in Table 4. The Gender × Hukou interaction is negative and significant in the commercial insurance model (p < 0.05), indicating that rural women have a substantially lower likelihood of purchasing commercial insurance compared to other

groups. The Hukou × Income interaction is not significant ($p > 0.05$), suggesting that income does not increase commercial insurance participation more strongly for urban residents than for rural residents.

5. Discussions

5.1. Summarization of Findings

Regarding RQ1: "In the Chinese context, how do social structural variables (educational level, income level, gender, and household registration) systematically predict the coverage and quality of individual medical insurance"—this study constructed a multivariate statistical model covering basic medical insurance coverage, commercial medical insurance coverage, and a comprehensive indicator of medical insurance quality based on CGSS2021 data. The results show that different types of medical insurance exhibit significant differences in coverage and influencing factors.

First, in terms of basic medical insurance, the sample coverage rate has reached 94.3%, indicating near-universal coverage. After controlling for variables such as gender, age, household registration, and income, educational level ($OR \approx 1.18$, $p = 0.003$) and personal income ($OR \approx 1.281$, $p < 0.001$) still maintain a significant positive prediction on the likelihood of participation, while gender and household registration are not significant in the multivariate model. This means that under the basic medical insurance system with high inclusiveness, differences in socioeconomic status (SES) related to education and income still exist, but urban-rural household registration differences tend to disappear after SES control.

Second, in terms of commercial medical insurance, the coverage rate significantly drops to 14.0%, with obvious social stratification characteristics. Results of the multivariate logistic regression show that education ($OR \approx 1.357$, $p < 0.001$), income ($OR \approx 1.276$, $p < 0.001$), and urban household registration ($OR \approx 1.18$, $p < 0.001$) all significantly and positively predict the probability of participation, while women ($OR \approx 0.800$, $p = 0.002$) and older individuals ($OR \approx 0.979$, $p < 0.001$) have a lower probability of participation. It is evident that commercial medical insurance has an obvious "threshold" effect of social stratification.

In terms of the comprehensive indicator of medical insurance quality (OLS model with a continuous variable consisting of no insurance, low-level, and high-level as the dependent variable), education ($B \approx 0.042$, $p < 0.001$) and income ($B \approx 0.040$, $p < 0.001$) remain the core factors for improving quality. Urban household registration has a slight advantage ($B \approx 0.014$, $p = 0.020$), while women ($B \approx -0.032$, $p = 0.001$) and the elderly ($B \approx -0.002$, $p < 0.001$) are at a relative disadvantage. The negative association between age and participation in commercial or high-tier insurance may stem from several structural and behavioral factors. Older adults face higher premiums and stricter underwriting rules in China's commercial insurance market, making enrollment financially burdensome. Additionally, the prevalence of pre-existing conditions results in greater rejection risk. Older individuals may also perceive limited marginal benefits from purchasing commer-

cial insurance because they depend primarily on basic medical insurance after retirement. These mechanisms collectively help explain the observed decline in higher-tier insurance participation among older age groups. This further confirms the important role of socioeconomic status in accessing higher-level security and shows that although urban-rural differences at the quality level are weaker than those in commercial medical insurance coverage, they still exist.

The difference between urban and rural registered residence mainly focuses on commercial medical insurance and quality, while it weakens in basic medical insurance; Gender and age both show disadvantages for women and older adults in terms of commercial medical insurance and quality. This is highly consistent with the dual structure of China's medical insurance system: basic medical insurance tends to be universal, while commercial medical insurance and higher quality guarantees have obvious social stratification barriers.

The following are the results of hypothesis testing: H1 (Individuals with higher educational levels have higher medical insurance coverage and quality): Supported. Education shows a significantly positive and consistent direction in basic medical insurance (OR ≈ 1.18, $p = 0.003$), commercial medical insurance (OR ≈ 1.357, $p < 0.001$), and the quality indicator (B ≈ 0.042, $p < 0.001$).

H2 (Individuals with higher income have higher medical insurance coverage and quality): Supported. Income is significantly positive in all three models (basic medical insurance: OR ≈ 1.281, $p < 0.001$; commercial medical insurance: OR ≈ 1.276, $p < 0.001$; quality: B ≈ 0.040, $p < 0.001$).

H3 (Medical insurance coverage and quality of agricultural household registration are significantly lower than those of non-agricultural household registration): Partially supported. Urban household registration has a significant advantage in commercial medical insurance (OR ≈ 1.18, $p < 0.001$) and quality (B ≈ 0.014, $p = 0.020$), but household registration is not significant in basic medical insurance ($p = 0.248$), indicating that urban-rural differences only exist in higher-level security and are not obvious in the inclusive basic medical insurance.

5.2. Compared with Previous Research

Prior research has repeatedly found that education and income are the main factors influencing health insurance participation, particularly for private insurance. According to Jin et al. (2016), going from the lowest to the highest income level decreased the likelihood of having no insurance while increasing the relative risk of having private insurance or both public and private insurance by factors of 1.74 and 1.51, respectively. In a similar vein, Wan et al. (2020) highlighted that the adoption of private health insurance is primarily driven by education and income. Our results align with and extend these findings: in commercial medical insurance, both education (OR ≈ 1.357) and income (OR ≈ 1.276) exert strong positive effects, confirming that "private insurance is more sensitive to income and education". Importantly, our study also reveals that even within China's highly inclusive basic medical insurance, education (OR ≈ 1.18) and income (OR ≈ 1.281)

remain significant predictors of participation—indicating that socioeconomic status influences participation across all tiers of the insurance system, not just the private segment.

In terms of urban–rural disparities, Yang et al. (2022) found no short-term evidence that consolidation of health insurance schemes reduced the urban–rural gap. Our findings partly echo this conclusion: although hukou status is not significant in basic medical insurance ($p = 0.248$), it remains a significant advantage in commercial insurance (OR ≈ 1.18) and insurance quality ($B \approx 0.014$, $p = 0.020$). This suggests that urban-rural stratification persists but is now more pronounced in higher-tier coverage and quality dimensions rather than in basic coverage rates.

Zhou et al. (2021) identified rural women as having the lowest coverage rates, with unemployed or informally employed individuals concentrated in schemes offering lower reimbursement ratios. Our findings extend this gendered disparity into the domain of commercial insurance and quality: women are significantly disadvantaged in commercial insurance participation (OR ≈ 0.800, $p = 0.020$) and in quality scores ($B \approx -0.032$, $p = 0.001$). The significant positive effect of income on quality ($B \approx 0.040$, $p < 0.001$) also indirectly supports Zhou et al.'s observation that employment status, which is closely tied to income, shapes protection levels.

Lastly, previous research has shown a distinct stratification of insurance kinds by economic resources, with private insurance being the most income-dependent (Jin et al., 2016; Wan et al., 2020). The fact that just 14.0% of respondents had commercial insurance, along with the fact that it is more heavily reliant on income and education, confirms this pattern of stratification and highlights the systemic obstacles to obtaining better or additional coverage.

5.3. Policy Implications of This Study

The findings of this study reveal that within China's medical insurance system, education and income are core social structural factors determining individuals' medical insurance coverage and quality, while commercial medical insurance and high-quality security still have obvious social stratification thresholds. Policymakers should further focus on the inequality faced by groups with both low education and low income in accessing commercial medical insurance and high-level security, exploring measures such as premium subsidies, product customization, and information popularization to lower institutional access thresholds. Meanwhile, in response to the disadvantages of women and the elderly in commercial medical insurance and quality, it is necessary to optimize insurance product design and pricing strategies to narrow the institutional gaps caused by gender and age. Although urban-rural differences have been significantly reduced in basic medical insurance, their persistence in high-level security reminds policymakers to adopt more balanced supportive measures in the development of urban-rural commercial insurance markets and public resource allocation.

Based on the empirical finding that women and older adults have significantly lower participation in commercial insurance, insurers could introduce gender-

sensitive pricing adjustments, simplified underwriting procedures for older adults, and age-friendly insurance products with reduced exclusion clauses. For low-income rural residents, targeted premium subsidies and low-threshold micro-commercial insurance packages could increase affordability. In addition, tailored information campaigns—using community health workers or digital platforms—could reduce the information barriers that disproportionately predict individuals with lower education levels.

5.4. Limitations and Future Research

Although this study systematically analyzed the relationship between social structure variables such as education, income, gender and registered residence, and health insurance coverage and quality by using the national representative data of CGSS2021, there are still some limitations that need to be further overcome and expanded by subsequent research.

Firstly, the limitations of measuring the dependent variable deserve attention. The "quality" indicator of medical insurance is based on the comprehensive construction of insurance types and levels in the questionnaire. Although it can reflect the coverage level, it fails to capture more detailed quality dimensions such as reimbursement ratio, accessibility of medical services, and actual economic risk protection. Therefore, its explanatory power has certain limitations at the policy level. In the future, it can be combined with micro-level medical expenditure data, claims records, or medical settlement information to measure the quality of medical insurance with more refined indicators.

Secondly, the ceiling effect of variable measurement and model estimates may underestimate the influence of certain factors. The coverage rate of basic medical insurance is close to universal, leading to a statistically significant decline in variables such as registered residence. Future research can examine the role of social structural variables in specific subgroups, such as migrant populations and informal workers, to reveal structural differences in the context of high coverage.

Thirdly, the causal inference limitations of cross-sectional data limit this study to revealing only correlation between variables and unable to confirm the causal direction. Education and income may be both determining factors for the quality of medical insurance, as well as being negatively influenced by health status and insurance choices. In the future, longitudinal tracking data or quasi-experimental designs (such as differentiated promotion of policy pilots) can be used to enhance causal inference capabilities.

Fourthly, the range of model variables is limited. This study only included core social structural variables such as education, income, gender, registered residence and age, but failed to cover important factors that may predict the participation and quality of medical insurance, such as health status, occupation type, employment form, financial capacity of regional medical insurance, social network resources, etc. Future research can explore the interaction of these factors and their differences under different types of medical insurance systems within a multidi-

mensional control variable framework.

Finally, the differences between urban and rural commercial insurance markets and the role of cultural factors still need to be further explored. Although this study reveals a significant gap in commercial medical insurance between urban and rural areas, it fails to segment the prediction of insurance product types, marketing channels, and social psychological factors. In the future, a hybrid approach can be used to combine quantitative analysis with qualitative interviews to reveal the cognitive patterns, risk preferences, and trust mechanisms of urban and rural residents in commercial medical insurance decision-making.

6. Conclusion

This study provides comprehensive and updated evidence on the social determinants of health insurance access and quality in China by analyzing nationally representative CGSS 2021 data through logistic and linear regression models. The findings consistently show that education and income remain the most powerful predictors across basic coverage, commercial insurance participation, and insurance quality, while gender, age, and hukou differences persist mainly in higher-tier and commercial insurance domains. Basic insurance has achieved near-universal coverage, but meaningful inequalities continue to shape access to commercial insurance and high-quality protection, reinforcing stratified patterns within China's mixed insurance system. These results underscore that "equal opportunity" in enrollment does not automatically translate into "equal outcomes" in protection levels. To advance equity, policies must move beyond broad universal coverage goals and instead target specific structural barriers faced by low-income groups, rural residents, women, and older adults. Innovative strategies—such as tailored premium subsidies, age- and gender-responsive product designs, and improved information transparency—are essential to lowering participation thresholds and narrowing gaps in protection. Future research should incorporate more granular quality indicators, longitudinal designs, and additional social-structural variables to strengthen causal inference and capture the evolving dynamics of China's healthcare reform.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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