

# The interaction of migration range, regional economic development level on social capital and public health services of internal migrants: evidence from the China Migrant Dynamic Survey in 2017

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## Research Article

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# Abstract

**Objectives** Studies have confirmed that both migration range (MR) and regional economic development level (REDL) have significant impacts on the accessibility of National Essential Public Health Services (NEPHS) for the internal migrants (IMs), but no studies have explored the interaction between MR and REDL, nor discussed the mechanism behind their influence.

**Method** A sample of 115412 respondents from the China Migrant Dynamic Survey in 2017 was adopted, aged 18-59 years and residence duration more than one year. Beijing, Tianjin and Shanghai were excluded. The MR was divided into inter-provincial and intra-provincial migration. Social capital (SC) was divided into cognitive social capital (CSC) and structural social capital (SSC). The REDL was divided into high income provinces (HIPs) and low-middle income provinces (LMIPs). Cross-table, chi-square test, logistic regression and other statistical methods were used to analyze impacts of MR and REDL on IMs' SC, awareness of NEPHS and establishment of health records (EHR).

**Results** (1) The SC of inter-provincial IMs is always lower than that of intra-provincial IMs. The CSC of IMs in HIPs is lower but their SSC is not the same. The MR difference of IMs' SC is greater in HIPs. (2) The IMs' level of NEPHS utilization in the inter-provincial group and the HIPs group is lower, and the MR difference of IMs' level of NEPHS utilization is greater in the HIPs. (3) The IMs' SC can significantly promote their NEPHS utilization level, but this relationship is affected by the dimensions of SC, MR and REDL.

**Conclusions** MR and REDL may affect the IMs' SC through cultural exclusion and institutional exclusion, and further affect the IMs' NEPHS utilization. When promoting equalization of NEPHS in HIPs, it is necessary for HIPs to expand more primary health facilities to increase the NEPHS supply, and take measures to stimulate the inter-provincial IMs' sense of identity and social participation.

## Introduction

Over the past three decades, social change has led to unprecedented massive internal migration in China. An increasing number of people leave their original places of residence to work and live in other cities or provinces to improve their lives, such people are called internal migrants (IMs). The number of IMs exceeded 240 million in 2017 [1]. IMs are vulnerable to social exclusion in their destinations [2], which prevents them from accessing local National Essential Public Health Services (NEPHS) as equitably as natives [3]. Social exclusion has become a risk affecting the health of IMs [4].

However, the situation has been improving in the past decade. China initiated the NEPHS project in 2009, the project is provided free of charge by the government to all residents, including IMs who have lived there for more than six months [5]. NEPHS includes health records, health education, immunization for children, and chronic disease management et al. Since then, the National Health Commission (NHC) has successively introduced measures to strengthen the equalization of NEPHS[6–8]. Efforts have paid off, and the IMs' NEPHS utilization level is rapidly improving [9]. The new situation promotes the

government's working mode to change from flooding to precise [8], and the focus has gradually shifted to how to achieve the NEPHS equalization within the IMs. Recent studies have confirmed that sex, education, community type, migration range (MR) and regional economic development level (REDL) have significant impacts on IMs' NEPHS[3, 9, 10–15]. Studies have consistently concluded that the NEPHS utilization of inter-provincial IMs is lower than that of intra-provincial IMs [9, 10, 13–15]. However, opinions on the relationship between REDL and IMs' NEPHS utilization are inconsistent. Some believe that the IMs' NEPHS utilization in high income provinces (HIPs) is lower than that in low-middle income provinces (LMIPs) [9, 12–15], but others do not think so [3].

Existing studies use indirect indicators to measure REDL, and the scales are different. It is urgent to adopt a new method to clarify this inconsistency. In addition, previous studies have viewed MR and REDL as independent factors, without considering their possible interaction, nor have they made a detailed discussion on the mechanism behind the two factors. The household registration status still affects and determines the urban class structure and social integration, and the social and economic conditions between the registered population and migrants as well as within the migrants are heterogeneous [16, 17]. The primary relationship such as geography is still a basis for the IMs' social network reconstruction [18]. However, the hometown consciousness is exclusive, people within hometown are easily accepted, while people outside it are excluded. This hometown can be a village, a city or a province [19]. So inter-provincial and intra-provincial IMs may have different socioeconomic status (SES). On the other hand, HIPs attract a large number of IMs. In order to control the population, the HIPs adopted a stricter household registration access system. Compared with LMIPs, the IMs face stronger institutional exclusion in HIPs. It can be inferred that MR and REDL may have significant impact on IMs' social capital (SC).

SC is a social determinant of health [20], and it can also have an impact on health services accessibility [21]. Different types of SC affect health services utilization by influencing the availability of health services in communities, the availability and effectiveness of outreach resources between health-care providers and communities they serve, and care-seeking behavior of individuals in those communities [22]. Migration means a loss of the original social network and a reduction of social participation in the new environment [23]. However, the SC that migrants have in the destination is more important for their access to local health services [24, 25]. Guo et al. [26] had pointed out that lack of information is the biggest obstacle to IMs accessing NEPHS. SC can influence health information through three mechanisms: increased information exposure, enhanced seeking abilities, and reinforced health culture or norms embedded in social networks [27]. Therefore, SC may play an important role in IMs' NEPHS utilization, few studies have confirmed this [28, 29]. Carpiano and Moore [30] suggested that SC and health knowledge base can be better served by asking three foundational questions of (a) how, (b) for whom, and (c) in which contexts does SC work, rather than focusing primarily on whether SC provides some universal health benefit. However, previous studies on questions b and c are far from complete.

Surveys show that the SC of IMs is significantly lower than that of local residents [31, 32], but few studies have explored the distribution of SC among subgroups of IMs. The relationship between SC and NEPHS

utilization of IMs in different subgroups remains unclear. Two models have been put forward by Cohen and Wills [33] to explain the mechanisms by which SC influence health outcomes: the stress-buffering model posits that social ties are related to well-being only for persons under stress, whereas the main effects model proposes that social ties have a beneficial effect regardless of whether individuals are under stress. Fried and Tiegs [34] have proved that both effects can exist at the same time. Uphoff et al [35] proposed three paths by which SES could affect the relationship between SC and health: (1) A more significant SC benefit on the health of disadvantaged persons in society, and no effects or limited health benefits for those in positions higher up in the social ladder. (2) People with a low SES will generally have less SC, and the SC available to them cannot be used effectively for health benefits. (3) SC might benefit the better-off in society while excluding people with a lower SES. Which of these conclusions apply to China's IMs remains to be verified.

Given MR and REDL may have a significant impact on the IMs' SC, and SC is closely related to NEPHS utilization, we speculate that MR and REDL affect the IMs' NEPHS utilization by affecting their SC. To test this path, a sample of the China Migrant Dynamic Survey (CMDS) in 2017 was adopted, and we want to verify two hypotheses: (1) Both the SC and NEPHS utilization level of IMs are significantly affected by MR and REDL; (2) The relationship between SC and NEPHS utilization of IMs is significantly moderated by MR and REDL. This study is the first to explore the impact of MR and REDL on IMs' access to public health services from the perspective of SC based on a national sample. Our study can provide evidence for the Chinese government to deepen the equalization of NEPHS for IMs, and can also provide references for other regions to deal with the health problems of IMs.

## Methods

### Data

The data was obtained from the CMDS in 2017 provided by the Migrant Population Service Center. CMDS is an annual national sample survey of the IMs organized by the NHC from 2009, with an annual sample size of approximately 200,000 households. CMDS adopts the layered, multi-stage, and proportional to scale PPS (Probability proportional to size) sampling method. This study adopted the individual questionnaire A of CMDS, which was uniformly printed and distributed by the NHC. The questionnaire A includes basic information about respondent's demography, perception of the destination, the state of social interaction, and utilization status of NEPHS, etc. Full-time investigators collected the questionnaire data through household interviews, and each respondent gave informed consent before commencing the interview. Dates were entered through the migrant population health and household planning dynamic monitoring system, input data was subjected to multiple checks to ensure quality. The respondents consisted of IMs aged 15–59 living in the destination for more than one month.

In this study, the inclusion conditions were set as "18–59 years of age, residence duration more than one year". Beijing, Tianjin and Shanghai, the three cities have only inter-provincial IMs, which do not meet the object of this study, so the samples of these three cities were excluded. After the quality audit, 115412

people were finally included. In addition, we introduce GDP per capita to reflect the REDL of each provincial region, and GDP per capita is based on 2017 data from the National Bureau of Statistics.

## Measurement

### Utilization of NEPHS

Awareness of NEPHS is a prerequisite for NEPHS utilization [26]. Awareness of NEPHS was set as an outcome variable, and the question was "Have you heard of the NEPHS" and the answer was "yes or no". Another outcome variable was establishment of health records (EHR). EHR is one of the service priorities and reflects the actual utilization of NEPHS by the IMs. The question was "Have you established health records at the destination" and the answer was "yes or no".

### Demographic variables

Demographic variables included sex, residence duration, community type, MR, and REDL. The residence duration was divided into three groups:  $\leq 3$  years, 3–10 years and  $\geq 10$  years. The community types were divided into urban and rural communities. The MR was divided into inter-provincial and intra-provincial migration. The REDL was divided into two groups according to per capita GDP in 2017, five provinces with a per capita GDP of more than RMB 70,000 were called HIPs, and the other 23 provinces were called LMIPs.

### Soical Capital

SC refers to the resources and benefits received through connections with others, either as individuals or groups, it can be distinguished into two dimensions: cognitive social capital (CSC) and structural social capital (SSC) [20]. The CSC generally refers to IMs' perceptions, beliefs, and attitudes toward their destination, with corresponding measures focused mainly on the concepts of generalized and particularized trust [36]. In this study, SC was limited to the destination, and it was a localized SC that reflects the social resources available to the IMs there. There were 6 questions in the survey: "I like the city/place I live now", "I am concerned about the changes in the city/place I live now", "I am very willing to blend with the local people and become a part of them", "I think the local people are willing to accept me as a part of them", "I feel locals look down on outsiders" (reverse scoring) and "I feel like I'm already a local". The answer to each question was "1 = totally disagree, 2 = disagree, 3 = basically agree, and 4 = totally agree". The Internal consistency coefficient  $\alpha = 0.786$ . According to the distribution of scores, CSC was divided into 8 levels: 1 (6–14 points), 2 (15–16 points), 3 (17 points), 4 (18 points), 5 (19–20 points), 6 (21–22 points), 7 (23 points), 8 (24 points).

SSC refers to the presence of formal opportunity structures or activities in which individuals build or strengthen their social connections [36]. The SSC of this survey included civic participation and social participation in the destination. Questions of the former were: since 2016, "have you made suggestions to your unit/community/village or supervised the unit/community/ village affairs management", " have you participated in property donation, blood donation, volunteer activities, etc.", "have you reported the

situation/put forward policy suggestions to relevant government departments in various ways ", "have you posted online comments on national affairs and social events or participated in related discussions", "have you participated in party/youth league organization activities and party branch meetings". Respondents were assigned a "yes" if they participated in any of these tasks, and a "No" if they did not. The question of social participation was "Have you participated in any of the following activities in the past year: trade unions, volunteer associations, homecoming associations, fellow-students association, home town chamber of commerce, others". Respondents were assigned a "yes" if they participated in any of these organizations, and a "No" if they did not.

## Statistical analysis

First, we describe the distribution characteristics of all the included variables (Table 1). Secondly, cross-table and chi-square tests were used to verify the influence of sex, residence duration, community type, MR and REDL on IMs' awareness of NEPHS and EHR (Table 2). Thirdly, we examined the interaction of MR and REDL on the IMs' SC and NEPHS utilization, statistical methods including two-way ANOVA and logistic regression analysis (Table 3, 4). Fourthly, we used sex, residence duration, community type as the control variables, MR and REDL as the moderating variables, and awareness of NEPHS and EHR as the dependent variables for a hierarchical logistic regression analysis (Table 5) to discuss the degree and direction of the interaction of MR, REDL, SC on IMs' NEPHS utilization. Finally, we conducted grouping logistic regression analysis according to REDL (Table 6), sex, residence duration, community type as the control variables, MR as the moderating variables, and awareness of NEPHS and EHR as the dependent variables. Sampling weights were included in all analyses to adjust for the complex survey design. In logistic regression analysis model, Odds ratios (OR) were presented. All the analyses were performed using SPSS 22.0.

## Results

### Characteristics of the sample

Table 1 shows that the NEPHS utilization level of IMs is in urgent need of further improvement. The awareness of NEPHS was 59.0%, while the EHR rate was even lower to 30.1%. In terms of sample composition, the proportion of migrant population was higher among males, urban communities, residents duration for 3–10 years, inter-provincial migrants and those from HIPs. The IMs' CSC was high, 79.9% of IMs had a positive evaluation of the destination ( $\geq 18$ points), but IMs' SSC was low. In the past

year, 56.4% of them did not participate in the listed civic activities, and 51.5% did not participate in the listed organizational activities.

Table 1 Characteristics of the sample, in 2017, China (N = 115412).

## Results of univariate analysis

Table 2 shows that sex, community type, residence duration, MR, REDL and SC all have significant impacts on IMs' NEPHS utilization. The awareness of NEPHS and EHR of inter-provincial IMs were significantly lower than those of intra-provincial IMs. Compared with LMIPs, the rates of NEPHS awareness and EHR of IMs in HIPs were significantly lower. The influence of SC on NEPHS utilization was more prominent than other variables. Both civic participation and social participation can significantly promote the IMs' NEPHS utilization. With the increase of CSC, the NEPHS utilization level of IMs also increased, but the relationship is nonlinear.

Table 2 Impact of sex, community type, community type, MR, REDL and SC on utilization of NEPHS.

## Interaction of MR and REDL on SC and utilization of NEPHS

According to Table 3, the values of all outcome variables in the inter-province group were significantly lower than their values in the intra-province group, and the gaps were greater in the HIPs. We note that there was a significant difference in the SC of the IMs between HIPs and LMIPs. The former has lower CSC( $t = 77.268, p < 0.001$ ) and civic participation ( $X^2 = 22.258, p < 0.001$ ) than the latter, but the former has higher social participation ( $X^2 = 128.583, p < 0.001$ ). The IMs' NEPHS utilization level is also significantly different between HIPs and LMIPs. The NEPHS awareness ( $X^2 = 627.718, p < 0.001$ ) and EHR ( $X^2 = 388.239, p < 0.001$ ) of the former were lower than those of the latter.

Table 3 Distribution of SC and NEPHS utilization levels in different MR and REDL groups.

Two-way ANOVA results showed that the main effect of MR ( $F = 645.074, p < 0.001$ ) and REDL ( $F = 3187.650, p < 0.001$ ) on CSC was significant, and the interaction effect of MR and REDL on CSC was also significant ( $F = 658.215, p < 0.001$ ). Since civic participation, social participation, awareness of NEPHS and EHR were dichotomous variables, we took these four variables as dependent variables and MR, REDL and MR\*REDL as independent variables for logistic regression analysis. The data (Table 4) shows that the main effects of MR on four dependent variables were all significantly negative. The main effects of REDL on four dependent variables were also significant but the direction was not consistent. MR\*REDL had a significant negative effect on the first three dependent variables but had no significant effect on EHR.

Table 4 Logistic regression results of MR, REDL and MR\*REDL on SC and utilization of NEPHS.

Table 5 shows that when awareness of NEPHS was taken as the dependent variable, block 2 compared with block 1, Omnibus test  $X^2$  increased by 6484.872 ( $p < 0.001$ ), Cox & Snell  $R^2$  increased by 0.054,

Hosmer & Lemeshow test  $\chi^2$  decreased by 179.162; With EHR as the dependent variable, block 2 compared with block 1, Omnibus test  $\chi^2$  increased by 4599.203 ( $p < 0.001$ ), Cox & Snell R<sup>2</sup> increased by 0.038, Hosmer & Lemeshow test  $\chi^2$  decreased by 238.013. Obviously, with the introduction of SC, the explanatory power and fitting degree of the model both have been significantly improved. In the two regression models, the OR values of CSC, civic participation and social participation were all significantly greater than 1, indicating that they had a significant role in awareness of NEPHS and EHR. Among the three interaction items, the OR value of MR\*REDL\*CSC was not significant, while OR values of MR\*REDL\*civic participation and MR\*REDL\*social participation were significant, indicating that MR and REDL may interact with SSC rather than CSC.

Table 5 Logistic regression results of sex, community type, residence duration, MR, REDL and SC on NEPHS utilization.

Next, we performed grouping logistic regression analysis according to REDL. Table 6 shows that the main effects of CSC, civic participation and social participation on NEPHS utilization were significant in both the HIPs and the LMIPs, but the interaction effects of MR, civic participation and social participation were only significant in the HIPs, and the OR values were all greater than 1. It could be inferred that inter-provincial IMs would benefit more from SSC when accessing NEPHS.

Table 6 Logistic regression results of sex, community type, residence duration, MR and SC on awareness of NEPHS and EHR in two groups of REDL.

## Discussion

There were three main findings: (1) The SC of inter-provincial IMs is always lower than that of intra-provincial IMs. The CSC of IMs in HIPs is lower but their SSC is not the same. The MR difference of IMs' SC is greater in HIPs. (2) The IMs' level of NEPHS utilization in the inter-provincial group and the HIPs group is lower, and the MR difference of IMs' level of NEPHS utilization is greater in the HIPs. (3) The IMs' SC can significantly promote their NEPHS utilization level, but this relationship is affected by the dimensions of SC, MR and REDL.

This study found that the CSC, civic participation and social participation of the inter-provincial IMs were significantly lower than those of the intra-provincial IMs. Migration means a loss of the original SC for the migrants [23], they need to restructure SC in the destination to adapt to the new environment. The social network reconstruction of IMs in China is still based on primary relationships such as blood and geography [18]. Dialects and customs vary from province to province in China. The cultural differences make those who move across provinces in a certain province be regarded as "strangers" while those who move within provinces are regarded as "townsmen", and the former have to face more cultural exclusion. A survey [37] finds that, compared with those who have migrated to areas with the same dialect as those of their origin, those who have migrated to areas with different dialects are less happy and have greater difficulty in social integration in their places of origin. In fact, almost all provinces in China have not made

differentiated migrant population policies according to MR. It can be inferred that cultural exclusion IMs faced in the destination may be one of the important reasons why MR has a significant impact on their SC.

According to the survey [1], the HIPs attract more than 54.8% of the country's migrant population, of which 78.2% are inter-provincial migrants. In order to control the population size, HIPs have introduced strict household registration access standards, which are often met only by highly educated people. However, the average education level of IMs, especially inter-provincial IMs, is low, and many of them are excluded by the system. Xiao et al. [38] argued that, compared with other regions, IMs from HIPs have the lowest level of psychological integration, but their level of economic integration and political integration is not low. We found similar results to those of Xiao et al., that the CSC of the IMs in HIPs was significantly lower than that of the IMs in LMIPs, but the difference in SSC between the two groups was not the case. We also found the interaction effect of REDL and MR on SC, and the MR difference of IMs' SC was greater in the HIPs. In conclusion, the degree of social exclusion experienced by IMs is jointly affected by MR and REDL. Given the relationship between social exclusion and SC, this influence can partially explain the interaction between MR and REDL on SC.

This study supports the conclusion that the NEPHS utilization level of inter-provincial IMs is significantly lower than that of intra-provincial IMs [9, 10, 13–15]. With regard to REDL, we support the conclusion that the NEPHS utilization of IMs in HIPs is low [9, 12–15]. Some studies believe that the low level of NEPHS utilization in HIPs is due to the insufficient supply [9, 15]. NEPHS is mainly provided by primary health institutions, but the number of primary medical institutions per 10,000 people in HIPs is lower than that in LMIPs [39]. Our findings provide new evidence for this assertion: the inter-provincial IMs' awareness of NEPHS in LMIPs was slightly higher than the inter-provincial IMs' awareness of NEPHS in HIPs, and the inter-provincial IMs' EHR in LMIPs was almost equal to the inter-provincial IMs' EHR in HIPs. Therefore, we believe that although the higher proportion of inter-provincial IMs (78.2%) will affect the overall NEPHS utilization level of the HIP group, the shortage of per capita resources in this region may be one of the main reason for limiting the NEPHS level of the IMs. Governments of HIPs must rapidly increase the number of primary health institutions to address the shortage of NEPHS resources.

Under the premise of the same system and supply, there are still significant differences in NEPHS utilization among inter-provincial and intra-provincial IMs, which provides evidence for the importance of individual SC. We found that the IMs' SC had significant positive main effects on NEPHS utilization, but the magnitude is still less than we expected. The reasons for this maybe: (1) the IMs' SC, especially SSC, is too low; (2) the IMs' social network is homogeneous and closed [40]. We further confirmed that MR and REDL not only affect SC, but also affect the way SC impacts on NEPHS utilization. In LMIPs, SC has a low explanatory power to IMs' NEPHS utilization and only has the main effect; in HIPs, SC has a higher explanatory power and both effects exist. SSC had a significant buffering effect on both awareness of NEPHS and EHR, while CSC had a buffering effect on awareness of NEPHS only. The former is in line with Cohen and Wills [33], while the latter is in line with Fried and Tiegs [34]. The actual situation may be whether the main effect and the buffering effect occur independently or simultaneously depends on the

combination of context and social capital dimensions. Further analysis of the buffering effect of SC showed that it only conforms to the first of the three paths proposed by Uphoff et al [35]. Although the inter-provincial IMs' SC is low in HIPs, it still plays a more important role in their access to NEPHS. Hence, it is more valuable to enhance the inter-provincial IMs' social identity and social participation for the popularization of NEPHS in HIPs.

Our study found some valuable results, but two problems need to be considered in evaluating the external validity of these conclusions. First, social relationships include "strong ties" and "weak ties", and "weak ties" are more prone to the diffusion of health information [20]. In this study, the measurement of social relations focuses on weak ties, but it is not comprehensive enough. For example, important weak ties such as colleagues and neighbors were not included, which may affect the interpretation of the results. Secondly, Chinese people are known for their strong sense of hometown consciousness, which can help migrants better integrate into the local society. However, its exclusivity makes it more difficult for inter-provincial IMs to integrate into society than intra-provincial IMs. In other cultural contexts, this difference in SC caused by "hometown consciousness" may not be the case.

## Conclusions

To sum up, this study believes that one of the mechanisms by which MR and REDL affect the NEPHS utilization of IMs may be as follows: MR and REDL affect the IMs' SC through regional exclusion and institutional exclusion, and further affect the IMs' NEPHS utilization level. When promoting equalization of NEPHS in HIPs, first of all, it is necessary for HIPs to expand more primary health facilities to increase the supply of NEPHS, and second, it is necessary to take measures to stimulate the sense of identity and social participation of inter-provincial IMs.

## Declarations

### Ethics approval and consent to participate

The "National Internal Migrant Dynamic Monitoring Survey, 2017" data is publicly available to authorized researchers who have been given permission by the Migrant Population Service Center, and written informed consents were obtained from all participants. The analysis of public access data was exempted by the local IRB; as this involved analyzing de-identified existing data, ethical approval was not required.

### Consent for publication

Not applicable.

### Availability of data and materials

Since the data used in this paper were provided by the Migrant Population Service Center, which is the top agency governing migrant population issues in China, we had to sign a legally binding agreement with

the agency that we will not share any original data with any third parties. However, interested researchers can apply for access to the data at <http://www.ldrk.org.cn/>.

## **Competing interests**

No competing interests in this study.

## **Funding**

No.

## **Authors' contributions**

All authors participated in the design of the study. ZY carried out the statistical analysis and composed the first draft. CHJ gave opinions for modification. All authors read and approved the final manuscript.

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## **Abbreviations**

CMDS: China Migrant Dynamic Survey

CSC: Cognitive Social Capital

EHR: Establishment of Health Records

HIP: high income province

IMs: Internal Migrants

LMIP: low-middle income province

MR: Migration Range

NEPHS: National Essential Public Health Services

NHC: National Health Commission

REDL: Regional Economic Development Level

SC: Social Capital

SES: Socioeconomic status

SSC: Structural Social Capital

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## Tables

**Table 1** Characteristics of the sample, in 2017, China (N=115412).

Variables	Subgroups	N	%	Variables	Subgroups	N	%
Awareness of NEPHS	No	47365	41.0	CSC	Level 1 $\leq$ 6-14	4760	4.1
	Yes	68047	59.0		Level 2 $\geq$ 15-16	12132	10.5
EHR	No	80662	69.9		Level 3 $\geq$ 17	17860	15.5
	Yes	34750	30.1		Level 4 $\geq$ 18	25699	22.3
Sex	Male	59399	51.5		Level 5 $\geq$ 19-20	21088	18.3
	Female	56013	48.5		Level 6 $\geq$ 21-22	16936	14.7
Community type	Urban	79520	68.9		Level 7 $\geq$ 23	9493	8.2
	Rural	35892	31.1		Level 8 $\geq$ 24	7444	6.4
Residence duration	$\leq$ 3 years	33278	28.8	Civic participation	No	65075	56.4
	3-10 years	53322	46.2		Yes	50337	43.6
	$\geq$ 10 years	28812	25.0	Social participation	No	59431	51.5
MR	intra-province	47957	41.6		Yes	55981	48.5
	inter-province	67455	58.4				
REDL	LMIP	35199	30.5				
	HIP	80215	69.5				

**Table 2** Impact of sex, community type, community type, MR, REDL and SC on utilization of NEPHS.

Variables	Subgroups	Awareness of NEPHS		EHR	
		Rate of yes (%)	$\chi^2$	Rate of yes (%)	$\chi^2$
Sex	Male	58.4	14.378***	29.2	45.973***
	Female	59.5		31.1	
Community type	Urban	62.7	1515.834***	33.5	1388.108***
	Rural	50.6		22.6	
Residence duration	≤3 years	57.7	44.497***	28.8	45.402***
	3-10 years	59.9		31.0	
	≥10 years	58.6		30.0	
MR	intra-province	63.3	645.592***	33.7	516.466***
	inter-province	55.9		27.5	
REDL	LMIP	64.4	627.718***	34.1	388.239***
	HIP	56.6		28.3	
CSC	Level 1	40.5	3448.248***	19.5	2416.408***
	Level 2	47.1		21.5	
	Level 3	50.8		23.7	
	Level 4	57.5		27.7	
	Level 5	62.8		32.5	
	Level 6	67.0		35.6	
	Level 7	69.8		39.4	
	Level 8	71.8		43.4	
Civic participation	No	52.2	2791.430***	24.7	2082.486***
	Yes	67.7		37.1	
Social participation	No	50.2	3865.413***	23.3	2737.875***
	Yes	68.2		37.4	

Note: \*\*\*p<0.001, \*\*p<0.01, \*p<0.05.

**Table 3** Distribution of SC and NEPHS utilization levels in different MR and REDL groups.

Outcome variable	HIPs			LMIPs		
	Intra-province	Inter-province	Total	Intra-province	Inter-province	Total
CSC ( $M \pm SD$ )	4.73 ± 1.736	4.01 ± 1.713	4.23 ± 1.751	5.13 ± 1.767	5.02 ± 1.775	5.10 ± 1.771
Civic participation(%)	49.3	40.5	43.2	46.1	41.5	44.7
Social participation(%)	55.3	47.2	49.6	48.1	41.5	46.0
Awareness of NEPHS(%)	61.1	54.6	56.6	65.6	62.0	64.4
EHR(%)	31.9	26.8	28.3	35.5	31.0	34.1

**Table 4** Logistic regression results of MR, REDL and MR\*REDL on SC and utilization of NEPHS.

Independent Variables	Reference group	Dependent Variables ( <i>OR</i> )			
		Civic participation	Social participation	Awareness of NEPHS	EHR
MR Inter-province	Intra-province	0.830***	0.767***	0.856***	0.812***
REDL	HIP	1.135***	1.338***	0.823***	0.847***
MR*REDL		0.846***	0.939*	0.897***	0.964

Note: \*\*\*p<0.001, \*\*p<0.01, \*p<0.05.

**Table 5** Logistic regression results of sex, community type, residence duration, MR, REDL and SC on utilization of NEPHS.

Independent Variables		Reference group	Awareness of NEPHS		EHR	
			Block 1 (OR)	Block 2 (OR)	Block 1 (OR)	Block 2 (OR)
sex	Female	Male	1.030*	1.122***	1.074***	1.159***
Community type	Rural	Urban	0.646***	0.756***	0.613***	0.709***
Residence duration	3-10 years	$\leq 3$ years	1.086***	1.031*	1.099***	1.049**
$\geq 10$ years			1.031	0.967*	1.057**	0.997
MR	Inter-province	Intra-province	0.837***	0.871***	0.839***	0.842***
REDL	HIP	LMIP	0.825***	0.811***	0.879***	0.857***
CSC				1.164***		1.149***
Civic participation	Yes	No		1.419***		1.303***
Social participation	Yes	No		1.673***		1.545***
MR*REDL*CSC				1.003		0.990
MR*REDL*civic participation				1.085**		1.196***
MR*REDL*social participation				1.168***		1.210***
Omnibus test X <sup>2</sup>			2100.285	8585.157	1854.446	6453.649
Cox & Snell R <sup>2</sup>			0.018	0.072	0.016	0.054
Hosmer & Lemeshow X <sup>2</sup>			200.111	20.949	261.083	23.070

Note: (1) \*\*\*p<0.001, \*\*p<0.01, \*p<0.05. (2) CSC was treated as a ordinal variable, as was the rest of the analysis.

**Table 6** Logistic regression results of sex, community type, residence duration, MR and SC on awareness of NEPHS and EHR in two groups of REDL.

Independent Variables	Reference group	Awareness of NEPHS		EHR	
		LMIP ( <i>OR</i> )	HIP ( <i>OR</i> )	LMIP ( <i>OR</i> )	HIP ( <i>OR</i> )
MR Inter-province	Intra-province	0.924	0.748***	0.791**	0.833**
CSC		1.165***	1.144***	1.149***	1.137***
Civic participation Yes	No	1.510***	1.279***	1.347***	1.235***
Social participation Yes	No	1.683***	1.673***	1.469***	1.678***
MR*CSC		1.000	1.025**	1.013	1.000
MR*civic participation		1.045	1.196***	1.042	1.247***
MR*social participation		0.948	1.174***	0.989	1.114**
Omnibus test $\chi^2$		1929.755***	6191.381***	1297.417***	5034.522***
Cox & Snell R <sup>2</sup>		0.053	0.074	0.036	0.061
Hosmer & Lemeshow $\chi^2$		13.839	30.797	10.071	25.068

Note: (1)\*\*\*p<0.001, \*\*p<0.01, \*p<0.05. (2)In Table 6, sex, community type and residence time in the model are treated in a similar way as in Table 5, but they are not presented in the table to save space.