

# Analysis of health education utilization of migrants in Beijing using Anderson health service utilization model

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## Research article

**Keywords:** Migrant, Health education utilization, Determinant factor, Anderson health service utilization model

**Posted Date:** September 19th, 2019

**DOI:** <https://doi.org/10.21203/rs.2.14666/v1>

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## Abstract

**Background:** Domestic migration is considered as a challenge for China. Migrants are vulnerable to certain risks and diseases due to encounter several obstacles to accessing preventive care services. This research sought to unveil and explore the determinant factors associated with health education utilization as one important aspect of basic public health services for migrants in Beijing of China.

**Methods:** A sample of 863 inter-provincial migrants who were 18 years old and above was chosen by three-stage stratified cluster sampling method in 2016 urban-rural connection districts of Beijing. A structured questionnaire survey was conducted via face-to-face interviews. Anderson health service utilization model was used to demonstrate the effects of the explanatory variables on health education seeking behavior from predisposing, enabling, health behavior and need variables.

**Results:** The study revealed that 60.4% migrants desired to receive health education, while only 34.5% of them received in the past year. Many migrants desired to access various types of health education information from the internet. Chi-square independence test shows that age, "Hukou" registration system, marital status, education level, plan to reside for a long time in Beijing, have at least one child in Beijing, employment status, housing source, average working time daily, do exercises, acquire health knowledge, smoking, self-evaluation general health status are the major determinants affecting migrants to receive whole health education. The binary logistic regression indicates that the migrants with younger, high education level, have at least one child in Beijing, do exercises and self-evaluated good health status were more likely to receive whole health education. The results also show that average working time daily of enabling variables and do exercise of health behavior variables were the strong and consistent determinants of three types of health education utilization, including communicable, non-communicable and occupational diseases.

**Conclusion:** There were certain gaps between the needs and utilization in health education. More attention should be given to the migrants with heavy workload and low education level. Relevant policies and feasible measures, including health providing health information by multiple channels, should be vigorously implemented to ensure easy and equitable access to health education for migrants.

## Background

Domestic migration is considered a major social, political and public health system challenge for the urban cities of China. Migrants refer to individuals who move from the place where they live to other areas of the country without possessing the local "Hukou" (residence registration certificates), including inter-province or rural-to-urban migrants population. In the past few decades, the number of migrants population in China has been increasing dramatically, reaching to 245 million and constituted 18% of the total population in 2016 [1]. Although migrants are needed for socioeconomic development and urban construction in major cities, they often encounter several obstacles to accessing public services because of their distinguishing characteristics irregular status (e.g. low paid wages, low education level, poor living condition, and insufficiently protected working environment) and economic and social marginalization (many public policies and social welfare programs were implemented based on a rigid "Hukou" system, serving as a domestic passport) [2, 3]. They suffer certain unnoticed health risks that can wear off their health awareness and make them vulnerable to health problems, such as communicable disease (CD), chronic non-communicable disease (NCD) and occupational disease, and also relatively easy to ignore their own health status [4, 5].

The real weakness of China's public health system had been exposed after the outbreak and epidemic of Severe Acute Respiratory Syndrome (SARS) in 2003 [6]. The Chinese government realized that the health status and health awareness of public population particular migrants, had a considerable impact on Chinese social stability and public health [7], and the fragmentary public health prevention and intervention systems should be re-established to control the spread of diseases and reduce the waste of medical resources [8]. As an important part of promoting the gradual equalization of basic public health services, and important issue for Chinese healthcare reform, the program of National Basic Public Health Services was implemented in 2009 and provided the services to residents [9]. The basic public health services are free and voluntary public services provided for permanent residents by primary health care institutions, including village clinics, township health centers, and community health service centers (stations), focusing on preventing and controlling diseases by public health intervention measures. At present, the basic public health services included fourteen basic items (e.g., the establishment of health records, health education, vaccine inoculation, children and maternal health management, tuberculosis and hypertension management). The government also raised the subsidy from 15 *Renminbi* (RMB) per capita in 2009, 25 RMB in 2011 to 45 RMB in 2016 for financing this project.

It cannot be denied that the rate of basic public health service utilization has increased rapidly among community permanent residents. The effectiveness of services also has improved obviously (e.g., save a significant number of lives, reduce suffering and ill health) with the strengthening of national support [10]. As far as the basic public health service is concerned, the migrants are difficult to enter the basic public health service network due to most of them are flow frequently. There is still an imbalance of basic public health services utilization between the local and migrant population, such as migrants have lower health awareness[11], high rate of spread of communicable diseases [12, 13], compared with local residents. At present, the trend of migration has changed from "temporary residence" and "migrant alone" to "long-term residence" and "migration with family members" in the last decade [14]. With the change of migration model, diversified requirements of public health services should to be satisfied for migrants. If the demands and utilization of basic public health services for them are not guaranteed, there will be a series of social problems as well as a potential threat to the health of the local residents. The Health Sector Reform formulated a series of strategies to "build up a strong basic public health service network." to promote the equalization of basic public health services. Since 2014, the National Health and Family Planning Commission (renamed National Health Commission of the People's Republic of China from 2017) launched trials work on the basic public health services equalization for improving the health of the migrant population in 40 cities across the country [15]. Put simply, providing accessible and good-quality basic public health services for migrants is an important issue.

As one item of the services in the basic public health services, health education intervention and materials has proven to be an effective strategy for strengthening the aspects of health knowledge, awareness and positive health behaviors. Furthermore, health education is essential to improving CDs and NCDs prevention, control, and treatment for everyone at every level and to the target group, particularly in the marginalized and migrant populations [16–18]. It

is also likely to be instrumental in effectively addressing growing health care costs and in preventing or mitigating the negative effects of migration on health systems and societies. While, previous study found that compare to a relatively high use of medical care, preventive care was used less frequently among migrants [19]. With an increasing sense of health among the general public including migrants, current contents and traditional face-to-face education of health information ignores the actual utilization situation and true demands of the general public [20]. In order to implement successful policies to target social and health inequalities among the migrant populations, policy makers need to understand what barriers migrants face to integrate, and also need to identify and address their health demands.

As the political, economic and cultural center, as well as the pilot city of China, Beijing attracts **tens of thousands of** migrants from all over the country every year [21]. Systematic research on health education utilization behavior and influence factors of migrants is far from sufficient. Meanwhile the research results are crucial to disease prevention and health promotion for the migrants in China. We aim to (1) evaluate differences between utilization and demands of health education; (2) put forth the potential major determinant factors of health education utilization behaviors in different sociodemographic, health behavior and health outcome setting for migrants in Beijing by using the simplified Anderson health service utilization model. The comparisons and inferences could help us figure out the obstacles to seek health education for migrants, and take targeted interventions measures to improve their health literacy, control disease and promote health status.

### *Analytic Framework*

As a well-validated theoretical framework, Andersen health service utilization model is to predict determinants of health services utilization, taking into consideration both individual and societal determinants [22]. According to the model, health education utilization is determined by three dynamics: predisposing, enabling, and need variances (PEN). Social demographic characteristics include sex, age, race, can be divided into predisposing factors, which increase one's needs for health education services. For example, a person who believes health education services are effective measures for preventing disease is more likely to seek health education. Enabling factors are comprised of individual, family and community resources support, that can facilitate or impede the use of health education services. Need factors represent both actual need and self-perceived for health education services. In our study, health behavior variances as one type of the important dynamics parameters were added to evaluate the predictions of a new model. In our study, a feedback loop was used to illustrate the relationship between health education behavior (seek health education, and not seek health education) and other aspects. (See figure 1)

## **Methods**

### *Ethics Statement*

The study was undertaken as a part of Beijing Philosophy and Social Science Planning Project, which is a population-based cross sectional survey on risk factors of health status for migrants. It was approved by the Ethical Committee of Capital Medical University, Beijing, China. Data were collected from a 2016 cross-sectional survey in urban-rural connection districts of Beijing. Considering the parents or guardians are the main decision-makers in the attitudes and decisions about public health services for children, thus those under 18 years of age were not included in this study. Written informed consent was obtained from each participant involved in this study. All participants' information will be anonymized and kept confidential.

### *Data acquisition and study population*

A fieldwork survey of Beijing Urban-Rural Connection Migrants Population Public Health Service Utilization was performed from June to November 2016. All respondents were at least 18 years old, including interprovincial migrants resided or worked in the sampling regions (for no less than six months). Migrants who mentally unfit to respond and those visited to Beijing were excluded. The structural questionnaire includes four parts of variances as follows: predisposing factors (sociodemographic characteristics), enabling factors (individual/family resources), need factors (general health status), health behavior factors (health promotion behaviors and health hazard behaviors) and health education seeking behavior (receiving health education or not). Quality-assurance measures implemented for this survey consists of evaluation of the questionnaire, training for the investigators and supervision of the fieldwork to monitor the survey procedure. It was reviewed, edited, and validated by experts from health administration and community health service institutions (CHSIs) before it was implemented. A trial survey covering 50 persons was implemented between June 6 to 11, 2016 to improve the comprehensibility of the questionnaire and the fieldwork procedures. The Cronbach's alpha coefficient calculated for internal consistency of the questionnaire was equal to 0.85 and considered acceptable.

The migrants of Beijing dwell mainly in 5 (*Chaoyang, Haidian, Fengtai, Daxing, Changping* districts) out of 16 districts. Five districts were divided into two types of region based on the number of migrants, including the region with more than 1 million migrants (*Chaoyang, Haidian* districts) and the region with 0.5 to 1 million migrants (*Fengtai, Daxing, Changping* districts). A sample of 1,000 migrants was chosen from two of the five districts in Beijing by using stratified three-stage cluster random sampling, as follows: In the first stage, one district was chosen from the first region (*Haidian* district), and another district was chosen from the secondary region (*Fengtai* district). In the second stage, two streets according to the population size and social economic condition from each sampled districts were chosen respectively. Finally, the total number of 1,000 migrants was recruited and investigated from four streets. The migrants was sampled in *Haidian* (500), *Fengtai* (500) respectively. Data were collected via face-to-face interview. Finally, a total of 863 respondents were analyzed after excluding the data having missing information on any of variables in the research. Double entry and validation was adopted for all data using EpiData software (Version 3.1, EpiData Association, Odense, Denmark). Discrepancies which compared and analyzed from the two databases, would be clarified by reviewing the original data source.

### *Statistical analysis*

A person was the unit of seeking health education at least once in the past year, rather than total number of times health education received. Chi-square independence test was used to analyze the differences in the categorical variables. Odds Ratios (ORs) and their 95% confidence intervals (CIs) were calculated using binary logistic regression analysis. In the first step, descriptive statistics and chi-square independence test were calculated, stratified by the categories of health education utilization (receive and non receive health education). In the second step, a binary logistic regression analysis was performed to predict the potential major determinant factors of affecting health education utilization for migrants, controlling for possible confounding variables. The full model consist of all of the predisposing, enabling, health-related behaviors and the need factors were entered into the model. The full list of independent variables is summarized in the table 1. All statistical analyses were performed using IBM Statistical Package for Social Science version 20.0 (SPSS Inc., Chicago IL, US) and all the tests are two sided. The significance level for all analyses was set at  $P < 0.05$ .

## Results

A total of 863 inter-provincial migrants (males 383; females 480) in Beijing above 18 years old were investigated. The age of migrants is from 18 to 76 years old, and the average was  $36.6 \pm 11.2$  years old.

### *Utilization of health education in the past year*

Table 2 shows that 60.4% migrants desired to received any one type of health education, while only 34.5% of them received. The top five types of health education received by migrants were "child healthcare" (15.8%), "occupational disease prevention and therapy" (15.1%), "antenatal, prenatal and postpartum healthcare" (14.9%), "communicable disease prevention and therapy" (12.4%), and "non-communicable disease prevention and therapy" (11.1%). While the top five types of health education demanded to receive by migrants were "non-communicable disease prevention and therapy" (61.2%), "communicable disease prevention and therapy" (48.9%), "aged healthcare" (47.4%), "child healthcare" (46.8%), and "adolescent healthcare" (38.0%).

Additionally, the top three pathways which migrants want to acquire health information was from television broadcasting (62.8%), internet (web page and WeChat) (58.2%), and professionals and health managers (37.4%).

Descriptive statistics and chi-square independence test were used to describe the information and analyze the influence factors of health education utilization by sociodemographic factors. Chi-square independence test showed that age, "Hukou" registration system, marital status, education level, plan to reside for a long time in Beijing, have at least one child in Beijing, employment status, housing source, average working time daily, do exercises, acquire health knowledge, smoking, self-evaluation general health status are the major determinants affecting migrants to receive health education. (See table 3)

Gender, "Hukou" registration system, education level, plan to reside for a long time in Beijing, have at least one child in Beijing, employment status, housing source, average working time daily, do exercises, acquire health knowledge are the major determinants affecting migrants to receive communicable disease health education. "Hukou" registration system, housing source, average working time daily, do exercises are the major determinants affecting migrants to receive non-communicable disease health education. Age, "Hukou" registration system, marital status, education level, plan to reside for a long time in Beijing, have at least one child in Beijing, employment status, average working time daily, do exercises, acquire health knowledge, smoking, are the major determinants affecting migrants to receive occupational disease health education. (See table 4)

### *Logistic Regression Model*

The finding indicates that all of the full models were able to distinguish between migrants with receiving health education and those without receiving health education, and all predictors were statistically significant at the 0.000 level (model 1,  $\chi^2 = 186.467$ ,  $P = 0.000$ ; Model 2,  $\chi^2 = 49.367$ ,  $P = 0.000$ ; Model 3,  $\chi^2 = 39.895$ ,  $P = 0.000$ ; Model 4,  $\chi^2 = 90.941$ ,  $P = 0.000$ ). In the model summary, the model 1 explained between 19.6 per cent (Cox and Snell R square) and 26.3 per cent (Nagelkerke R square) of the variance in health education utilization as a whole. Model 2 explained between 5.6 per cent (Cox and Snell R square) and 10.7 per cent (Nagelkerke R square) of the variance in communicable disease health education utilization as a whole. Model 3 explained between 4.6 per cent (Cox and Snell R square) and 9.1 per cent (Nagelkerke R square) of the variance in non-communicable disease health education utilization of migrants as a whole. Model 4 explained between 10.1 per cent (Cox and Snell R square) and 17.7 per cent (Nagelkerke R square) of the variance in occupational disease health education utilization as a whole. (See table 5)

Table 6 predicts the determinant factors of health education utilization for migrants (model 1) by binary logistic regression. Model 1 shows that the migrants with 25-34, 35-44, 45-54, above 55 years old in the past year were at 0.559-times (OR = 0.559), 0.302-times (OR = 0.302), 0.278-times (OR = 0.278) and 0.232-times (OR = 0.232) lower chances of receiving health education respectively, comparing to 18-24 years old. Migrants with education of university or college and above, high school or secondary, and junior high school were at 4.423-times (OR = 4.423), 3.545-times (OR = 3.545), and 2.219-times (OR = 2.219) higher chances of receiving health education respectively in the past year, comparing to migrants with education of primary school or below. Migrants who have at least one child in Beijing (OR = 1.901), do exercises (OR = 1.989), have chronic disease (OR = 1.565) were more likely to receive health education. Plan to reside for a long time in Beijing (OR = 0.674), smoking (OR = 0.605), were less likely to receive health education. Additionally, the chances of receiving health education were decreased by 43.4% in poor health status (OR = 0.566) and 41.9% in moderate health status (OR = 0.581), comparing to self-evaluated good health status.

Table 7 predicts the determinants of communicable disease, non-communicable disease, and occupational disease health education utilization for migrants (Model 2, model 3, and model 4) by binary logistic regression. Model 2 shows that the chances of receiving communicable disease health education were decreased by 71.0% in average working time more than 8 hours daily (OR = 0.290), comparing to migrants with average working time less than 8 hours daily. Additionally, migrants who do exercises (OR = 2.204), acquire health knowledge (OR = 1.954) were more likely to receive communicable disease health education. Model 3 indicates that migrants with divorced or widowed were at 4.448-times (OR = 4.448) higher chance of receiving non-communicable disease

health education, compared to migrants with no married. The chances of receiving non-communicable disease health education were decreased by 74.6% in average working time more than 8 hours daily (OR = 0.254), comparing to migrants with average working time less than 8 hours daily. Additionally, migrants who do exercises (OR = 2.436), were more likely to receive non-communicable disease health education. Model ② indicates that the chances of receiving occupational disease health education were decreased by 58.3% in married (OR = 0.417), and 68.5% in average working time more than 8 hours daily (OR = 0.315), comparing to migrants with unmarried and average working time less than 8 hours daily respectively. Migrants who have formal work (OR = 2.001), do exercises (OR = 1.827), were more likely to receive occupational disease health education.

## Discussion

This study attempted to describe and assess the major determinants associated with the health education utilization for migrants in urban-rural connection of Beijing, to better facilitate health education utilization for them.

### *Utilization and demands of health education*

Previous researches indicated that the advantage of “healthy migrant effect” (first-generation migrants are often healthier with lower overall morbidity and mortality than local-born populations) will diminish dramatically particular in middle age [23, 24], company with demanding work schedules, poor working and resident environment, insufficient health literacy, and negative attitude to the health preventive behaviors. The research also revealed that though many migrants were aware of significances associated with health education, and expressed a desire to gain access to health information that would allow them to take responsible actions for enhancing their own well-being, low utilization rate persisted, which only 46.2% migrants received health education in the past year. It was not difficult to show in the study, most of the migrants investigated were middle-aged, and they had age-appropriate health education needs, e.g. antenatal, prenatal and postpartum healthcare, aged healthcare. Furthermore, with the evolution of migration model, migrants should take the responsibilities for caring for their child(ren) and parent(s), thus they have relative high demands of child, adolescent, and aged healthcare. It also seems strange that there were low rates of occupational disease health education utilization and demands actually, which are consistent with the previous study in Xi’ an that more than 50% migrants have not received occupational safety and health protection training [25]. Furthermore, there may be a reason to explain the low demands of occupational disease health education among migrants. Different from acute occupational diseases (occupational allergic contact dermatitis, occupational poisoning) that always occur after a relatively brief exposure, the common chronic occupational diseases (pneumoconiosis, musculoskeletal disorders, psychological stress at work, occupational tumors) which occupy the majority of occupational diseases, only occur after prolonged exposure to the relevant hazard [26, 27]. Migrants with low health literacy, instable job, and lacking of a full understanding of occupational hazards, would not pay enough attention to occupational diseases, even if chronic occupational diseases having occurred.

### *Determination factors of whole health education utilization*

The rate of health education utilization was higher in the groups of 18 to 24 and 25 to 34 years old, particular in the first age group, than other three age groups. The result was similar to a previous China-based study that migrants in the group of 25 to 34 years old have higher rate of health education utilization than other age groups, but the rate of migrants in age group of 18 to 24 years old was opposite. There might be two factors account for the differences. Firstly, with higher education level, besides relatively stable working condition, the new-generation migrants who birth after 1980, had better health literacy and could acquire reliable health information derived from a wide range of ways, compared to the old-generation migrants [28]. Meanwhile, this research also indicated that migrants with high education level, do exercises had a higher likelihood of receiving health education. The prevalence of health literacy was related to health knowledge, health decisions, health behaviors and health outcomes of the population [29–31]. On the contrary, low education levels, accompanied by low literacy skills and health awareness, were said to create difficulties and barriers in understanding complex health-related information, health practices and outcomes [32]. Secondly, selection bias would be no enough to demonstrate the results due to insufficient sample size of migrants in age group of 18 to 24 years old. In the future, migrants in this age group should be studied in terms of their health education utilization behaviors and influencing factors as a unique group.

### *Determination factors of three types of health education utilization*

Considering that there were certain gaps between the demands and utilization of three types of health education which implemented for general migrants population investigated, including communicable disease, non-communicable disease and occupational disease for the investigated migrants, our study took emphases to analysis the determinations factors of three types of health education utilization.

For migrants, we observed that both average working time daily of enabling variables and do exercise of health behavior variables contributed significantly to the variances in three types of health education utilization. Migrants who worked more than 8 hours daily and not to do exercises were less likely to use three types of health education than migrants with working time less than 8 hours and do exercises. Put another way, the heavy workloads in the jobs and poor health awareness for migrant workers reduce the opportunity to receive health information. Additionally, consistent with the previous research [33], migrants with formal work have more likely to receive occupational disease health education than employment status of informal work. Worldwide, the patterns of employment for migrants are similar, no matter in the developing countries or the developed countries. Migrant workers are overwhelmingly employed in 3-D jobs (dirty, dangerous, and degrading), e.g., the service sector, production, construction and maintenance, transportation that report have more health-related risks compared with other industries [34–36]. In accordance with state regulations, employers have the responsibility to educate their workers to protect from specific occupational hazards by providing regular training, and inform the workers have to abide strictly by work safety rules. Nevertheless, migrants who worked in small- and medium-sized enterprises have more risks due to the deficiency of occupational disease health education and supervision than large-sized enterprises [37]. Meanwhile, in the informal and temporary working status, long working time and situational stress diminish the demands of acquiring health information especially on occupational disease for migrant workers.

With the development of information technology (IT), technologies such as smartphones and internet access have become an integral part of our lives, and these are widely used in health information research. The report of "internet adoption, social media usage, and smartphone ownership rates in 37 countries across the world in 2017" from Pew research center revealed that the rates of internet use, smartphone ownership and social media use were 71%, 68% and 60% respectively in China [38]. Different from traditional text-based health education tools, including brochures, leaflet, newspaper, web-based social media tools offer a convenient and effective method of delivering health information [39]. Using the WeChat application as an example, as a free instant messaging application for smartphones, it plays an important part in modern lifestyles. WeChat can serve on a bridge using IT technology and frequent multimedia messages to provide health support and management through the communication and propagation of voice, text, pictures, and videos over great distances [40]. Information related to the prevention and treatment of various diseases can be acquired and requested at any time via such applications [41, 42]. The increased widespread of mobile phones into China's communities provides a platform for delivering health education on mobile platforms. As in our study, 58.2% migrants want to acquire health information via the internet. Therefore, mHealth interventions strategies have enormous potential to be used as an educational tool for behavioral change to further control the spread of epidemics, development of the chronic disease for migrants.

## Limitations

The study has several limitations. Firstly, cross-sectional survey cannot be determined the time-effect and causality accurately, compared with the cohort study. Secondly, recall biases on self-report might underestimated the information on health education utilization. Thirdly, health education utilization was measured as a dichotomous variable (the receive or non-receive of health education), rather than measured the receive intensity of health education. Finally, although the questionnaire was designed according to the previous theories and experience, several significant potential determination factors may not be considered in the model, such as community resource factors. Future research is needed to explain the dynamic and cyclical causal relationships of Anderson's health service utilization model by identifying more variables.

## Conclusion

The findings of the survey contribute to our understanding of the health education utilization and determination factors, and demands of health education among Chinese migrants. There were certain gaps between the needs and utilization in different types of health education. Compared with the old-generation migrants, new-generation migrants had higher rate of health education utilization. Additionally, average working time daily of enabling variables and do exercise of health behavior variables in the Anderson health service utilization model, was a dominant predictor of three types diseases of health education utilization, including CDs, NCDs and occupational diseases. Many migrants desired to access health education information from internet. In the next step, we should focus special attention on the health education utilization for heavy workload and low education level migrants.

The findings of this research would be useful for establishing basic public health service network. It also suggests that policy makers should take feasible policies and measures to overcoming obstacles and break down barriers for migrants, including fully implement of policies, using multiple channels to provide health information, and carry out health education intervention strategies, to ensure easy and equitable access to health education. In the future, more comprehensive studies should be carried out to evaluate the efficiency of health intervention strategies to improve the acquisition and utilization of basic public health services for migrants.

## Abbreviations

*SARS*: Severe Acute Respiratory Syndrome *CD*: communicable disease *NCD*: chronic non-communicable disease *RMB*: *Renminbi* *CHSIs*: community health service institutions *IT*: information technology *PEN*: predisposing, enabling, and need variances

## Declarations

### Ethics approval and consent to participate

It was approved by the Ethical Committee of Capital Medical University, Beijing, China. Data were obtained from a 2016 cross-sectional survey in urban-rural connection districts of Beijing. Written informed consent was obtained from each participant involved in this study. For participants under the age of eighteen, written informed consents were obtained from their guardians. All participants' information was kept confidential and tracked anonymously with an identification number only.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Competing interests

The authors declare that they have no competing interests.

## Funding

The study was undertaken as a part of Beijing Philosophy and Social Science Planning Project (15SHC035), which is a population-based cross sectional survey on risk factors of health status for migrants. Apart from inputs on overall progress of this research, as funding body, the funders had no role in the design, collection, analysis, interpretation of data, or writing of the manuscript related to this study.

## Authors' contributions

SS drafted the manuscript and acquired data. SS and HRZ acquired, analyzed, and interpreted the data. JYXX and XLC analyzed the data. YLZ revised the manuscript. JD conceived the study and design and revised the manuscript. All authors read and approved the final manuscript.

## Acknowledgements

To all the primary care workers who participated in this research, the authors convey their sincere thanks and respect for their contribution and sharing of experiences.

## Publisher's Note

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## Tables

**Table 1. The list of variables for empirical analysis.**

Predisposing	Demography	Age	18~24 years (Reference group); 25~34; 35~44; 45~54; ≥55
		Gender	Male (Reference group); Female
	Social structure	Marital status	Unmarried (Reference group); married; divorced/widowed
		Education level	Primary school or below (Reference group); Junior high school; High school or secondary; University or college and above
		Ethnicity	Han ethnic (Reference group); Minorities
		"Hukou" registration system	Non-agricultural (Reference group); Agricultural
Enabling	Individual/family resources	Time to Beijing	<1 years (Reference group); 1~; 5~; ≥10
		Plan to reside for a long time in Beijing	No (Reference group); Yes
		Have at least one child in Beijing	No (Reference group); Yes
		Incoming monthly	<3000 RMB(Reference group); 3000~4999; 5000~9999; ≥10000
		Employment status	Formal work (Reference group); Informal work
		Insurance status	Uninsured (Reference group); Insured
		Housing condition	Own house (Reference group); Rent
		Average working time daily	<8 hours (Reference group); 8; >8
Health behavior	Health promotion behaviors	Do exercise	No (Reference group); Yes
		Acquire health knowledge	No (Reference group); Yes
	Health hazard behaviors	Smoking	No (Reference group); Yes
		Drinking	No (Reference group); Yes
Need	Having chronic disease	No (Reference group); Yes	
	Self-evaluation general health status	Good (Reference group); General; Poor	

**Table 2. The types of health education received and hope to receive by migrants.**

Types	Received N (%)*	Hope to receive N (%)*
Child healthcare	136 (15.8)	404 (46.8%)
Occupation disease prevention and therapy	130 (15.1)	279 (32.3)
Antenatal, prenatal and postpartum healthcare	129 (14.9)	307 (35.6)
communicable disease prevention and therapy	107 (12.4)	422 (48.9)
Non-communicable disease prevention and therapy	96 (11.1)	528 (61.2)
Adolescent healthcare	78 (9.0)	328 (38.0)
Aged healthcare	71 (8.2)	409 (47.4)
Menopause healthcare	56 (6.5)	312 (36.2)
Total	298 (34.5)	521 (60.4)

**Note:** There are overlaps in the number of migrants who received and hope to receive the different types of health education.

**Table 3. Information on the whole health education receipt by migrants in different characteristic.**

## Migrants (n=863)

Variations	Receive health education N(%)	Non receive health education N(%)	$\chi^2$	P
<b>Predisposing variables</b>				
<b>Gender</b>			0.022	0.882
Male	207(44.6)	176(44.1)		
Female	257(55.4)	223(55.9)		
<b>Age</b>			82.167	0.000
18-24	84(18.1)	26(6.5)		
25-34	207(44.6)	109(27.3)		
35-44	97(20.9)	114(28.6)		
45-54	56(12.1)	112(28.1)		
≥55	20(4.3)	38(9.5)		
<b>Ethnicity</b>			1.667	0.197
Han	445(95.9)	389(97.5)		
Minority	19(4.1)	32(2.5)		
<b>"Hukou" registration system</b>			20.025	0.000
Non-agricultural	163(35.1)	85(21.3)		
Agricultural	301(64.9)	314(78.7)		
<b>Marital status</b>			33.125	0.000
Unmarried	123(26.5)	44(11.0)		
Married	334(72.0)	346(86.7)		
Divorced/Widowed	7(1.5)	9(2.3)		
<b>Education level</b>			97.200	0.000
Primary school or below	18(3.9)	64(50.0)		
Junior high school	124(26.7)	181(45.4)		
High school or secondary	121(26.1)	77(19.3)		
University or college and above	201(43.3)	77(19.3)		
<b>Enabling variables</b>				
<b>Incoming</b>			4.951	0.175
<3000 RMB	93(20.0)	98(24.6)		
3000-4999	174(37.5)	147(36.8)		
5000-9999	154(33.2)	130(32.6)		
≥10000	43(9.3)	24(0.6)		
<b>The time resident in Beijing</b>			6.555	0.088
<1 year	50(10.8)	32(8.0)		
1-4	83(17.9)	97(24.3)		
5-9	156(33.6)	132(33.1)		
≥10	175(37.7)	138(34.6)		
<b>Plan to reside for a long time in Beijing</b>			49.602	0.000
No	128(27.6)	203(50.9)		
Yes	336(72.4)	196(49.1)		
<b>Have at least one child in Beijing</b>			28.977	0.000
No	309(66.6)	330(82.7)		
Yes	155(33.4)	69(17.3)		
<b>Employment status</b>			29.977	0.000
Formal work	227(48.9)	122(30.6)		
Informal work	237(51.1)	277(69.4)		
<b>Housing source</b>			7.529	0.006
Own house	69(14.9)	35(8.8)		
Rent	395(85.1)	364(91.2)		
<b>Insurance</b>			0.407	0.523
Uninsured	18(3.9)	19(4.8)		
Insured	446(96.1)	380(95.2)		
<b>Average working time daily</b>			43.817	0.000
<8 hours	16(3.4)	15(3.8)		
8-7	264(56.9)	138(34.6)		
>8	187(39.7)	246(61.7)		
<b>Health behavior</b>				
<b>Health promotion behaviors</b>				
<b>Do exercises</b>			29.872	0.000
No	226(48.7)	268(67.2)		
Yes	238(51.3)	131(32.8)		
<b>Acquire health knowledge</b>			24.476	0.000
No	188(40.5)	229(57.4)		
Yes	276(59.5)	170(42.6)		
<b>Health hazard behaviors</b>				
<b>Smoking</b>			13.121	0.000
No	402(86.6)	308(77.2)		

Yes	62(13.4)	91(22.8)		
<b>Drinking</b>			1.487	0.223
No	418(90.1)	349(87.5)		
Yes	46(9.9)	50(12.5)		
<b><i>Need variables</i></b>				
<b>Having chronic disease</b>			0.064	0.801
No	373(80.4)	318(79.7)		
Yes	91(19.6)	81(20.3)		
<b>Self-evaluation general health status</b>			24.467	0.000
Good	128(27.6)	97(24.3)		
Moderate	203(43.8)	176(44.1)		
Poor	133(28.7)	126(31.6)		

**Table 4.** Information on the three types of health education receipt by migrants in different characteristic.

Variances	Migrants (n=863)		$\chi^2$	P	Receive non-communicable disease health education	Non receive non-communicable disease health education	$\chi^2$	P	Receive occupational disease health education	Non receive occupational disease health education
	Receive communicable disease health education	Non receive communicable disease health education								
	N (%)	N (%)								
<b>Predisposing variables</b>										
<b>Gender</b>			3.890	0.049			2.746	0.097		
Male	38(35.5)	345(45.6)			35(36.5)	348(45.4)			73(56.2)	310(40.0)
Female	69(64.5)	411(54.4)			61(63.5)	419(54.6)			57(43.8)	423(55.0)
<b>Age</b>			5.964	0.202			3.967	0.411		
18≤24	17(15.9)	93(12.3)			7(7.3)	103(13.4)			34(26.2)	76(9.8)
25≤34	41(38.3)	275(36.4)			35(36.5)	281(36.6)			53(40.8)	263(33.8)
35≤44	30(28.0)	181(23.9)			26(27.1)	185(24.1)			27(20.8)	184(23.7)
45≤54	12(11.2)	156(20.6)			19(19.8)	149(19.4)			13(10.0)	155(19.9)
≥55	7(6.5)	51(6.7)			9(9.4)	49(6.4)			3(2.3)	55(7.1)
<b>Ethnicity</b>			0.836	0.565			2.777	0.096		
Han	105(98.1)	729(96.4)			90(93.8)	744(97.0)			125(96.2)	709(90.7)
Minority	2(1.9)	27(3.6)			6(6.3)	23(3.0)			5(3.8)	24(3.1)
<b>"Hukou" registration system</b>			9.148	0.002			8.818	0.003		
Non-agricultural	44(41.1)	204(27.0)			56(58.3)	208(27.1)			51(39.2)	197(25.3)
Agricultural	63(58.9)	552(73.0)			40(41.7)	559(72.9)			79(60.8)	536(69.7)
<b>Marital status</b>			2.749	0.253			3.520	0.172		
Unmarried	18(16.8)	149(19.7)			16(16.7)	151(19.7)			56(43.1)	111(14.4)
Married	85(79.4)	595(78.7)			76(79.2)	604(78.7)			72(55.4)	608(78.9)
Divorced/Widowed	4(3.7)	12(1.6)			4(4.2)	12(1.6)			2(1.5)	14(1.8)
<b>Education level</b>			8.404	0.038			1.870	0.600		
Primary school or below	5(4.7)	77(10.2)			7(7.3)	75(9.8)			3(2.3)	79(10.2)
Junior high school	30(28.0)	275(36.4)			30(31.3)	275(35.9)			24(18.5)	281(36.3)
High school or secondary	28(26.2)	170(22.5)			24(25.0)	174(22.7)			28(21.5)	170(22.1)
University or college and above	44(41.1)	234(31.0)			35(36.5)	243(31.7)			75(57.7)	203(26.4)
<b>Enabling variables</b>										
<b>Incoming</b>			0.616	0.893			1.245	0.742		
<3000 RMB	23(21.5)	168(22.2)			20(20.8)	171(22.3)			26(20.0)	165(21.4)
3000≤4999	41(38.3)	280(37.0)			39(40.6)	282(36.8)			45(34.6)	276(35.7)
5000≤9999	33(30.8)	251(33.2)			28(29.2)	256(33.4)			50(38.5)	234(30.3)
≥10000	10(9.3)	57(7.5)			9(9.4)	58(7.6)			9(6.9)	58(7.6)
<b>The time resident in Beijing</b>			4.047	0.256			0.982	0.806		
<1 year	14(13.1)	68(9.0)			11(11.5)	71(9.3)			24(18.5)	58(7.5)
1≤5	19(17.8)	161(21.3)			17(17.7)	163(21.3)			30(23.1)	150(19.5)
5≤10	30(28.0)	258(34.1)			33(34.4)	255(33.2)			42(32.3)	246(31.7)
≥10	44(41.1)	269(35.6)			35(36.5)	278(36.2)			34(26.2)	279(36.3)
<b>Plan to reside for a long time in Beijing</b>			4.316	0.038			1.747	0.186		
No	30(28.0)	293(38.8)			30(31.3)	300(39.1)			37(28.5)	286(37.2)
Yes	77(72.0)	463(61.2)			66(68.8)	467(60.9)			93(71.5)	447(58.3)
<b>Have at least one child in Beijing</b>			4.726	0.030			0.071	0.789		
No	70(65.4)	569(75.3)			70(72.9)	569(74.2)			106(81.5)	533(69.3)
Yes	37(34.6)	187(24.7)			26(27.1)	198(25.8)			24(18.5)	200(26.1)
<b>Employment status</b>			44.567	0.000			0.033	0.856		
Formal work	49(45.8)	300(39.7)			38(39.6)	311(40.5)			87(66.9)	262(34.0)
Informal work	58(54.2)	456(60.3)			58(60.4)	456(59.5)			43(33.1)	471(61.4)
<b>Housing source</b>			0.152	0.004			6.106	0.013		
Own house	22(20.6)	82(10.8)			19(19.8)	85(11.1)			17(13.1)	87(11.3)
Rent	85(79.4)	674(89.2)			77(80.2)	682(88.9)			113(86.9)	646(84.7)
<b>Insurance</b>			1.741	0.303			1.279	0.419		
Uninsured	2(1.9)	35(4.6)			2(2.1)	35(4.6)			5(3.8)	32(4.2)
Insured	105(98.1)	721(95.4)			94(97.9)	732(95.4)			125(96.2)	701(91.1)
<b>Average working time daily</b>			22.026	0.000			18.335	0.000		
<8 hours	7(6.5)	24(3.2)			7(7.3)	24(3.1)			7(5.4)	24(3.1)
8-10	69(64.5)	333(44.0)			60(62.5)	342(44.6)			90(69.2)	312(40.3)
>10	31(29.0)	399(52.8)			29(30.2)	401(52.3)			33(25.4)	397(51.4)
<b>Health behavior</b>										
<b>Health promotion behaviors</b>			23.561	0.000			19.064	0.000		
Do exercises										
No	38(35.5)	456(60.3)			35(36.5)	459(59.8)			55(42.3)	439(57.1)

Yes	69(64.5)	300(39.7)		61(63.5)	308(40.2)		75(57.7)	294
<b>Acquire health knowledge</b>			15.584	0.000		1.362	0.279	
No	32(29.9)	385(50.9)		41(42.7)	376(49.0)		48(36.9)	369
Yes	75(70.1)	371(49.1)		55(57.3)	391(51.0)		82(63.1)	364
<b>Health hazard behaviors</b>								
<b>Smoking</b>			1.153	0.283		0.328	0.567	
No	92(86.0)	618(81.7)		81(84.4)	629(82.0)		104(80.0)	606
Yes	15(14.0)	138(18.3)		15(15.6)	138(18.0)		26(20.0)	127
<b>Drinking</b>			2.804	0.094		2.213	0.137	
No	90(84.1)	677(89.6)		81(84.4)	686(89.4)		110(84.6)	657
Yes	17(15.9)	79(10.4)		15(15.6)	81(10.6)		20(15.4)	76
<b>Need variables</b>								
<b>Having chronic disease</b>			0.739	0.390		1.740	0.222	
No	89(83.2)	602(79.6)		72(75.0)	619(80.7)		103(79.2)	588
Yes	18(16.8)	154(20.4)		24(25.0)	148(19.3)		27(20.8)	145
<b>Self-evaluation general health status</b>			1.290	0.525		1.391	0.499	
Good	32(29.9)	193(25.5)		28(29.2)	197(25.7)		37(28.5)	188
Moderate	47(43.9)	332(43.9)		44(45.8)	335(43.7)		49(37.7)	330
Poor	28(26.2)	231(30.6)		24(25.0)	235(30.6)		44(33.8)	215

Table 5. Model summary of health education utilization of migrants.

	-2Log likelihood	Cox and Snell R Square	Nagelkerke R Square
Model I <sup>a</sup>	993.868	0.196	0.262
Model II <sup>b</sup>	587.575	0.056	0.107
Model III <sup>c</sup>	556.608	0.046	0.091
Model IV <sup>d</sup>	631.023	0.101	0.177

**Note:** Model I: Binary logistic regression analysis of predictors of health education utilization of migrants in the past month.

Model II: Binary logistic regression analysis of predictors of communicable disease health education utilization of migrants in the past month.

Model III: Binary logistic regression analysis of predictors of non-communicable disease health education utilization of migrants in the past month.

Model IV: Binary logistic regression analysis of predictors of occupational disease health education utilization of migrants in the past month.

a:  $\chi^2=186.467$ ,  $P=0.000$

b:  $\chi^2=49.367$ ,  $P=0.000$

c:  $\chi^2=39.895$ ,  $P=0.000$

d:  $\chi^2=90.941$ ,  $P=0.000$

**Table 6. Binary logistic regression analysis of predictors of health education utilization of migrants.**

Variables in the equation	Model I			
	B (SE)	Wald	OR[95%-CI]	P-value
<b>Predisposing variables</b>				
Age (Ref=18-24)				
25-34	-0.581(0.274)	4.503	0.559[0.327, 0.957]	0.034
35-44	-1.198(0.298)	16.131	0.302[0.168, 0.542]	0.000
45-54	-1.279(0.318)	16.211	0.278[0.149, 0.519]	0.000
≥55	-1.461(0.397)	13.535	0.232[0.107, 0.505]	0.000
Education level (Ref=Primary school or below)				
Junior high school	0.756(0.318)	5.642	2.129[1.141, 3.973]	0.018
High school or secondary	1.266(0.342)	13.703	3.545[1.814, 6.929]	0.000
University or college and above	1.487(0.349)	18.097	4.423[2.229, 8.774]	0.000
<b>Enabling variables</b>				
Plan to reside for a long time in Beijing (Ref=No)				
Yes	-0.395(0.173)	5.184	0.674[0.479, 0.946]	0.023
Have at least one child in Beijing (Ref=No)				
Yes	0.642(0.198)	10.561	1.901[1.290, 2.800]	0.001
<b>Health behavior variables</b>				
Do exercises (Ref=No)				
Yes	<b>0.687(0.160)</b>	<b>18.546</b>	<b>1.989[1.454, 2.719]</b>	<b>0.000</b>
Smoking (Ref=No)				
Yes	-0.502(0.204)	6.075	0.605[0.406, 0.902]	0.014
<b>Need variables</b>				
Having chronic disease (Ref=No)				
Yes	0.448(0.211)	4.500	1.565[1.035, 2.366]	0.034
Self-evaluation general health status (Ref=good)				
General	-0.543(0.202)	7.261	0.581[0.391, 0.862]	0.007
Poor	-0.569(0.223)	6.476	0.566[0.365, 0.877]	0.011
Constant	0.096 (0.412)	0.054	1.101	0.816

Abbreviation: B: Unstandardized regression coefficient. SE: standard error. OR: odds ratio. CI: confidence interval. Ref: reference category.

Model I: Binary logistic regression analysis of predictors of health education receipt by migrants.

Table 7. Binary logistic regression analysis of predictors of three types health education utilization of migrants.

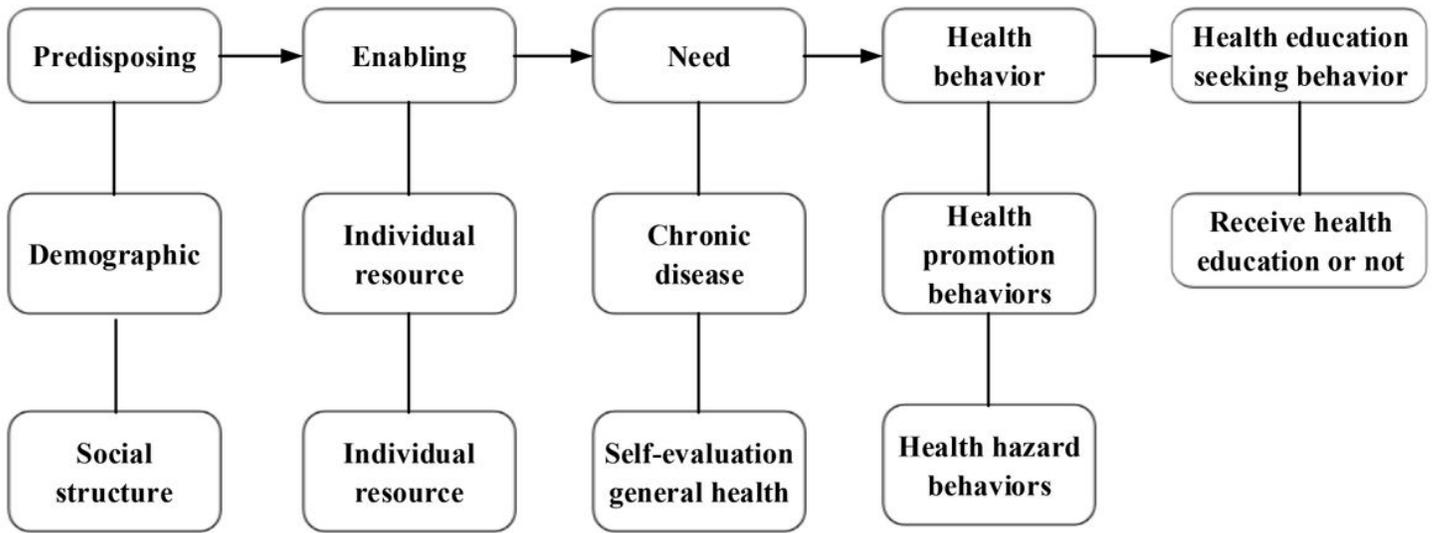
Variables in the equation	Model I				Model II				Model III			
	B (SE)	Wald	OR[95%-CI]	P-value	B (SE)	Wald	OR[95%-CI]	P-value	B (SE)	Wald	OR[95%-CI]	P-value
<b>Predisposing variables</b>												
<b>Marital status (Ref= Unmarried)</b>												
Married					0.501(0.302)	2.756	1.650	0.097	-0.876(0.232)	14.216	0.417	0.000
							[0.913, 2.981]				[0.264, 0.657]	
Divorced/Widowed					1.492(0.671)	4.941	4.448	0.026	-0.519(0.806)	0.415	0.595	0.520
							[1.193, 16.584]				[0.123, 2.888]	
<b>Employment status (Ref= Informal work)</b>												
Formal work									0.694(0.242)	8.195	2.001	0.004
											[1.245, 3.217]	
<b>Enabling variables</b>												
<b>Average working time daily (Ref=&lt;8 hours)</b>												
8	-0.356(0.461)	0.595	0.701	0.440	-0.422(0.465)	0.825	0.656	0.364	-0.426(0.481)	0.783	0.653	0.376
											[0.255, 1.677]	
>8	-1.237(0.480)	6.634	0.290	0.010	-1.372(0.484)	8.037	0.254	0.005	-1.156(0.493)	5.495	0.315	0.019
											[0.120, 0.827]	
<b>Health behavior variables</b>												
<b>Do exercises (Ref=No)</b>												
Yes	0.790(0.223)	12.519	2.204	0.000	0.890(0.229)	15.112	4.436	0.000	0.603(0.205)	8.610	1.827	0.003
											[1.222, 2.734]	
											[1.555, 3.861]	
<b>Acquire health knowledge (Ref=No)</b>												
Yes	0.670(0.234)	8.203	1.954	0.004								
											[1.236, 3.091]	
Constant	-2.087 (0.480)	18.905	0.124	0.000	-2.188 (0.535)	16.738	0.112	0.000	-0.799 (0.527)	2.297	0.130	0.450

**Note:** Model I: Binary logistic regression analysis of predictors of communicable disease health education utilization of migrants in the past month.

Model II: Binary logistic regression analysis of predictors of non-communicable disease health education utilization of migrants in the past month.

Model III: Binary logistic regression analysis of predictors of occupational disease health education utilization of migrants in the past month.

## Figures



**Figure 1**  
 The simplified Anderson health education utilization model. Health education seeking behaviors (seek health service or not) is determined by four dynamics: predisposing (demographic and social structure), enabling (individual and family resources), health behavior variances (health promotion behaviors and health hazard behaviors), and need variances (chronic disease and self-evaluation general health).