Available online at www.sciencedirect.com

ScienceDirect

Journal of the Chinese Medical Association 79 (2016) 531−537

www.jcma-online.com

Original Article

Income-related health inequality of migrant workers in China and its decomposition: An analysis based on the 2012 China Labor-force Dynamics Survey data

Cenyi Shao, Xuehui Meng*, Shichen Cui, Jingru Wang, Chengcheng Li

Department of Health Service Management, Humanities and Management School, Wenzhou Medical University, Wenzhou, China

Received October 20, 2015; accepted February 23, 2016

Abstract

Background: Although migrant workers are a vulnerable group in China, they demonstrably contribute to the country's economic growth and prosperity. This study aimed to describe and assess the inequality of migrant worker health in China and its association with socioeconomic determinants.

Methods: The data utilized in this study were obtained from the 2012 China Labor-force Dynamics Survey conducted in 29 Chinese provinces. This study converted the self-rated health of these migrant workers into a general cardinal ill-health score. Determinants associated with migrant worker health included but were not limited to age, marital status, income, and education, among other factors. Concentration index, concentration curve, and decomposition of the concentration index were employed to measure socioeconomic inequality in migrant workers' health.

Results: Prorich inequality was found in the health of migrant workers. The concentration index was −0.0866, as a score indicator of ill health. Decomposition of the concentration index revealed that the factors most contributing to the observed inequality were income, followed by gender, age, marital status, and smoking history.

Conclusion: It is generally known that there is an unequal socioeconomic distribution of migrant worker health in China. In order to reduce the health inequality, the government should make a substantial effort to strengthen policy implementation in improving the income distribution for vulnerable groups. After this investigation, it is apparent that the findings we have made warrant further investigation.

Keywords: concentration index; income-related health inequality; inequality decomposition; migrant workers

1. Introduction

China has experienced noteworthy industrialization, urbanization, and economic growth over the past several decades, which is supplemented in part by the largest migrant population in the world.[1] As significant drivers of economic growth, migrant workers often serve as the labor force that fills certain jobs that other workers are reluctant to undertake.[2] In China, migrants are defined as a specific population under the household registration system, living in a place or engaging in various jobs, who are stranded across the country for more than 6 months and whose household registration is typically in a village.[3] Internal migration in China has increased dramatically in the past 25 years; there were approximately 30 million migrant workers in 1989, 62 million in 1993, 132 million in 2006, 221 million in 2011, and 245 million by the end of 2013.[4−6] These figures show that more than one in six people are classified as migrant workers in China, and this large migrant population continues to grow.

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

* Corresponding author. Dr. Xuehui Meng, Zhejiang Hospital Development Center, 216, Qingchun Road, Hangzhou 310006, China.

E-mail address: mengxuehui@aliyun.com (X. Meng).

http://dx.doi.org/10.1016/j.jcma.2016.02.009

However, recent information from different sources suggests that the entire process of migration has an effect on worker health outcomes, a topic that has caught the attention of public health researchers.[7−9] Most of this research has indicated an increasing risk of poor health among China's migrant population compared with that among the general population.[10−12] In most countries, migrant workers can be found in agricultural, food processing, construction, and manufacturing jobs, or in low-wage service jobs. Thus, migrant workers are likely to experience more serious abuse and exploitation.[13−16] Additionally, migrants often suffer stressful incidents that may increase their vulnerability to health-related problems, increasing the health inequality of these workers.

The extent of health inequality is assessed to specify the differences, varieties, and disparities in health achievements of individuals and groups.[17] Reducing inequality has been widely considered a major aim of health care policies in China, becoming a growing concern among the public. However, overall, there is substantial health inequality within the Chinese population due to gender, educational, marital, and economic factors, especially in the vulnerable populations. Migrants are one of these vulnerable population groups in China. A study found different risk factors of unhealthy lifestyle score in male and female rural-to-urban migrants, especially in some cities where they experienced salary, marital status, and workplace scale.[18] Workforce health inequity was found in another study, particularly with respect to the quality and geographic distribution of health care.[19] Lin et al[20] found that status-based discrimination and inequity had been related to the process of migration, especially with economics-driven internal migration.

Migrant workers are a special phenomenon in the process of China's economic transformation. The household registration system categorizes them as temporary residents within existing cities, immediately putting them in a vulnerable state. In China, internal migration usually occurs without a change of *hukou* (household registration) status. To a certain degree, *hukou* status is related to a person's employment, medical insurance, housing allowance, social welfare, and education within the registration area.[21] Therefore, internal migrants are often regarded as "vulnerable individuals" in some cities.[22] Owing to the household registration system, migrants are usually unable to participate in local public health services and medical insurance plans.[23] Migrants generally tend to live in poor conditions and work in highly dense environments.[23−25] Since the late 1990s, research on health issues affecting internal migrants has proliferated. However, almost all these studies focused on the physical or mental health, whereas only a handful of studies have explored the health inequality of migrant workers in China.[26]

The concept of health inequality connotes both pure and socioeconomic inequalities in health. For the purpose of quantification, there are many ways to measure health inequality. Among them, the Lorenz curve and the Gini coefficient are used to measure pure health inequality; the concentration curve and concentration index (CI) method can measure health inequality related to income. For instance, CI, concentration curve, and decomposition of the CI were adopted to measure socioeconomic inequality in maternal health service utilization.[17] In another study, inequality was determined by estimating each indicator's CI and establishing a geographic Gini index. For further assessment of the inequalities, the CI can be decomposed in order to analyze the determinants' contributions to the inequalities.[27]

The purpose of this study was to analyze the degree of income-related inequality of migrant workers and to decompose socioeconomic inequality into its determinants. These findings can be used to make recommendations to the Chinese government for promoting migrant workers' health in China.

2. Methods

2.1. Data and variables

The data utilized in this study were obtained from the China Labor-force Dynamics Survey 2012 conducted in 29 provinces of mainland China. This survey was nationally representative, multistage clustered, stratified, and Probability Proportionate to Size Sampling (PPS) sampled with a sample size of 16,253, with the individuals ranging in age from 16 years to 65 years. The total number of migrant workers in the dataset was 1122, including 1024 observations of information integrity and 98 individuals with any missing information (76 people due to lack of income variables, 15 arising from self-rated health, 6 due to the lack of sex, and 1 due to the lack of marital status). The methods were carried out in accordance with the approved guidelines.

We regarded self-rated health as a health outcome in this study. The determinants associated with migrant worker health included age, gender, ethnicity, marital status, income, education, medical insurance, occupational status, smoking history, drinking status, and social support.

For the purpose of this analysis, we used a subjective measure of health. Individuals were asked the question "how would you describe your current health?", and could rate their health status with the following answers: "very good (1)," "good (2)," "fair (3)," "bad (4)," or "very bad (5)."

Income is widely agreed to be associated with health, and the income referenced in this paper is the total annual income of 2011, including wage income and operating income. In order to reflect the nonlinear relationship between income and health, the annual income is taken as a logarithm, and the coefficient is used to detect the comprehensive effect of income on health.

Age was categorized into four levels: <25 years, 25−34 years, 35−44 years, and >44 years. Marital status was classified into two categories: "married" and "single." "Single" included people who were never married, currently divorced, or widowed at the time of the survey administration; "married" included people who were currently married. We distinguished three categories of occupational status: employee, employer, and nonworking individuals. Employee also contained farmers; employer referred to those employing

more than one employee and included self-employed workers. As education may have a protective impact on health, the educational level of individuals was measured at four levels. The first level comprised those with an education level of primary school or below (schooled for up to 6 years), the second level referred to junior high school education (schooled for 6–9 years), and the third level included those with education levels of senior high school, vocational school, technical secondary school, technical school, etc. (schooled for 9–12 years). Others who had more than 12 years of schooling were classified into a fourth level. Ethnicity was defined as either Han or minority, and smoking history, drinking status, medical insurance, and social support were all treated as binary variables.

2.2. Ethics statement

This study was approved by the Institutional Review Board of the Humanities and Management School, Wenzhou Medical University (Wenzhou, China). Written informed consent was obtained from all the study participants. Data were preserved at the Sun Yat-sen Center for China Labor-force Dynamics Survey of Sun Yat-sen University.

2.3. Measuring inequality

In this study, the CI is used to measure the health inequality of migrant workers. CI is associated with the concentration curve, which plots the cumulative proportion of the outcome variable against the cumulative proportion of the population, ranked by a measure of socioeconomic status.[28,29] Essentially, the concentration curve depicts the relationship between cumulative population (ranked by income) and the cumulative ill-health score. The value of the CI can vary between −1 and +1. The CI is 0 if the concentration curve coincides with the diagonal, indicating that there are no income-related health inequalities. The CI is negative if the focus curve is above the diagonal, suggesting that poor health is focused on low-income groups—a prorich health inequality. Conversely, the CI is positive if the focus curve is below the diagonal, indicating that poor health is focused on high-income groups—a poor health-favoring inequality. The value of CI measures the seriousness of health inequality; the larger the absolute value of CI, the greater the disparity. In this study, a method proposed by Wagstaff and Van Doorslaer,[30] assumed to be hidden behind the five levels of self-rated health and the actual self-rated health score, is a continuous variable that obeys the standard normal distribution. Most people evaluate their own health better than others (which in fact is the case), and the standard lognormal simulates this skewed result. Sample proportion is occupied by class divide, checking the index in terms of standard normal distribution and then getting each level corresponding to the actual score, whereafter the score is a measure of a person's health-based indicators.[31] Referred to herein as the ill-health score, the greater the value of the said score on behalf of poor health, the higher the level, and patient health status worsens.

The CI equals twice the area between the concentration curve and the line of equality, and for a health variable y it can be expressed as follows:

$$C = \frac{2}{n\mu}\sum_{i-1}^{n} yiRi - 1 \tag{1}$$

where C denotes the CI, n is the number of observations, μ is the mean of the health variable y, and R is the fractional rank of the individuals by income.

2.4. Decomposition of the CI

The CI of migrant workers' health measures the degree of inequality, which can be decomposed into the contributions of various explanatory factors. According to this method, the CI of migrant workers' health can be decomposed into the contributions of determinants to income-related inequality using the method of decomposition of CI. The decomposition of the CI has been explained in detail elsewhere.[29,32] In summary, decomposition of the CI links the different indicators of migrant workers' health to a set of K determinants, x_1, …, x_k, by linear regression:

$$y = \alpha + \sum_{k=1}^{k} \beta_k xk + \varepsilon \tag{2}$$

where y is the indicator in question and ε is an error term. Given the relationship between y_i and x_{ki} in Eq. (2), we get

$$C = \sum_{k=1}^{k} \frac{\beta_k \bar{x}k}{\mu} C_k + \frac{GC\varepsilon}{\mu} \tag{3}$$

where C is the CI, β_k is the regression coefficient in Equation (2), $\bar{x}k$ is the mean of the determinant k, μ is the mean of the outcome variable y, and C_k is the CI of the determinant k. The last term is the unexplained part calculated as a residual, where $GC\varepsilon$ is the cumulative CI of the error term. Equation (3) is basically made up of two components, the explained component giving the contribution of each determinant and an unexplained component or residual.

However, this method is developed for continuous outcomes where linear regression is appropriate and does not allow for binary outcome variables that require nonlinear regression models. Probit regression models are employed to analyze the influence of determinants on the probability of migrant workers' health.

3. Results

Of the 1024 respondents, 57.13% were male, 42.87% female, and 92.09% of Han ethnicity. Additionally, 78.125% of the respondents were married and 21.875% single. More than one half of the respondents were <35 years of age, 27.05% of the respondents were 35–44 years old, and the rest (17.97%) were 45 years of age or older. Table 1 shows the summary statistics for all the variables. About 64% of respondents

Table 1
Summary statistics of the indicators.

Category	Subcategory	No.
Number of respondents		1024 (100)
Gender	Male	585 (57.13)
	Female	439 (42.87)
Age group (y)	<25	180 (17.58)
	25−34	383 (37.40)
	35−44	277 (27.05)
	>44	184 (17.97)
Ethnicity	Han	943 (92.09)
	Minority	81 (7.91)
Marital status	Single (divorced or widowed)	224 (21.875)
	Married	800 (78.125)
Occupational status	Nonworking	105 (10.25)
	Employer	218 (21.29)
	Employee	701 (68.46)
Education	First level	278 (27.15)
	Second level	373 (36.43)
	Third level	221 (21.58)
	Fourth level	152 (14.84)
Smoking history	Presence	646 (63.09)
	Absence	378 (36.91%)
Drinking status	Presence	678 (66.21)
	Absence	346 (33.79)
Medical insurance	Presence	221 (21.58)
	Absence	803 (78.42)
Social support	Presence	147 (14.36)
	Absence	877 (85.64)
Self-rated health	Very good	267 (26.07)
	Good	414 (40.23)
	Fair	295 (28.81)
	Bad	43 (4.20)
	Very bad	5 (0.49)
Income		10.18 ± 0.889

Data are presented as n (%) or mean ± standard deviation.

completed junior high school, and the others achieved a higher educational level. Employees accounted for 68.46% of the total respondents, 21.29% of the respondents were employers, and the rest (10.25%) were nonworking individuals. In addition, the number of people having access to medical insurance is more than those without such insurance (21.58%), smoking history, drinking status, and social support.

A trend of inequality in migrant workers' health has been observed. For the indicator of ill-health score, the CI was −0.0866, indicating a prorich inequality. From Fig. 1, we can see that the concentration curve was above the line of equality, which indicated that the outcome is concentrated among the poor.

The decomposition analysis clarifies how each determinant contributes to the socioeconomic-related inequality in the health of migrant workers. Results of the decomposition analysis are depicted in Table 2. The positive marginal effect indicates that the determinant had a positive association with outcome and had a high probability of outcome compared with the reference. The absolute value of contribution signifies the extent to which inequality was attributed to this variable. A positive value of contribution means that the variable contributes to a prorich inequality, that is to say, richer individuals are healthier than poor ones, and vice versa. It has been clearly

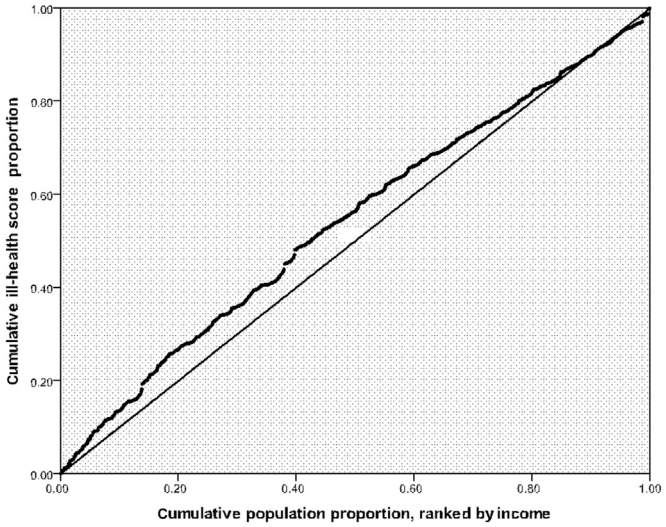

Fig. 1. Concentration curve for ill-health score.

Table 2
Decomposition of inequality of migrant workers' health.

Indicator	Mean	Marginal effects	Flexibility	C_k	Contribution (%)
Ill-health score			−0.0866		
Income	10.1763	−0.2049*	−1.3323	0.0478	73.5242
Gender					
Male	—				
Female	1.4287	0.3300*	0.3011	−0.0611	21.2216
Occupational status					
Nonworking	—				
Employer	0.2129	−0.1787	−0.0243	0.2108	5.9119
Employee	0.6846	−0.3152	−0.1378	−0.00059	−0.9452
Education					
First level	—				
Second level	0.3643	0.1683	0.0392	−0.082	3.7067
Third level	0.2158	0.2235	0.0308	0.1396	−4.9643
Fourth level	0.1484	−0.1165	−0.011	0.3577	4.56
Smoking history					
Absence	—				
Presence	0.3691	0.4319	0.1018	0.1615	−18.9803
Drinking status					
Absence	—				
Presence	0.3379	−0.0369*	−0.008	0.1896	1.7424
Medical insurance					
Absence	—				
Presence	0.7842	−0.1918	−0.0961	0.0473	5.2398
Social support					
Absence	—				
Presence	0.8564	0.1058	0.0579	0.0286	−1.9098

The marginal effects demonstrate associations between determinants and migrant workers' health outcome. Those with a positive sign indicate positive associations with the probability of migrant workers' health, while those with a negative sign indicate negative associations. In addition, the larger the absolute value of a marginal effect, the more substantial the association.
*Statistically significant estimates of marginal effects, $p < 0.05$.

observed that most of the inequalities of migrant workers' health can be explained by inequalities in income, age, gender, marital status, and smoking history. Among these contributions, income alone accounts for the majority (73.5342%) of the explained inequality. Age, gender, marital status, and

smoking history also made notable contributions to the inequality of migrant workers' health. As the variables were divided into categories, the contribution of each variable was generated by adding up the contributions of variables within each category.

4. Discussion

This study focused on income-related inequality of migrant workers' health and decomposed socioeconomic inequality into its determinants in mainland China based on the national survey data. Although the literature on this topic is sparse, several studies and reports suggest that immigrants are vulnerable with regard to health.[33−35] Self-rated health cannot be used directly for research due to its ordinal nature. Therefore, this study converted it into an ill-health index-based score by assuming the distribution of latent health function, and thus the extent of health inequality was estimated. The results showed that the CI of the health of migrant workers of mainland China in 2012 was −0.0866, indicating a prorich inequality. After decomposing the inequality of migrant workers' health, this study showed that the income factor played the most important role in the health inequality. The result was consistent with those of previous studies that also suggested that income was associated with health inequality.[36−38]

Other studies have also found gender to be an important determinant of migrant workers' health, which is consistent with the results of this study.[39] This study employs the 2009 survey data of migrant workers and uses the improved Brown decomposition approach to measure the gender wage difference of migrant workers in China. The result shows that there exists a severe gender wage difference among migrant workers. In the aspect of the structure of wage gap, gender discrimination of unexplained factors accounts for 83.94%, while human capital and social capital are minimal in their influence. From the perspective of within the industry and between the industry, 83.49% is caused by within the industry, whereas between the industry plays a small role in the total difference. Therefore, eliminating gender discrimination and creating a fair labor market are important ways to improve the gender-wage differential of migrant workers.

In our study, regression results showed that females had better health than males, although the number of male migrant workers was larger than that of females; the health of "single" was also superior to the health of "married" workers. To the best of our knowledge, the migration of Chinese labor is mainly from rural to urban environments, and most of the migrants engaged in simple work because of their low level of education. The migration of labor has mainly focused on young and middle-aged men in that migration of women is mostly considered to be accompanying migration with a relative lag. This information may explain the results regarding gender and age. In addition, the CI of smoking history was positive, indicating a pro-poor inequality. Regarding economic factors, the rich generally are more likely to smoke than the poor, and most of the smokers are male.

Although a previous study indicated that health care had an impact on the inequality of migrant workers' health,[40] that study compared Chinese rural-to-urban migrants with permanent rural and urban residents. Migrants were young, worked very long hours, with very basic living conditions. Nineteen percent of these workers had some form of health insurance and 26% were entitled to limited sick pay, compared with 68% and 66% for urban workers, respectively. These migrants demonstrated the "healthy migrant effect." However, poor living conditions and inattention to health can make migrants vulnerable to poor long-term health. As health insurance schemes will remain limited for the foreseeable future, attention should focus on providing affordable health care to both uninsured migrants and the urban poor. The data for this study were collected in 2012, when Medicare had basic coverage, and people's health awareness had only been gradually advanced, therefore, the impact of medical insurance on migrant workers' health was not so obvious. Unfortunately, when decomposing inequalities in health outcome, factors such as occupational status, education, and so on only accounted for a relatively small proportion of the inequalities. Furthermore, the results also showed that residual variable substantially contributed to the inequality, suggesting that there remains a good deal of unexplained variation in inequality besides the variables examined in this analysis. It is important to note that redressing income-related inequalities alone cannot be an effective intervention to reduce inequalities when reviewing access to migrant workers' health in the absence of an intervention that also tackle other social determinants such as smoking history. However, in this study, a new method for assessing inequalities was used, which can lead to an improved and more nuanced understanding of both the current migrant health situation and the migrant health situation that is changing over time. Quantifying inequalities using the CI provides a useful tool for comparing the magnitude of the inequalities for different variables and for assessing the changes in inequality over time. From the findings of the present study, the Chinese government should focus greater attention and emphasis on the growing concern of China's migrant workers, including increasing their labor income and strengthening health education to improve their health knowledge (e.g., healthy lifestyle), among other solutions. Meanwhile, the government should also enhance the health services system and reduce the migrant populations' burden of the medical economy in order to reduce inequality.

The limitation of the study should be addressed. First, the analysis of this study assumed that the actual self-rated health scores concealed behind the five levels of self-rated health would obey the standard logarithmic normal distribution and that the base nature of the adverse health index would be true of the personal health status measure. To investigate the rationality of this hypothesis, it is also necessary to further study the data of self-rating health indicators and objective health measures. Second, the decomposition analysis is based on regression analysis, with a varying degree of statistical significance. Therefore, the results of the decomposition analysis should be interpreted with caution. Third, there were

limitations to the data. Owing to the small sample size and variable selection, there were some factors that could not be explained by the factors we reviewed. Consequently, we could not compare the results among different variables most effectively. Further studies with larger sample sizes are therefore needed to assess health inequalities.

In conclusion, overall, the results of this study suggested that there is a strong prorich inequality of migrant workers' health in mainland China. We found that income, age, gender, marital status, and smoking history were the main factors contributing to the prorich inequality of migrant workers' health. Feasible measures need to be taken immediately to reduce the risk of health inequality, and equity in access to fair health among migrant groups should be assured. The government should make a considerable effort to strengthen policy implementation for the purpose of improving income distribution. However, there is still a long way to go to ameliorate health inequality in mainland China.

Acknowledgments

This work was supported by Zhejiang Natural Science Foundation (No. LQ15G030011). Data used in this paper is from the China Labor-force Dynamics Survey (CLDS) by the Center for Social Science Survey at Sun Yat-sen University in Guangzhou, China. We would like to express our deep gratitude to them.

References

1. Lu L, Zou G, Zeng Z, Han L, Guo Y, Ling L. Health-related quality of life and its correlates among Chinese migrants in small- and medium-sized enterprises in two cities of Guangdong. *PLoS One* 2014;**9**:1−10.
2. Benach J, Muntaner C, Chung H, Benavides FG. Immigration, employment relations, and health: developing a research agenda. *Am J Ind Med* 2010;**53**:338−43.
3. Sun Yat-sen Center for Migrant Health Policy. *The develop report on migrant workers of China 2014*. Beijing: China Population Press; 2014.
4. Cai F, Park A, Zhao Y. The Chinese labor market in the reform era. In: Brandt L, Rawski TG, editors. *China's great economic transformation*. Cambridge County, UK: Cambridge University Press; 2008. p. 167−214.
5. Chan KW. Migration and development in China: trends, geography and current issues. *Migr Dev* 2012;**1**:187−205.
6. National Bureau of Statistics of the People's Republic of China. *Monitoring survey report on migrant labours of China 2014*. Published 2015. Available from: http://www.stats.gov.cn/tjsj/zxfb/201504/t20150429_797821.html [accessed 25.05.15].
7. Connell J, Zurn P, Stilwell B, Awases M, Braichet J-M. Sub-Saharan Africa: beyond the health worker migration crisis? *Soc Sci Med* 2007;**64**:1876−91.
8. Ahonen EQ, Benavides FG, Benach J. Immigrant populations, work and health—a systematic literature review. *Scand J Work Environ Health* 2007;**33**:96−104.
9. Mou J, Cheng J, Griffiths SM, Wong S, Hillier S, Zhang D. Internal migration and depressive symptoms among migrant factory workers in Shenzhen, China. *J Commun Psychol* 2011;**39**:212−30.
10. Takeuchi DT, Zane N, Hong S, Chae DH, Gong F, Gee GC, et al. Immigration-related factors and mental disorders among Asian Americans. *Am J Pub Health* 2007;**97**:84−90.
11. Bilsborrow RE. *International migration statistics: guidelines for improving data collection systems*. Geneva, Switzerland: International Labour Office; 1997.
12. Li L, Wang HM, Ye XJ, Jiang MM, Lou QY, Hesketh T. The mental health status of Chinese rural−urban migrant workers. *Soc Psychiatry Psychiatr Epidemiol* 2007;**42**:716−22.
13. Lerche J. A global alliance against forced labour? Unfree labour, neoliberal globalization and the International Labour Organization. *J Agrarian Change* 2007;**7**:425−52.
14. ILO. *A global alliance against forced labour: global report under the follow-up to the ILO declaration on fundamental principles and rights at work*. Report of the Director-General. 2005.
15. Ruhs M. The potential of temporary migration programmes in future international migration policy. *Int Labour Rev* 2006;**145**:7−36.
16. Beets G, Willekens F. The global economic crisis and international migration: an uncertain outlook. *Vienna Yearb Popul Res* 2009;**7**:19−37.
17. Liu X, Gao W, Yan H. Measuring and decomposing the inequality of maternal health services utilization in Western Rural China. *BMC Health Serv Res* 2014;**14**:1−7.
18. Yang H, He F, Wang T, Liu Y, Shen Y, Gong J, et al. Health-related lifestyle behaviors among male and female rural-to-urban migrant workers in Shanghai, China. *PLoS One* 2015;**10**:1−14.
19. Chen R, Zhao Y, Du J, Wu T, Huang Y, Guo A. Health workforce equity in urban community health service of China. *PLoS One* 2014;**9**:1−15.
20. Lin D, Li X, Wang B, Hong Y, Fang X, Qin X, et al. Discrimination, perceived social inequity, and mental health among rural-to-urban migrants in China. *Commun Ment Health J* 2011;**47**:171−80.
21. Solinger DJ. *Contesting citizenship in urban China: peasant migrants, the state, and the logic of the market*. Oakland, California: University of California Press; 1999.
22. Jian X, Kun Huang. Up-to-date investigation report on rural migrant workers of China. *China Popul Resour Environ* 2007;**17**:1−6.
23. Liu S, Griffiths SM. From economic development to public health improvement: China faces equity challenges. *Public Health* 2011;**125**:669−74.
24. Xiao Y, Smith D, Zhang X. The current status and issues related to occupational health surveillance in China. *J Occup Health Saf Aust N Z* 2008;**24**:455−63.
25. Wong K, Fu D, Li CY, Song HX. Rural migrant workers in urban China: living a marginalised life. *Int J Soc Welf* 2007;**16**:32−40.
26. Hu X, Cook S, Salazar MA. Internal migration and health in China. *Lancet* 2008;**372**:1717−9.
27. Skaftun EK, Ali M, Norheim OF. Understanding inequalities in child health in Ethiopia: health achievements are improving in the period 2000−2011. *PLoS One* 2014;**9**:1−10.
28. Kakwani N, Wagstaff A, Van Doorslaer E. Socioeconomic inequalities in health: measurement, computation, and statistical inference. *J Econom* 1997;**77**:87−103.
29. O'Donnell O, Van Doorslaer E, Wagstaff A, Lindelow M. *Analyzing health equity using household survey data: a guide to techniques and their implementation*. Washington, USA: World Bank; 2008.
30. Wagstaff A, Van Doorslaer E. Measuring inequalities in health in the presence of multiple-category morbidity indicators. *Health Econ* 1994;**3**:281−91.
31. Jing Z. Income-related health inequality in China and its decomposition-an empirical analysis based on CGSS2008 data. *J Guizhou Univ Finance Econ* 2013;**3**:52−7 [In Chinese].
32. Wagstaff A, Van Doorslaer E, Watanabe N. On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. *J Econom* 2003;**112**:207−23.
33. World Health Organization (WHO). *International migration, health and human rights*. Geneva, Switzerland: WHO; 2003.
34. Jolivet A, Cadot E, Florence S, Lesieur S, Lebas J, Chauvin P. Migrant health in French Guiana: are undocumented immigrants more vulnerable? *BMC Public Health* 2012;**12**:53.
35. Magalhaes L, Carrasco C, Gastaldo D. Undocumented migrants in Canada: a scope literature review on health, access to services, and working conditions. *J Immigr Minor Health* 2010;**12**:132−51.
36. Pradhan M, Sahn DE, Younger SD. Decomposing world health inequality. *J Health Econ* 2003;**22**:271−93.

37. Lee L. Decomposing wage differentials between migrant workers and urban workers in urban China's labor markets. *China Econ Rev* 2012;**23**: 461−70.
38. Peng YC, Chang WH, Zhou HQ, Hu HP, Liang WN. Factors associated with health-seeking behavior among migrant workers in Beijing, China. *BMC Health Serv Res* 2010;**10**:69.
39. Yang P, Zhang GS. An empirical analysis of the gender wage differential of migrant workers in China based on the improved Brown decomposition approach. *J Guangdong Univ Bus Stud* 2012;**27**:74−83 [In Chinese].
40. Hesketh T, Jun YX, Lu L, Mei WH. Health status and access to health care of migrant workers in China. *Public Health Rep* 2008;**123**:189−97.