EMPIRICAL ESSAYS ON THE EVALUATION OF HEALTH CARE REFORMS IN RURAL CHINA

BY

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ABSTRACT

This thesis is comprised of three empirical studies on health care reforms in rural China. It specifically examines the determinant of enrolment in the social health insurance program, the effects of the insurance on health care utilization, and the extent of income-related inequity in the use of health care before and after the reforms.

Chapter 2 analyses the determinant of enrolment in the New Rural Cooperative Medical Scheme (NRCMS) from 2004 to 2006. The results show that people who use low-level public health facilities (village clinics or town hospitals) are more likely to be insured while people who use high-level public health facilities (county or city hospitals) are less likely to be covered. The relationship remains strong and significant after controlling for various groups of independent variables, such as demographics, socio-economic characteristics and health variables. The results may be attributed to generous reimbursements for health services delivered by low-level health facilities, making insurance more attractive for people who use primary care. However, the fact that people who use high-level facilities are less likely to purchase the NRCMS may indicate problems related to weak health systems at the primary level and a breakdown in the referral system.

Chapter 3 provides evidence on the effectiveness of the NRCMS on health care utilization to explore whether the insurance has helped patients to obtain more and better quality health services. As the program is a non-random policy initiative rolled out nationally, various matching methods with

difference-in-difference (DID) models are employed based on data from the China Health and Nutrition Survey (CHNS). The results show that the introduction of the NRCMS was not clearly related to the overall use of medical care, but it may have directed patients from town hospitals towards village clinics and county hospitals. On the one hand, the NRCMS appears to partly rationalise the use of health services, with some increase in the use of primary care. On the other hand, the insurance may also alleviate financial barriers to accessing higher levels of medical facilities and help patients to obtain better quality health care.

Chapter 4 examines how the income-related inequity of health care utilization in China develops from 2000 to 2009, the period before and after the health care reforms. The first part of the analysis uses Concentration Indices and Erreygers' Indices of the need-standardized use of different types of health services and different levels of health facilities. Pro-rich inequity emerges with respect to the use of preventive care and county hospitals, and pro-poor inequity is found in the use of folk doctors and village clinics. The results indicate that the rich are more likely to obtain formal and better quality health services. The second part of the analysis assesses the contribution of various need and non-need factors to total inequity in health care use and shows that inequity is mainly driven by income. Therefore, policies that address the unequal distribution of income would help to reduce the degree of horizontal inequity in the use of health services.

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DECLARATION OF AUTHORSHIP

I hereby declare that this thesis is my own work and has not been submitted in any form for the award of a higher degree elsewhere.

Miaoqing Yang

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Chapter 1

INTRODUCTION

During the late 1970s, China began the process of transforming itself from a closed centralized planned economy to a market economy. The market-liberalization policies brought dramatic changes to China's health care system within a few years. The health system was faced with various problems such as a reduction of people's access to health services, increases in the risk of large out-of-pocket payments and widened disparities in health and health care. In 2003, the Chinese government publicly acknowledged the limitations of such a system and began to implement a series of reforms aimed at achieving universal health coverage. A series of measures have been taken from 2003 onwards. The first was the New Rural Cooperative Medical Scheme (NRCMS) introduced between 2003 and 2008, which aimed at providing insurance to more than 800 million people living in rural areas. In 2007, another social health insurance program was introduced, targeted at 420 million urban residents not covered by the Urban Employer Basic Medical Insurance Scheme (UEBMI) who are mainly the elderly, students, children and the unemployed. On the supply side, the reform mainly develops a primary health care system, strengthening the quality and funding for low-level health facilities, such as village clinics and town hospitals in rural areas and community health centres in urban areas. The aim is to encourage people to seek and receive treatment in lower-level facilities and stop them from being admitted to hospitals unnecessarily or from staying there longer than required (Wagstaff et al., 2009b).

Over the last decade, there has been an increased interest in the evaluation of the health care reforms which have occurred in China after 2003. Due to the timing of the reforms, most evidence to date focuses on the NRCMS rather than the UEBMI. Since the objective of the NRCMS is to improve equity and access to health care and provide financial protection by reducing large out-of-pocket health payments, previous studies have investigated whether the insurance has achieved these goals. However, the findings appear to be mixed and inconclusive across data sources and study periods. For example, some literature that examines the impact of the NRCMS on health care utilization have found an increase in the use of

outpatient and inpatient care among the insured (Wagstaff et al., 2009a), while others have found little evidence that having insurance increases overall utilization (Lei and Lin, 2009; Babiarz et al., 2010; Babiarz et al., 2012). However, the NRCMS appears to encourage utilization at primary health facilities (village clinics and town hospitals), especially among the poor (Babiarz et al., 2010; Babiarz et al., 2012; Hou et al., 2014; Wagstaff et al., 2009a). The existing literature also offers mixed evidence on the effects of the NRCMS on medical expenditure. Some studies have shown that the program successfully lowers out-of-pocket spending or reduces the fraction of households who suffer from financial catastrophe related to large medical expenditure (Babiarz et al., 2010; Babiarz et al., 2012; Sun et al., 2009; Sun et al., 2010; Yip and Hsiao, 2009b), while other studies have found little or no impact of the NRCMS on households' financial burden (Cheng et al., 2015; Hou et al., 2014; Lei and Lin, 2009; Wagstaff et al., 2009a; Yang, 2015). A possible reason for the limited impact of the NRCMS in alleviating major financial risk is that the insurance may encourage access to care and use of high-level providers while the benefit packages are insufficient to offset the increase in medical expenditure associated with this. Few studies until now have considered the impact of the NRCMS on health outcomes. Two studies have found that the NRCMS had no impact on improving self-reported health, sickness or injuries in the last four weeks or the mortality rate of pregnant women and young children (Lei and Lin, 2009; Chen and Jin, 2012). However, Hou et al. (2014) demonstrate a beneficial impact of the NRCMS among the rural elderly in terms of health outcomes. In addition, some studies have also examined the distribution of health and health care across income groups before and after the health care reforms in rural areas and have found a pro-rich inequity after the reform in the use of outpatient and inpatient care (Chen et al., 2015; Wang et al., 2012; Xie, 2011; Zhang et al., 2015; Zhou et al., 2011), preventive care (Yang, 2013), maternal health services (Li et al., 2015; Shen et al., 2014) and treatment of major chronic conditions (Elwell-Sutton et al., 2013; Xie et al., 2014). The results suggest various challenges remaining within the health care system in rural China, such as inadequate insurance coverage, relatively low reimbursement rates and lack of portability of benefits (Barber and Yao, 2010; Eggleston, 2012).

This thesis contributes to the debate on whether the rural health care reforms have achieved the objectives of improving access to health services and reducing income-related inequity in health care use. Based on a large panel dataset – the China Health and Nutrition Survey (CHNS), the thesis first shows how the NRCMS is rolled out across regions and what type of population groups it has covered. It then

measures the effects of the NRCMS on the use of different types of health services and different levels of health facilities. The last chapter looks at potential income-related inequity on the use of health services before and after the health care reforms. I provide new evidence for the NRCMS which also adds to a more general literature on the impact of health care reforms aimed at achieving universal coverage in developing countries. A detailed summary of the empirical chapters is presented below.

Chapter 2 explores the determinant of enrolment in the NRCMS in rural China. This is the first study to focus on the relationship between purchasing insurance and facility preference in this setting. Facility choice should affect the demand for the insurance since it reflects both the price and quality of medical services covered and not covered by the NRCMS. Given various reimbursement rates and quality of care at different levels of health facilities, people who go to low-level health facilities (village clinics or town hospitals) are faced with lower price but also lower quality health services than people who go to high-level facilities (county or city hospitals). Therefore, the NRCMS appears to be more attractive to people who use low-level services since it reduces the cost of medical care. However, since the insured patients are required to seek care from primary level and can only be referred to hospitals if their conditions are complicated/serious, people who use high-level health facilities may not be willing to purchase the insurance if they do not want to risk obtaining low quality health services at primary health centres. They may rather go to better hospitals and incur full treatment fees.

The primary finding of chapter 2 confirms the expected results. People who use village clinics or town hospitals (low-level public health facilities) are more likely to be insured while people who use county or city hospitals (high-level public health facilities) are less likely to be covered. The unwillingness of people who use high-level facilities to purchase the NRCMS may indicate problems related to a perceived low quality of health care delivered by village clinics and town hospitals and a potentially inefficient referral system.

Many previous studies have examined the impact of the NRCMS on health care utilization, but little is known concerning whether the insurance has had an impact on people's treatment-seeking behaviour in terms of the use of different levels of health facilities. Chapter 3 evaluates the effects of insurance enrolment on the use of different types of health services and different levels of health facilities. The analysis exploits the phasing design of the NRCMS introduced in different rural counties across time and

employs a difference-in-difference analysis combined with propensity score matching. The results show that the NRCMS does not affect the overall use of medical care, but it may have directed patients from town hospitals towards village clinics and county hospitals. On the one hand, the NRCMS appears to partly rationalise the use of health services, with some increase in the use of primary care. On the other hand, the insurance may also alleviate financial barriers to accessing higher levels of medical facilities and help patients to obtain better quality health care.

Establishing the impact of health insurance is difficult because it is very rare that insurance coverage is allocated randomly. In most cases, the insured and uninsured are different from each other in terms of individual characteristics that influence both their decision to participate in the program and their health outcomes. The analysis in Chapter 2 adopts an approach that first pre-processes data with propensity score matching and then applies parametric difference-in-difference analysis on the pre-processed dataset. The method provides estimates based on the subsequent parametric analysis that is less dependent on modelling choices and specifications. The chapter seeks to advance previous literature by using a large panel of data and rigorous evaluation methods to measure the impact of the NRCMS on people's treatment-seeking behaviour. Compared with previous studies, I use a richer set of control variables, including people's risk preference and health facility characteristics. These variables are important confounders that may influence the effect of the NRCMS on health care utilization. Unlike previous research, I find substitution effects of the NRCMS from town hospitals to village clinics and county hospitals, suggesting that the insurance has helped patients to access health services more conveniently and of potentially better quality.

The issue of inequity in health care utilization has raised great interest since the market reforms in 1978 widened health care disparities between the rich and poor in China. The poor suffered from higher rates of mortality and morbidity compared with the rich, as well as using fewer health services despite their greater needs. Chapter 4 investigates the research question of whether inequities still exist in rural China's health care system after a series of reforms, and to what extent any observed differentials in use across income groups cannot be accounted for by differences in health needs. Inequity is defined as horizontal inequity in the delivery of health care, which is equal treatment for equal medical need, irrespective of other characteristics such as income, race, place of residence and so on (Van Doorslaer et al., 2000; Wagstaff and Van Doorslaer, 2000). The concentration index for need-standardized health care

utilization is used to measure horizontal inequity. Concentration indices are calculated for the use of formal medical care, preventive care, folk doctors, inpatient care and the utilization of different levels of health facilities before and after the health care reforms (from 2000 to 2009). The results suggest that there is pro-rich inequity in the use of preventive care and county hospitals, while pro-poor inequity in the use of folk doctors and village clinics. Inequity is further decomposed into the contribution of various need and non-need factors to total inequity in health care use, and income appears to be the most important contributor for the unequal distribution of health care use. The results indicate that the rich are more likely to use formal and better quality health services than the poor, and income plays an important role in driving total inequity in health care use.

Chapter 3 adds significantly to the existing literature on income-related inequity in terms of the use of different levels of health facilities, including public (village clinics, town hospitals and county hospitals) and private ones (private clinics). Since various health facilities indicate different quality levels of health services, the findings provide new evidence on the differences in the quality of health care received by rich and poor people. Although the overall utilization of formal medical care appears to be fairly equally distributed, people with higher incomes are significantly more likely to obtain better quality health services from high-level health facilities.

The thesis provides empirical evidence about the impact of the health care reforms on the access to different types of health services and on the distribution of medical utilization across income groups in the context of rural China. The findings add to the current debate concerning whether the health care reforms have achieved the intended goals in rural areas. The results and associated policy implications may be useful for other developing countries that are in the process of achieving universal coverage. However, caution should also be exercised since the conclusions reached in this thesis may be related to the institutional background that is specific to rural China. This will be discussed in more detail in the Conclusion chapter.

Chapter 2

DEMAND FOR VOLUNTARY SOCIAL HEALTH INSURANCE IN CHINA: EVIDENCE FROM THE NEW RURAL COOPERATIVE MEDICAL SCHEME

2.1 INTRODUCTION

In recent years, several developing countries have expanded, or are in the process of expanding, social health insurance with the ultimate aim of achieving universal coverage. Health insurance is commonly considered as a desirable way of enabling households to access health care and reduce potentially large out-of-pocket health expenditure. Many governments in developing countries have established a compulsory scheme for formal sector employees and, recently, aimed to promote voluntary schemes for other population groups, such as the unemployed and informal sector workers (Nguyen and Knowles, 2010). However, targeting people working in informal sectors is challenging. Demand-side barriers include adverse selection, lack of knowledge of health insurance and high transportation cost, while supply-side barriers include limited access to good quality health care, cumbersome paperwork involved in accessing insurance benefits and limited portability of insurance schemes (Sepehri et al., 2009). Therefore, government organised voluntary schemes are usually faced with low demand among the targeted population groups. For this reason, better understanding of factors driving demand for voluntary health insurance in developing countries is important.

China has adopted both compulsory and voluntary social health insurance programs: the compulsory scheme targets at urban formal-sector workers, including civil servants and employees of state and private enterprises; while the voluntary schemes focus on the remaining population groups who are not eligible for the compulsory scheme, including rural residents, the unemployed, children, the disabled and

the elderly. The compulsory scheme has been mandatory in urban areas since 1990s, while the voluntary schemes were introduced from 2003 onwards. The first program was the New Rural Cooperative Medical Scheme (NRCMS), a heavily subsidized voluntary health insurance program targeted at more than 800 million people in rural China. The program was launched in 2003 and expanded to all rural counties by 2008. Another voluntary social health insurance program, known as the Urban Resident Basic Medical Insurance scheme (URBMI), was introduced in 2007 and targeted at 420 million urban residents who were not covered by the compulsory scheme. The URBMI was initially piloted in 79 cities, and since 2010 the coverage was extended to all cities. Both voluntary programs are heavily subsidized by central and local governments in order to get poor and vulnerable people involved.

Several features of the NRCMS are unique to the developing country setting. The targeted population of the NRCMS were previously not covered by any other health insurance at all; the insurance premium is heavily subsidized by both central and local governments; the program offers a single plan to everyone living in the same county; the reimbursement varies by different levels of public health facilities; and insured patients may be faced with a wide range of barriers to access health care and insurance benefits. Since more than 80 percent of the rural residents were not covered by any health insurance before the introduction of the NRCMS (Liu and Cao, 1992), the demand for the program was expected to be high, and the generous government subsidies should incentivise poor people to take part in the program. In addition, given the single plan in each county, consumers can only decide whether or not to purchase the NRCMS but not how much to purchase. Since different levels of health facilities have various reimbursement rates and quality of care, the effect of facility choice is a worthwhile consideration in analysing health insurance enrolment decisions. People who choose low-level health facilities would enjoy higher reimbursement rates compared with those who use high-level ones. However, health services delivered by low-level public health facilities are usually perceived to be of poor quality, and many patients tend to seek treatments at high-level hospitals even for minor diseases (Yip et al., 2012; Yip and Hsiao, 2014). Therefore, the NRCMS would be more attractive to people who use more primary level care, but people who need to seek care at high-level hospitals may give up insurance benefits because of low quality of covered services and limited referral ability of primary health providers.

This paper assesses the determinants of enrolment in the NRCMS at the individual, household and community levels. The period analysed lasts from 2004 to 2006 when the NRCMS was in its pilot phase[1]. This is the first study to focus on the relationship between insurance purchase and health facility choice. Facility choice is an important factor affecting people's demand for the NRCMS because it reflects both the price and quality of health services covered and not covered by the insurance. Due to various reimbursement rates and quality of care at different levels of health facilities, the benefits of the NRCMS would appear to be different for people who use different facilities. To figure out the relationship between facility choice and insurance enrolment, the initial approach is to estimate a series of logit regressions with the purchase of the NRCMS as the dependent variable. People who go to village clinics or town hospitals (low-level public health facilities) are significantly more likely to be enrolled while people who go to county or city hospitals (high-level public health facilities) are less likely to be covered. The relationship is strong and significant across various specifications. The latter relationship appears to be insignificant after conditioning on county fixed effects, however, the relationship between insurance enrolment and the use of low-level health facilities still remains significant. Further analysis confirms the finding and shows that households with male head, larger size and a low wealth level are more likely to use low-level health facilities and also more likely to be insured. The insurance appears to be particularly attractive among poor households, indicating that the rich tend to give up insurance benefits rather than risking low quality health services. The results should be attributed to various reimbursement rates at different levels of health facilities, low quality of health services at primary health facilities and poorly working referral system.

The following section provides some background information on the features of the NRCMS. Existing studies of the demand for health insurance in developing countries are then reviewed. Section 4 specifies the model and introduces the dataset, and section 5 presents the results. Section 6 concludes with the implications of the findings for the ongoing efforts to expand SHI in China as well as many other developing countries.

2.2 INSTITUTIONAL BACKGROUND

[1] The NRCMS was expanded to nearly all rural counties by 2008. The enrolment rate is over 90 percent in waves after 2008, making it difficult to identify the determinants of demand for the NRCMS.

The New Rural Cooperative Medical Scheme (NRCMS) is the only health insurance scheme available to most rural residents in China. The coverage of other insurance programs, such as commercial health insurance and free medical care, was very limited.

The NRCMS was first implemented in 2003 and initially covered only 10 percent of rural counties in China (Sun et al., 2009). The placement of the program was not random, and a set of criteria, such as local interest and capacity, development of economic status and health care delivery systems, were considered when selecting pilot counties. Up to 2006, the program was implemented in 1,451 counties and covered more than 400 million rural residents, accounting for nearly 50 percent of the total rural population. All rural residents are eligible for the program and nobody can be rejected based on health status or other considerations.

The NRCMS operates at the county level, and local governments have a degree of autonomy over premium levels. The central government only formulates the lower limit on individual contributions, and each county office decides on the premium for its own county within the national range (Liu and Tsegai, 2011). The insurance is financed partly through flat-rate household contributions and partly through subsidies from four levels of governments: central, provincial, county and township. The minimum requirement of the annual premium in 2006 was 50 RMB (US$6.27) per person, with 10 RMB (US$1.25) from households supplemented by a subsidy of 20 RMB (US$2.51) from local governments and 20 RMB (US$2.51) from the central government[2] (Ministry of Health et al., 2006). The premiums are not risk-rated at the individual level, and all insured individuals within the same county are offered the same premium level.

The benefit package of the NRCMS varies across counties and over time according to local resources and priorities. County governments have the authority to define local policy details, such as services covered and reimbursement rates. In most counties, the program refunds a fraction of inpatient care to patients[3], but not all counties cover outpatient services. Approximately 72 percent of the counties cover outpatient

[2] In 2006, the average annual disposable income of rural population was 3,587 RMB (US$450).

[3] Detailed reimbursement rules of inpatient services were not specified in national guidelines until 2007. According to "Advices on Developing Reimbursement Rules of the New Rural Cooperative Medical Scheme" issued by , deductibles should be set from twice to four times higher than the average outpatient expense per visit in the last year, and no more than 100 RMB (US$13.14) in central and western areas. Maximum reimbursement caps should amount to six times the annual average per capita income of farmers according to (Ministry of Health, 2009), and increased to eight times plus no less than 60,000 RMB (US$7884.36) in 2012 by (Ministry of Health et al., 2012). The reimbursement rate was targeted at 50 percent in 2009 according to (Ministry of Health, 2009), and increased to 70 percent in 2011 and 75 percent in 2012 based on the document issued by (Ministry of Health et al., 2012).

services through a household account or on a pooled basis. Among the rest, 11 percent of the counties cover outpatient services only for catastrophic diseases, and 17 percent does not subsidize outpatient services at all (Liu et al., 2014; Lei and Lin, 2009; Wagstaff et al., 2009a; You and Kobayashi, 2009)[4]. Both the reimbursement for inpatient and outpatient expenses is subject to separate deductibles, coinsurance rates and spending caps. The rates vary across facility types: reimbursements are usually less generous for health care delivered in higher-level facilities (Wagstaff et al., 2009a). Detailed reimbursement rules for inpatient care are shown in Table 2.1. In addition, the enrolees can only visit certain approved facilities to be eligible for the insurance benefits, and can be repaid immediately or later on at a health facility or other agency, depending on local policies (Liu et al., 2014).

[*Tables 2.1 about here*]

On the supply side, the government aimed to develop a health care delivery system based on primary health facilities, such as village clinics and town hospitals in rural areas. These providers are expected to take on a gate-keeping role and manage referrals to specialist care and high-level hospitals (county/city hospitals) in order to reduce the medical care cost arising from the overuse of expensive hospital services (Liu et al., 2011). In this case, patients could seek care from low-level health facilities for minor illnesses and be referred to specialized hospitals for more complex problems. Under the NRCMS, the reimbursement rates are more generous for health services provided by low-level facilities, creating incentives for rural patients to seek care at a primary care contractor first and be referred to secondary and tertiary care if needed. Those who bypass the primary care provider are responsible for full treatment fees. However, due to poor quality of care offered by primary health facilities and a breakdown of the referral system, many patients still prefer to visit high-level hospitals even for simple health problems (Yip et al., 2012). Whether the task-shifting to clinicians and doctors at primary health care level will be successful remains to be seen.

The rural China's public health care system consists of three tiers: village clinics, town hospitals and county (and higher level) hospitals. Village clinics form the base of the system and offer preventive and

[4] According to (Barber and Yao, 2010), there are four basic types of benefit packages. The first model is called the "inpatient and household medical saving accounts (MSA)": it includes the formula-based reimbursement of inpatient services and an MSA for outpatient services and preventive care. Households are expected to make contributions to MSAs, which are shared among all household members. The second model uses the same inpatient reimbursement rule, but doesn't cover outpatient services. Therefore, it is called the "inpatient only" model. The third model is called the "inpatient and catastrophic care": it reimburses medical expenses of inpatient services and treatment of catastrophic diseases in outpatient departments. The fourth model reimburses both inpatient and outpatient services from pooled funds, and is called the "inpatient and outpatient pooling" model. Both inpatient and outpatient expenses are subject to separate deductibles, coinsurance rates and reimbursement caps.

primary health services. County hospitals provide the most specialized inpatient and outpatient medical care, and town hospitals provide both primary and specialized services. Of these three tiers, county hospitals are usually perceived to offer the highest quality care. They are staffed by physicians with four or five years of medical school training as well as nurses and technicians. In contrast, village clinics are staffed by clinicians and doctors with only three to six months of training after junior middle school (Yip et al., 1998). Therefore, there is quite large quality difference of health services provided by different levels of health facilities.

Another key consideration is whether different levels of public health providers can work together to form an effective referral system. China has a fragmented delivery system in which the provision of preventive care, primary care and tertiary care are separated and uncoordinated. To vertically integrate the delivery system, it requires a single financing system for all services instead of the existing separate financing systems for different levels of services. At present, the government sponsors only a small share of the facility spending and staff salaries, and the rest of the fund is from fee-for-service revenue (You and Kobayashi, 2009). Although the majority of Chinese health facilities are publicly owned, they act like private and profit seeking entities since they rely heavily on revenue-generating activities for financial survival. To achieve higher profits, health providers tend to over-prescribe drugs and tests and to race to attract patients. This leads to a poorly working referral system since each supplier aims to retain patients at their own facility instead of referring them to other providers.

2.3 LITERATURE REVIEW

There is considerable variation in the enrolment rates of social health insurance in developing countries. The voluntary health insurance program for informal sector workers in Nicaragua with no co-payment has a take-up rate of only 20% (Thornton et al., 2010), while social health insurance in Costa Rica achieved a 56% coverage rate among agricultural workers through a concerted government effort to reach all salaried and self-employed workers, pensioners, and their dependents (Dow and Schmeer, 2003). The enrolment rates of the same program also differ markedly across time and regions. In Colombia, the Regimen Subsidiado health insurance for the poor increased its enrolment rates from 20 percent in 1993 to 80 percent in 2007 (Miller et al., 2009). In Ghana, the enrolment rate of National Health Insurance Scheme (NHIS) varies from 24 percent to 72 percent according to region.

Although the enrolment rates differ greatly across country and time, factors on which the uptake of insurance depends appear to be similar. There is much evidence that the decision to purchase social health insurance in developing countries is mostly determined by socio-economic variables such as income, marital status, education, wealth and employment status (Axelson et al., 2009; Mensah et al., 2010; Thornton et al., 2010; Trujillo et al., 2005), and health status (Trujillo et al., 2005; Thornton et al., 2010). The demand for health insurance is also sensitive to features of the insurance plans, such as program costs and streamlined bureaucratic procedures such as on-site affiliation (Thornton et al., 2010). In an analysis of the demand for a health insurance program targeting at school-age children and adolescent student (aged 6-20) in Vietnam, Nguyen and Knowles (2010) also find that demand increases significantly with the expected benefits of insurance, as measured by closeness to and quality of tertiary hospitals.

Many social health insurance programs in developing countries are targeted specifically at poor and vulnerable people, and therefore the demand function may behave in a different way from the one in developed countries. Trujillo et al. (2005) show that participants in the Colombian subsidized health insurance program for the poor are usually individuals with less education and living in households with lower levels of wealth, fewer rooms, bigger family sizes and without telephones or bathrooms. Sparrow et al. (2013) examine the demand for the Askekin program in Indonesia and find that the Askeskin has been allocated to the poor and to those households that are expected to require a relatively high health spending budget share.

There is not much evidence on the demand for social health insurance in rural China. Wang et al. (2006) and Zhang and Wang (2008) find that individuals with worse health status, based either on self-reported health status or on chronic condition history, are more likely to enrol in the insurance. The adverse selection mainly occurs in partially enrolled households (Wang et al., 2006), and the magnitude remains similar over time (Zhang and Wang, 2008). However, both studies analyse the demand for Rural Mutual Health Care (RMHC), an experimental scheme only introduced in Fengshan township (with a population size around 37,000) in Guizhou province (the poorest province in China) in 2002. Therefore, the results may not represent the demand among rural residents living in other parts of the country. Liu et al. (2014) examine the enrolment in the New Rural Cooperative Medical Scheme (NRCMS) based on the China Health and Nutrition Survey (CHNS) dataset and find that the demand for health insurance is affected by

the insurance decisions of co-villagers through social learning. A 10-percentage point increase in the enrolment rate in a village increases one's take-up probability by 5 percentage points. However, their paper only focuses on the impact of social learning and does not discuss other factors affecting demand. Therefore, this study contributes to the literature by examining various factors affecting the enrolment in the NRCMS, and the analysis mainly focuses on the relationship between facility choice and insurance enrolment. Facility choice is very important in modelling the demand for the NRCMS because it reflects both the expected benefits of the insurance given various reimbursement rates and quality levels across different levels of health facilities. The results have policy implications in that the supply-side factors can play an important role in the success of insurance expansion in developing countries.

2.4 DATA AND METHODOLOGY

2.4.1 CHINA HEALTH AND NUTRITION SURVEY (CHNS)

The data used in this study is drawn from the China Health and Nutrition Survey (CHNS), a large-scale longitudinal dataset on Chinese households and their surrounding communities. CHNS is an international collaborative project between the Carolina Population Centre at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Centre for Disease Control and Prevention. The data is not designed to be representative of China but to be randomly selected to capture a range of demographic, socio-economic and health-related characteristics (Popkin et al., 2010). The sample is selected from nine provinces: Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning and Shandong. In each province, a multi-stage random cluster process was used to draw the sample. Counties are initially stratified by income (low, middle and high), and four in each province are randomly selected based on a weighted sampling approach. Villages and townships within the counties, and urban and suburban neighbourhoods within the cities, are also selected randomly. The available rounds until now are in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011. Surveys were conducted at individual, household and community levels, with detailed information on health care utilization, socioeconomic and demographic characteristics, health insurance, health facility, food markets, family planning practices and other social services.

This study mainly focuses on the household demand for the NRCMS among rural residents in China. We use two waves of CHNS data (2004 and 2006) and estimate the probability of taking up the insurance in 2006. The sample is restricted to rural residents who were not covered by any health insurance in 2004, and the analysis is only conducted among households living in counties where the NRCMS has been introduced between 2004 and 2006. Although the CHNS survey question does not distinguish between the old Cooperative Medical Scheme (CMS) and the current New Rural Cooperative Medical Scheme (NRCMS), the community head or health workers report the implementation date of the CMS in the community. As the NRCMS was first introduced in rural areas in 2003, the community that starts the CMS in 2003 or later should be considered as an NRCMS community. A county with any community implementing the NRCMS is defined as a NRCMS county given that the insurance program is managed at the county level. As a result, 12 non-NRCMS counties are excluded, and the final sample consists of 22 NRCMS counties and 1,285 households in total[5].

2.4.2 FACTORS ASSOCIATED WITH INSURANCE AVAILABILITY IN THE COMMUNITY

The determinants of demand for the NRCMS may not be generalizable to the entire population if the availability of insurance is systematically selective. For example, if the NRCMS targets first at areas with easier access to health facilities, better quality health services or higher socioeconomic status, the high enrolment rates in these regions may not be easily achieved when the insurance is rolled out to other more challenging regions. Therefore, it is important to investigate whether the availability of the NRCMS is correlated with factors that might affect household demand for the insurance. In this section, the community-level characteristics are compared between counties with and without the NRCMS in 2004 and 2006[6]. The summary statistics would provide a better understanding of the rolling out process of the NRCMS and show the difference between the insured and the uninsured communities in early waves. The variables included represent 12 broad areas that reflect the urbanicity level of the community, such as population density, economic activity, traditional/modern markets, transportation infrastructure, sanitation facilities, communications, housing, education, diversity, health infrastructure and social service (Jones-Smith and Popkin, 2010). Detailed variable selection in these 12 areas is as follows:

(1) Population density: total population of the community divided by community area;

[5] More detailed description on sample selection can be found in Table A 2.1 in Appendix.
[6] Only summary statistics results are presented here since there is a too small sample size to run the regressions.

(2) Economic activity: daily wage of an ordinary male worker (RMB), proportion of workforce engaged in non-agricultural work;

(3) Traditional markets: Distance to the nearest free market (km), the longest opening hours (days/week) of the available free markets;

(4) Modern markets: number of supermarkets in the community, number of modern markets (cafes, internet cafes, indoor restaurants, outdoor fixed and mobile eateries, bakeries, ice cream vendors, fruit and vegetable stores and vendors, bars) in the community;

(5) Transportation infrastructure: type of the most commonly used roads in or around the village/neighbourhood[7], distance to the nearest bus stop (km), distance to the nearest train station (km);

(6) Sanitation: proportion of households with treated water, proportion of households without excreta present outside the home;

(7) Communications: availability of cinema, daily newspaper, postal service, telephone service in the village/neighbourhood, percent of households with a computer, television or cell-phone;

(8) Housing: average number of days a week that electricity is available in the community, percent of households in the community with indoor tap water, percent of households in the community with flush toilets, percent of households in the community with gas cooker;

(9) Education: average education level among adults older than 21 years old[8];

(10) Diversity: variance in community education level, variance in community income level;

(11) Health infrastructure: presence of public health facilities in or near the community (<12km), highest level of public health facilities in or near the community (<12km)[9], number of health facilities in or near the community (<12km), presence of pharmacy in the community;

(12) Social service: provision of preschool for children under 3 years old and availability of commercial medical insurance.

Tables 2.2 and 2.3 show the factors associated with insurance availability in the community in 2004 and 2006. The results indicate that the 2004 pattern is different from that in 2006. In 2004, only 10 out of

[7] Type of the most commonly used roads is represented by a categorical variable: it is defined as 1 for dirt road, 2 for stone, gravel or mixed material road and 3 for paved road.

[8] Average education level is defined as a categorical variable: 0 if no education, 1 if graduating from primary school, 2 if having lower middle school degree, 3 if having upper middle school degree, 4 if having technical or vocational degree, 5 if having university or college degree and 6 if having master's degree or higher.

[9] The highest level of public health facilities in or near the community is denoted by a categorical variable: 1 for village clinics, private clinics and other clinics; 2 for town hospitals, town family planning service and other hospitals; 3 for county hospitals, county maternal and child clinics, work unit clinics and county maternal and child hospitals; and 4 for neighbourhood clinics, community hospitals, work unit hospitals, district hospitals, city hospitals, army hospitals, university/provincial/specialized hospitals, private hospitals and city maternal and child hospitals.

140 communities introduced the NRCMS, and the insured ones were more developed in economic terms (more people working in non-agricultural sectors) and transportation facilities (better constructed roads). In 2006, the number of insured communities has increased to 64 out of 109[10]. More vulnerable communities were targeted, and the insured ones appeared to be less developed in economic terms (with fewer people working in non-agricultural sectors and fewer modern markets) and housing facilities (with fewer households with flush toilets). The results indicate that the insurance was introduced in relatively rich communities from 2003 to 2004 and was then extended to less developed regions from 2004 to 2006. The significant difference is mainly related to seemingly unimportant factors, and the communities that introduced the insurance early and those that took it later are generally similar with each other. Nevertheless, it is still possible that insured and uninsured communities may have some unobserved differences that may bias the results.

[*Tables 2.2 and 2.3 about here*]

2.4.3 INSURANCE DESIGN OF THE NRCMS IN 2006

Since the NRCMS package varies across counties, insurance design may affect the household demand for the NRCMS as well. Figures 2.1, 2.2, 2.3 and 2.4 show the variation of insurance design in treated communities across eastern, middle and western provinces in 2006. The figures provide information about whether the insurance benefits differ geographically, in terms of deductibles, reimbursement rates and spending caps and whether we need to account for regional heterogeneity in the analysis that follows. Only the reimbursement data for inpatient care is used here since the coverage for outpatient care is very limited. The data quality is low because many people are unclear of the detailed reimbursement rules. The NRCMS offers various benefit packages for different types of health services and health care delivered by different levels of health facilities. The rules are perhaps too complicated for people to work out how much they can actually benefit from the insurance.

Figure 2.1 plots the histograms of the NRCMS premium separately for eastern, middle and western regions. The premium is largely charged within the national range (10-15 RMB per person per year), suggesting that county governments set very similar premium levels. Almost all western communities set

[10] There are 145 rural communities in 2006 survey, but 46 communities are dropped because they introduced the urban social health insurance programs during 2004 and 2006. No rural counties introduced urban social health insurance programs.

the lowest limit at around 10 RMB, while some communities in eastern and middle regions set relatively higher premium at around 15 RMB.

[*Figure 2.1 about here*]

Figure 2.2 plots the histograms of reimbursement rates for inpatient care. There is some heterogeneity across communities, but the reimbursement rates mainly concentrate between 40 and 70%. The eastern and middle regions set relatively low reimbursement rates at around 40-60%, while the majority of the western communities set higher levels at around 60-70%. Possible reasons may be that 1) lower price levels in western regions lead to relatively more generous coverage of health services; 2) the central government subsidize more towards poor communities in western regions (You and Kobayashi, 2009).

[*Figure 2.2 about here*]

The variation of deductibles and spending caps for inpatient care is shown in Figures 2.3 and 2.4. There is some regional heterogeneity in the deductibles, with relatively lower levels in western provinces compared with eastern and middle ones. The levels of spending caps are quite similar across the three regions and concentrate largely within the range from 10,000 to 20,000 RMB.

In general, there is some regional variation in the levels of reimbursement rates and deductibles, and the western region offers relatively more generous coverage with higher reimbursement rates and lower deductibles. Therefore, the insurance package is not geographically homogeneous, which underlies the importance of subgroup analysis over regions when explaining the pattern of household demand for the NRCMS.

[*Figures 2.3 and 2.4 about here*]

2.4.4 HOUSEHOLD DEMAND FOR THE NRCMS IN 2006

Following Nguyen and Knowles (2010), the demand for social health insurance can be expressed as follows:

$$SHI = F(I, E, H, P, P_{m,c}, Q_{m,c}, P_{m,uc}, Q_{m,uc}, Z)$$

where SHI is a binary variable that is 1 if the individual is enrolled and 0 otherwise. The function F takes the form of a logit or probit function. I, E, H represent the individual's income, education and health respectively. P denotes the insurance premium. $P_{m,c}$ and $Q_{m,c}$ are the price and quality of medical services covered by the insurance while $P_{m,uc}$ and $Q_{m,uc}$ are the price and quality of medical services not covered by the insurance. Z is a vector of other exogenous variables that may affect demand.

Since participation in the NRCMS is on a household basis, all household members are defined as insured if the household head is reported as enrolled[11]. The dependent variable is thus defined as a binary indicator of the NRCMS household membership. The CHNS asks each respondent whether he/she has Cooperative Medical Scheme, but makes no distinction between the old and new scheme. As the study sample is restricted to counties where the NRCMS has been implemented, it is reasonable to define the CMS enrolees in the NRCMS counties as NRCMS participants.

The main independent variables are the ones related to the insurance design. Insurance premium can reflect the cost of obtaining the NRCMS while the price and quality of the medical services covered and uncovered by the insurance represents the expected benefits of obtaining the NRCMS[12]. People's demand for health insurance depends mainly on whether the benefits they expect to gain from the insurance exceed the premium cost they pay. In the absence of data on the price and quality of medical care provided by various health facilities, facility choice is used as a proxy to control for the observed wide variation in terms of price and quality. Since the NRCMS offers a more generous reimbursement for health services delivered by low-level facilities, people who go to village clinics or town hospitals are faced with lower price than people who use county or city hospitals. However, low-level facilities also provide lower quality health services than high-level ones. Therefore, facility choice is expected to play an important role in modelling the demand for the NRCMS since it reflects the variation in both price and quality of medical services: compared with county or city hospitals, village clinics or town hospitals offer poorer quality health services at a cheaper price. .

The question on household preference towards different levels of health facilities is formulated as follows "If household members are sick or want to see a doctor, dentist, nurse or other health worker,

[11] The insurance dummy is defined based on the insurance status reported by household heads because some household members may be unaware of their insurance status given that only the household heads make the insurance decisions.
[12] The premium is not included as an independent variable for the following two reasons: 1) the premium variable has a high proportion of missing values, leading to a small estimation sample size. 2) Given that local governments cannot vary premium according to individual characteristics, there is not much variation in the premium levels (see Figure 2.2).

which clinics and hospitals can they use?"[13] Respondents can choose from 15 types of health facilities, including village clinic, private clinic, work unit clinic, other clinic, town family planning service, town hospital, county maternal and child hospital, county hospital, city maternal and child hospital, city hospital, worker's hospital, other hospital, drugstore and other. Each household can choose more than one categories. We construct five dummies for village clinic, private clinic, town hospital, county hospital, city hospital and other types of health facilities[14], respectively. Village clinic, town hospital, county hospital and city hospital are all public health facilities while private clinic represents private health facilities. We treat the private clinics variable as the reference category and use the other four dummies in the model. All the facility choice dummies are lagged by one survey period in the model because they may be influenced by the insurance enrolment.

The analysis uses the following model to estimate the demand for the NRCMS:

$$I_i^* = \beta' C_i + \gamma' X_i + \varepsilon_i \,, \quad \begin{cases} I_i = 1 \text{ if } I_i^* > 0; \\ I_i = 0 \text{ otherwise} \end{cases} \tag{2.1}$$

where I_i^* is a continuous and latent variable measuring the net benefits of the NRCMS, I_i is the observed insurance coverage, C_i denotes the vector of facility choice dummies, X_i is a vector of household characteristics, β and γ are vectors of coefficients, ε_i measures unobserved factors.

Other independent variables (X_i) can be broadly classified into eight groups: (1) demographic characteristics of the household head, i.e., gender, household size, marital status, ethnicity (Han and ethnic minority) and geographic dummies (eastern, middle and western areas); (2) age, i.e., age of the household head, proportion of children under 18 in the household and proportion of elderly family members over 55 in the household; (3) household income and wealth level; (4) education level, i.e., illiterate (reference group), primary school, junior high school, senior high school and above; (5) labour condition, i.e., working ratio (proportion of working people in the household) and farmer; (6) health condition of the household, i.e., self-assessed health status of the household head, presence of major diseases of household head (hypertension, diabetes, heart disease, stroke, bone fracture and asthma) and the ratio of household members with chronic diseases; (7) risk preference of the household head, i.e.,

[13] The response to this question reflects both facility preference and accessibility. Facility choice is not purely driven by the preference, but also restricted by people's ability to access these health facilities.
[14] The frequencies of utilization in different levels of health facilities are as follows: village clinic (4115), private clinic (1794), town hospital (3055), county hospital (2203), city hospital (2576), private clinic (1794), other facilities (1167).

overweight, abdominal obesity, smoking status and alcohol consumption and (8) health facility characteristics such as waiting time, treatment cost for a common cold, travel cost and drug availability. All the independent variables are lagged by one survey period to account for the endogenous relationship between the take-up of the health insurance and the covariates.

The analysis begins with a simple model containing only health facility dummy variables and examines the relationship between facility choice and insurance coverage by adding explanatory variables to control for observed sources of heterogeneity across individuals. To lessen the chance that omitted variables are driving the observed correlation between insurance and facility choice, the model subsequently includes demographic characteristics, age, income, education levels, health status, risk preference and facility characteristics in the demand for the insurance. Finally, county fixed effects are also controlled for in the last model to account for the geographic heterogeneity.

However, it is possible that the relationship between facility choice and insurance enrolment is endogenous if there exist unobserved factors that influence both people's choice of health facilities and their decisions to purchase the insurance. For example, people with chronic diseases may be more likely to use low-level health facilities for frequent and routine treatments, and also tend to obtain greater value from the NRCMS. In principle, one can identify the causal effect of facility choice on insurance enrolment if there is a valid instrumental variable (IV) that is correlated with facility choice but not correlated with insurance enrolment given facility choice and other covariates. However, it is difficult to find a valid IV for the problem here[15]. Any variable that has an impact on facility choice may also have a potential influence on insurance enrolment conditional on facility choice. For example, the presence of different levels of health facilities in the community obviously offers more convenient access to these facilities for people living in the community, but the facility location may also influence people's willingness to purchase the NRCMS. Therefore, the validity of IV is questionable.

In the absence of appropriate IVs, this paper further examines whether facility choice and insurance enrolment share common covariates. To calculate how much the relationship between facility choice and insurance coverage is attributed to various characteristics, the analysis adopts a method used by Doiron

[15] The following variables has been used as the instruments for facility choice: the presence of village clinics in the community, the presence of town hospitals in the community, the presence of county hospitals in the community, the presence of city hospitals in the community, the presence of other facilities in the community, travel time to the nearest health facility and travel cost to the nearest health facility. However, they do not pass standard IV tests for weak instruments and they do not appear to satisfy the assumption of exclusion restrictions. Therefore, the IV estimation results are not shown here, but are available upon request.

et al. (2008) to investigate the correlation between self-reported health status (SAHS) and private health insurance coverage in Australia. Reduced form models for insurance and facility choice are estimated with all explanatory variables except for facility choice. We then compare components of the estimated latent variables for facility choice and insurance purchase. Specifically, the insurance choice is modelled using a binary logit regression as in Equation (2.1) but excluding the C_i dummies:

$$I_i^* = \delta' X_i + \varepsilon_i\,, \quad \begin{cases} I_i = 1 \text{ if } I_i^* > 0; \\ I_i = 0 \text{ otherwise} \end{cases} \tag{2.2}$$

and facility choice is defined as a binary variable that equals to one if the household uses low-level public health facilities (village clinics or town hospitals) and equals to zero if the household uses high-level public health facilities (county or city hospitals). We again use a logit regression to model the facility choice:

$$F_i^* = \pi' X_i + \eta_i, \quad \begin{cases} F_i = 1 \text{ if } F_i^* > 0; \\ F_i = 0 \text{ otherwise} \end{cases} \tag{2.3}$$

However, the errors in Equation (2.2) and (2.3) are very likely to be correlated since facility choice may affect insurance enrolment. Therefore, a bivariate probit model is more appropriate to be used here to account for the correlation between the error terms in both models.

2.5 RESULTS:

2.5.1 DESCRIPTIVE STATISTICS

Table 2.4 presents the summary statistics of 2006 and 2009 samples by insurance status[16]. In 2006, households who use village clinics and town hospitals (low-level public health facilities) are more likely to enrol in the NRCMS compared with households who use county and city hospitals (high-level public health facilities). Insured households in 2006 are also more likely to have larger household size, belong to the minority ethnicity groups, live in eastern and middle provinces, have lower wealth levels and are supported by more working people. The heads of the insured households tend to be younger males who are married, literate and work as farmers. There is no evidence of adverse selection since heads in better health are more likely to purchase the insurance. However, moral hazard may play a role here given that

[16] Demand analysis in 2004 is not shown here because only 10 counties introduced the NRCMS. There is a too small sample size.

the insured heads tend to be overweight and daily alcohol drinkers. The NRCMS may lower their costs in ill health states and make them take fewer precautions or invest less in preventive measures. Households with better access to health services (with shorter waiting times) are also more likely to be covered. Almost all the significant differences disappear in 2009, which may be due to the fact that the insurance by then covers the majority of the rural sample. Therefore, in the rest of the analysis, we only use data from 2004 to 2006 when the insurance was newly introduced in most rural areas and the enrolment rates are still not high.

[*Table 2.4 about here*]

2.5.2 ESTIMATION RESULTS

To test the robustness of the results, Table 2.5 presents the marginal effects of facility preference on insurance enrolment by subsequently adding different sets of independent variables in the insurance logit in 2006[17]. The explanatory variables can be divided into eight groups: (1) demographic characteristics of the head and the household; (2) age of the head and other household members; (3) household income and wealth level; (4) education level of the head; (5) occupation and labour condition; (6) health status of the head and other household members; (7) risk-related health behaviours of the head; (8) health facility characteristics. Finally, we also control for the county fixed effects in the last model. Each column of results represents a separate logit.

Model 1 uses only the facility preference dummies including the choice of village clinics, town hospitals, county hospitals, city hospitals and other facilities. There is a significant relationship between facility choice and insurance coverage in 2006. Individuals who use village clinics or town hospitals (low-level public health facilities) are 12-15 percent more likely to be covered by the NRCMS, while people who use county or city hospitals (high-level public health facilities) are 8-12 percent less likely to be enrolled.

In Model 2, a set of 6 demographic variables are added to the logit. These variables include information on gender, household size, ethnicity, marital status and geographical dummies. The pseudo R^2 increases dramatically from 4.6% in Model 1 to 13.5% after the inclusion of these controls. There is a decrease in the positive correlation between the choice of low-level public health facilities and insurance enrolment,

[17] More detailed results can be found in Table A 2.1 in Appendix. The demand for the NRCMS in 2009 is shown in Table A 2.2 in Appendix. None of the coefficients of facility choice is significant in 2009 because the enrolment rate is too high (95%).

however, the negative correlation between the choice of high-level public health facilities and the insurance becomes even stronger. Model 3 adds 3 age-related variables: age of the household head, proportion of people under 18 years old within the household and proportion of people above 55 years old within the household. The relationship between facility choice and insurance purchase is not much affected.

Model 4 adds 2 variables representing household income and wealth level. They slightly reduce the relationship between the choice of low-level health facilities and the probability of getting insurance, while the relationship between city hospitals and insurance has been strengthened. With the addition of 3 variables on education and 2 variables on occupation in Models 5 and 6, the correlation between facility choice and insurance enrolment remains almost the same.

Models 7 and 8 include health variables (self-rated health status of household head, presence of chronic conditions of household head, proportion of people with chronic diseases within the household) and risk-related health behaviours of household head (overweight, abdominal obesity, smoking and drinking), respectively. The main relationship between facility choice and insurance is not very much affected. Most coefficients become smaller but still remain significant. Model 9 adds health facility characteristics, including travel cost to the nearest health facility, waiting time, drug availability and treatment cost of a common cold. These variables largely reduce the correlation between county hospitals and the insurance, leading to an insignificant result. However, the effects of town hospitals and city hospitals are both stronger.

Finally, the last model controls for county fixed effects, which are defined by 21 county dummies[18]. These variables would be expected to explain the majority of the correlation between facility choice and insurance given that the insurance package differs geographically. In fact, including these variables largely reduces the relationship between the use of high-level health facilities and the insurance, but the effect of the low-level health facility use on insurance enrolment still remains significant. People who go to village clinics or town hospitals have an 8-14 percentage point higher probability of having insurance compared with those who use private clinics (the reference group).

[18] The sample size is largely reduced in the last model after controlling for the county fixed effects, however, the significance and magnitudes of the coefficients are similar when Model 1 to 9 are run based on the sample of Model 10 (Table A 2.3 in Appendix). It indicates that the results presented here are not driven by the change of the sample size.

In summary, there is a positive, strong and significant empirical relationship between the use of the low-level public health facilities (village clinics and town hospitals) and insurance enrolment and a negative relationship between the use of high-level public health facilities (county and city hospitals) and the insurance. The latter effects are largely reduced after the inclusion of health facility characteristics and county fixed effects, suggesting that the significant relationship is mainly accounted for by these two factors. The significant relationship between the use of primary level care and insurance remains strong and consistent across all models.

[*Table 2.5 about here*]

The quantitative relationship between facility choice and insurance coverage is made clearer by looking at the probability of purchasing the insurance. Table 2.6 presents the average predicted probability of insurance with all explanatory variables at their sample means. The average predicted probabilities by facility choice are calculated by placing each observation in different categories of health providers. The predicted probabilities are computed based on the coefficients of the two extreme models in Table 2.5: Model 1 with only facility choice dummies and Model 10 with the maximum number of explanatory variables and county fixed effects. There is a drop of 20 percentage points between the probability of coverage for those who use village clinics and those who use city hospitals in Model 1. After the inclusion of all other control variables, the fall in probability of coverage becomes even larger at the level of 24 percentage points. Therefore, people who use low-level public health facilities are more likely to purchase the insurance than people who use high-level public health facilities.

[*Table 2.6 about here*]

Table 2.7 presents additional results of selected variables based on Models 9 and 10[19]. The results indicate that households with larger sizes are more likely to purchase the insurance. The heads of the insured households also tend to belong to the minority ethnicity groups. Geographic residence is found to be an important determinant of insurance coverage, since households living in eastern and middle provinces are more likely to be covered, even if they are faced with higher premium and more limited reimbursement compared with western households. Wealth level decreases the likelihood of insurance coverage, which indicates that the NRCMS appears to be more attractive to poor households.

[19] The full set of results is available Table A 2.2 in the Appendix. Results of Model 9 are also presented here because the geographic dummies are omitted in Model 10.

[*Table 2.7 about here*]

Tables 2.8 and 2.9 further look at the heterogeneity across different income groups and regions. The significant relationship between the choice of low-level facilities and insurance enrolment is mainly driven by people from low income groups who live in western regions (the poorest regions)[20]. The NRCMS appears to be attractive among the poor rural households who prefer low-level facilities, while the rich households may forego insurance benefits and incur the full treatment fees instead of risking lower quality of care.

[*Tables 2.8 and 2.9 about here*]

In order to investigate the factors driving the correlation between facility choice and insurance enrolment, separate logit and bivariate probit models are run for both outcomes. The correlation coefficient between these two outcomes is 0.22 and significant at 1% level. Therefore, the bivariate probit model needs to be used to account for the correlation between the error terms. All the significant variables have the same sign for both outcomes, indicating a positive correlation between the probability of seeking care at low-level health facilities and the probability of purchasing the NRCMS. Female household head reduces both the use of low-level facilities and insurance coverage, while households of larger size are more likely to buy insurance and be treated at low-level facilities. There is a strong negative effect of asset index on both the likelihood of having insurance and using low-level facilities. It indicates the NRCMS appears to be more popular among poor households, perhaps because they prefer cheap services from low-level facilities. High-income households, on the other hand, may be less likely to be enrolled in the insurance because they distrust the low quality services at primary facilities.

[*Table 2.10 about here*]

In summary, we find a positive and significant relationship between the choice of low-level public health facilities and insurance coverage. The correlation is particularly strong among poor households living in western regions. In addition, households with larger size, belonging to the minority ethnicity groups, living in eastern and middle provinces or with a lower wealth level are also more likely to be enrolled in

[20] China has diverse socioeconomic conditions across eastern, middle and western provinces. The eastern provinces are high-income regions while the western provinces are low-income regions. Eastern provinces include Liaoning, Jiangsu and Shandong; Middle provinces include Heilongjiang, Henan, Hubei and Hunan; Western provinces include Guangxi and Guizhou.

the NRCMS. Further correlation analysis confirms the relationship between facility choice and insurance enrolment since all the significant variables (e.g. female household head, household size, asset index) drive both outcomes in the same direction.

2.6 CONCLUSION

The demand for the NRCMS is affected by some features specific to informal sectors in developing countries: the premium is heavily subsidized by governments; reimbursement is more generous for health care delivered by low-level health facilities in order to direct patients to seek primary care first; the quality of health services provided by low-level health facilities is perceived to be low. Therefore, we should expect that the demand function behaves in a way different from the demand for private health insurance in developed countries. This study finds a strong positive relationship between the NRCMS coverage and the use of low-level public health facilities: people who use village clinics or town hospitals are more likely to be covered compared to people who use county or city hospitals.

The results may reflect the existing problems related to reimbursement, quality of primary care providers and the referral system across different levels of health facilities. Since low-level public health facilities have lower deductibles, higher reimbursement rates and lower reimbursement caps for inpatient care compared with high-level ones, the insurance appears to be more attractive among people who access town hospitals. Although village clinics only deliver outpatient care and the NRCMS appears to provide little or no coverage for this type of care, people who use village clinics are still more likely to enrol since they are expected to benefit from more choices and better quality health services in higher-level facilities after the insurance.[21] However, the negative relationship between the use of high-level health facilities and insurance enrolment may indicate that the perception of quality of care is an important factor affecting enrolment in the NRCMS. Those who perceive the quality of primary care to be poor are perhaps not willing to switch to village clinics and town hospitals and therefore less likely to enrol in the insurance. They would rather forego insurance benefits and incur full treatment fees given limited reimbursement rates at high-level facilities and poor quality of care at low-level ones. The findings are consistent with the existing literature that also finds that quality perception is related to insurance demand in the context of developing countries (Alkenbrack et al., 2013; Nguyen and Knowles,

[21] Given the poor quality of health care delivered by village clinics, people choose to use this type of facility mainly out of financial concern. With the help of insurance, they tend to go to higher-level facilities for better quality outpatient and inpatient services.

2010; Sepehri et al., 2009). This is particularly true in China since the infrastructure of primary health care facilities in rural areas has lagged behind the development of high-level hospitals in cities. Rather than risking low quality care, many patients tend to seek initial care at secondary or tertiary hospitals for minor ailments. The health care delivery therefore remains hospital-centred and fragmented, and primary health facilities have not been able to perform a gate-keeping function (Yip and Hsiao, 2014). The inequitable health care utilization is also related to the inefficient referral system with a high transaction cost involved in obtaining a referral. Although the health insurance benefits are in principle portable, provided that the insured obtain a letter of referral from the designated health facility, in practice the referral system is working poorly because of competition for profits between different levels of health facilities.

Some caveats should be noted. The regression models do not control for the quality of care received by patients. The inclusion of the facility choice may act as a proxy for quality of care in that higher level public health facilities tend to provide a higher quality of care than lower level public health facilities. However, the estimated coefficients of the type of health facility may be subject to omitted variable bias if there exists any unobserved variable that affects both facility choice and insurance enrolment. We have not been able to find an appropriate instrumental variable given the data availability. Future study is worthwhile to explore the endogeneity issue of the facility choice variables. Secondly, the facility choice question reflects both the preference and availability of different levels of health facilities. Cautions should be given when we interpret the relationship between facility choice and insurance enrolment. Finally, if the NRCMS pilot scheme is not randomly allocated across communities or if the variation in the insurance design is related to insurance enrolment, the results found here may not be generalizable to other regions in rural China.

China achieved a very high enrolment rate for the NRCMS over the last ten years. The take-up rate reached 98% in 2012, much higher than most other developing countries. One possible reason is the enforcement and strong regulatory capacity of the Chinese governments. The central government sets enrolment targets for each local government and leads them into a competition for high enrolment rates. Local government officials exert considerable efforts to show strong political commitment through intensive advertising campaigns and door-to-door appeals. Secondly, the high enrolment rate may also be attributed to more comprehensive benefit packages over time with a massive injection of government

subsidies. The coverage of the scheme has expanded from mainly catastrophic illnesses in earlier years to both outpatient and preventive care, and there is a large increase in reimbursement rates as well. By 2012, the targeted reimbursement rates had already reached 75% for inpatient care expenses. Generous benefit packages attract more rural residents to become enrolled. Finally, the improvement in low-level health facilities may also play an important role in expanding insurance coverage. In recent years, Chinese government has directed much funding into strengthening the infrastructure and improving workforce productivity at primary health care level (Yip et al., 2012). Given the results of this study, demand for the NRCMS is highly sensitive to the quality of care covered by the insurance. Therefore, improving quality of insured services may help to expand coverage.

To meet the challenge of covering the majority of the rural population in the long run, it is important to understand the mechanism underlying the NRMCS take-up decision and the factors that drive demand for social health insurance in rural areas, which could also be of interest to other governments facing similar problems. This study shows that the perception of quality of care may be an important factor affecting enrolment in the NRCMS. Therefore, to expand the insurance coverage in the long run, priorities should be given to the improvement of the infrastructure and workforce at primary care level. Low-level health facilities are expected to serve as gate-keepers and manage to provide basic health care to the rural poor. The referral system across different levels of health facilities should also be strengthened to delivery services more efficiently. The financing system of low- and high-level facilities should be integrated in order to increase coordination and integration of health care delivery between primary care and hospitals.

Table 2.1: Reimbursement rules of the NRCMS for inpatient spending by area and different levels of health facilities

Area	Healthcare provider level	Reimbursement rule (median)		
		Deductible (RMB)	Ceiling (RMB)	Coinsurance (%)
National	Township health centre	200	10,000	45-65
	County hospital	305	10,000	50-70
	Higher level hospital	500	10,000	55-80
East	Township health centre	400	20,000	40-70
	County hospital	500	20,000	50-75
	Higher level hospital	900	20,000	52-80
Central	Township health centre	100	10,000	45-70
	County hospital	300	10,000	50-70
	Higher level hospital	551	10,000	50-75
West	Township health centre	100	5,000	50-55
	County hospital	200	5,000	55-70
	Higher level hospital	400	5,350	60-70

Sources: The New Cooperative Medical Scheme in China (You and Kobayashi, 2009)

Table 2.2: Insurance availability in the community in 2004

	Uninsured	Insured	Difference	P-value
Population density	3516.74	1345.86	2170.88	0.42
Daily wage for ordinary male workers (RMB)	32.75	30.64	2.12	0.80
Proportion of people working in non-agricultural work	0.56	0.74	-0.18	0.07*
Distance to the nearest traditional market (km)	0.84	0.52	0.33	0.64
Opening hours of the traditional markets (days/week)	6.03	5.33	0.70	0.41
No. of supermarkets in the community	3.55	3.00	0.55	0.86
No. of modern markets in the community	37.01	60.80	-23.79	0.23
Type of the most commonly used road	2.51	2.90	-0.39	0.07*
Distance to the nearest bus stop (km)	1.32	1.60	-0.28	0.74
Distance to the nearest train stop (km)	43.31	21.00	22.31	0.26
Proportion of households with treated water	0.63	0.77	-0.15	0.28
Proportion of households without excreta present outside the home	0.68	0.83	-0.14	0.12
Availability of daily newspaper in the community	0.48	0.60	-0.12	0.45
Availability of postal service in the community	0.83	0.90	-0.07	0.57
Availability of telephone in the community	0.84	0.90	-0.06	0.61
Proportion of households with a computer, TV or cellphone	0.41	0.41	-0.00	0.99
Number of days a week that electricity is available to the community	6.76	6.60	0.16	0.41
Proportion of households with indoor tap water	0.46	0.59	-0.13	0.32
Proportion of households with flush toilet	0.26	0.34	-0.08	0.51
Proportion of households with gas/electricity cooker	0.25	0.10	0.15	0.09*
Average education level among adults >21 years old	1.53	1.56	-0.03	0.86
Variation in community education level	1.11	1.33	-0.22	0.16
Variation in community income level	338545.10	279415.12	59129.98	0.68
Presence of public health facilities in or near the community	0.97	1.00	-0.03	0.58
Highest level of public health facilities in or near the community	2.41	2.30	0.11	0.71
Number of health facilities in or near the community	2.07	1.60	0.47	0.22
Presence of pharmacy in the community	0.02	0.00	0.02	0.69
Provision of preschool for children under 3	0.24	0.20	0.04	0.78
Availability of commercial health insurance	0.15	0.10	0.05	0.68
Number of communities	130	10		

Notes: * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level.

Table 2.3: Insurance availability in the community in 2006

	Uninsured	Insured	Difference	P-value
Population density	3002.79	726.97	2275.81	0.05*
Daily wage for ordinary male workers (RMB)	43.84	41.47	2.37	0.34
Proportion of people working in non-agricultural work	0.62	0.50	0.11	0.04**
Distance to the nearest traditional market (km)	1.45	1.95	-0.50	0.50
Opening hours of the traditional markets (days/week)	5.80	5.77	0.03	0.94
No. of supermarkets in the community	2.02	1.08	0.94	0.20
No. of modern markets in the community	45.13	21.55	23.59	0.01***
Type of the most commonly used road	2.58	2.61	-0.03	0.79
Distance to the nearest bus stop (km)	2.40	2.98	-0.58	0.62
Distance to the nearest train stop (km)	45.99	30.72	15.27	0.14
Proportion of households with treated water	0.60	0.62	-0.02	0.79
Proportion of households without excreta present outside the home	0.64	0.65	-0.01	0.83
Availability of daily newspaper in the community	0.64	0.53	0.11	0.28
Availability of postal service in the community	0.87	0.86	0.01	0.89
Availability of telephone in the community	0.91	0.86	0.05	0.42
Proportion of households with a computer, TV or cellphone	0.48	0.46	0.02	0.39
Number of days a week that electricity is available to the community	6.61	6.76	-0.15	0.38
Proportion of households with indoor tap water	0.47	0.38	0.09	0.26
Proportion of households with flush toilet	0.33	0.17	0.16	0.01***
Proportion of households with gas/electricity cooker	0.31	0.36	-0.05	0.38
Average education level among adults >21 years old	1.52	1.34	0.19	0.06*
Variation in community education level	1.27	1.13	0.14	0.11
Variation in community income level	412540.10	1191491.08	-778950.98	0.19
Presence of public health facilities in or near the community	0.94	0.93	0.00	0.99
Highest level of public health facilities in or near the community	2.19	2.04	0.15	0.46
Number of health facilities in or near the community	1.77	1.78	-0.01	0.97
Presence of pharmacy in the community	0.00	0.00	0.00	---
Provision of preschool for children under 3	0.27	0.13	0.14	0.06*
Availability of commercial health insurance	0.16	0.08	0.08	0.20
Number of communities	45	64		

Notes: * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level.

Figure 2.1: Histograms of annual premium by regions

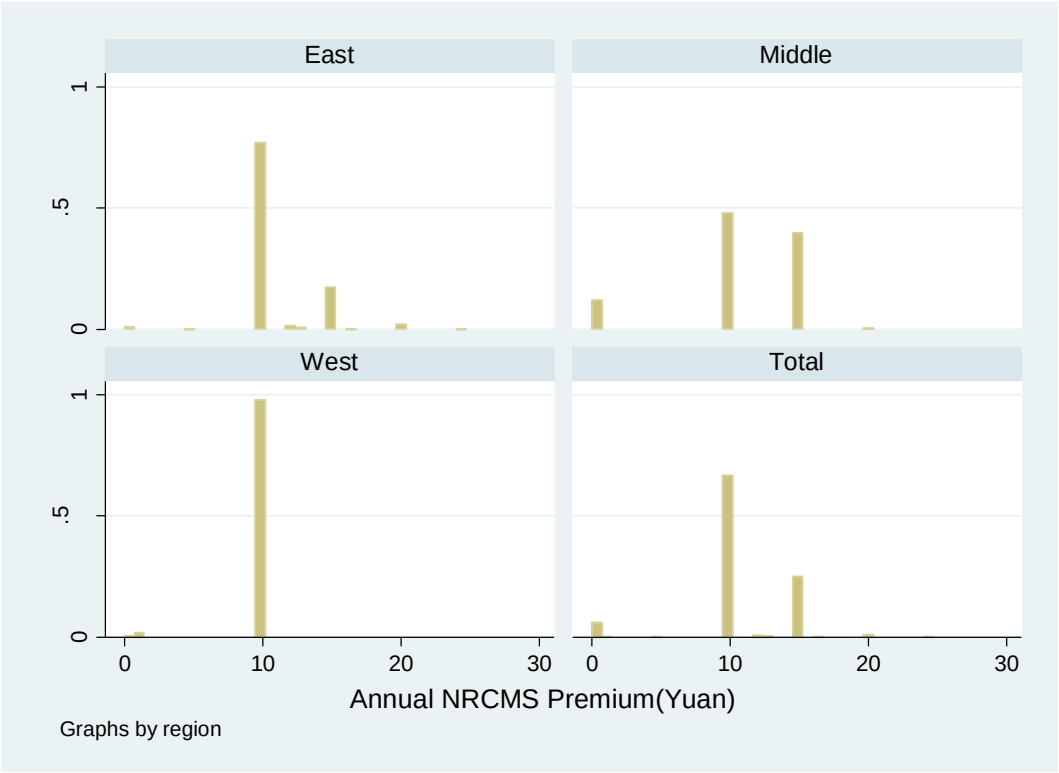


Figure 2.2: Histograms of reimbursement rates of inpatient care

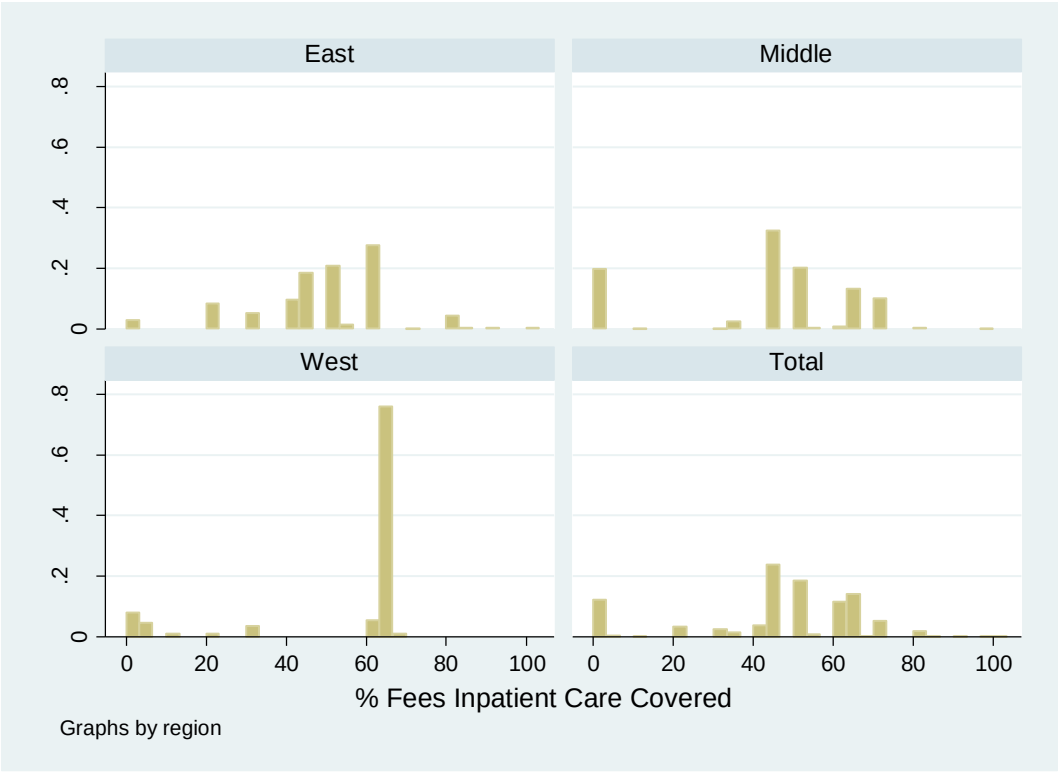


Figure 2.3: Histograms of deductibles of inpatient care

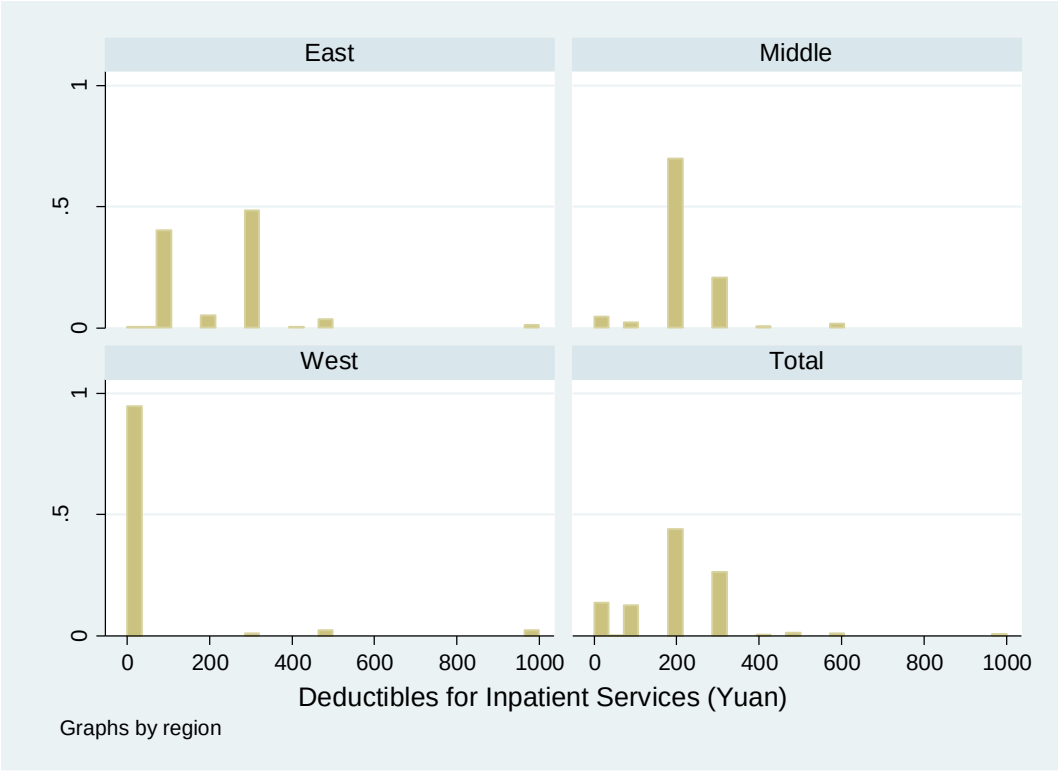


Figure 2.4: Histograms of spending caps of inpatient care

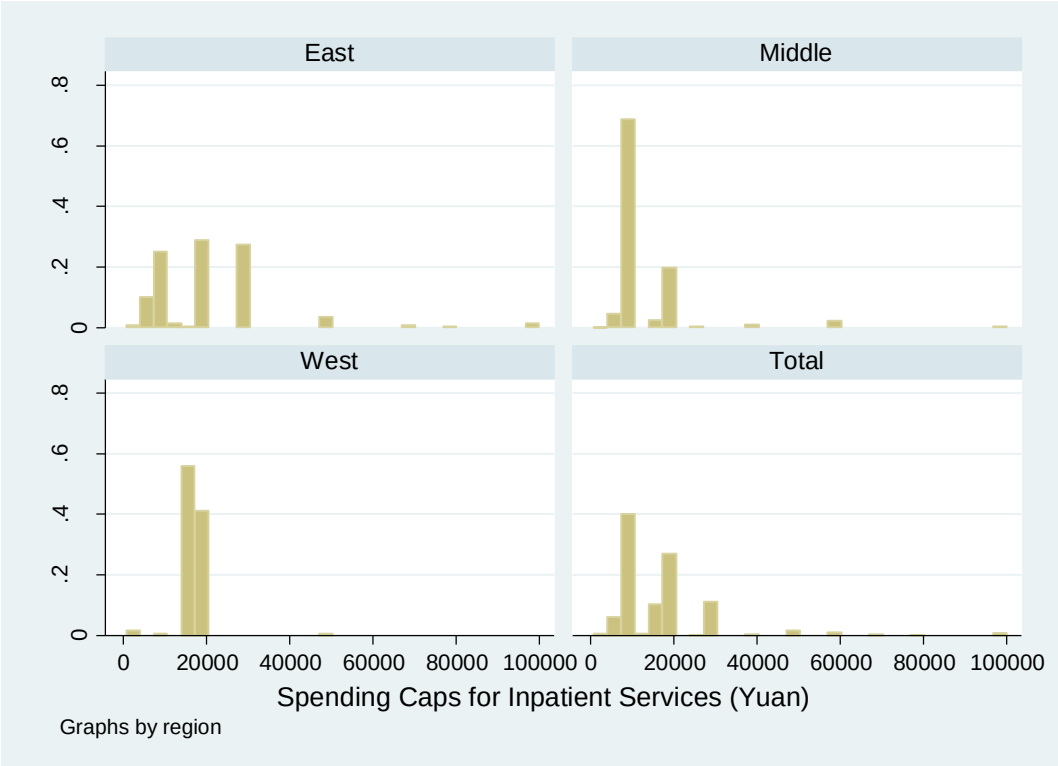


Table 2.4: Summary statistics of household-level characteristics by insurance status in 2006 and 2009

Variables	2006				2009			
	Without NRCMS	With NRCMS	Difference	P-value	Without NRCMS	With NRCMS	Difference	P-value
Village clinics	0.42	0.59	-0.16	0.00***	0.48	0.58	-0.10	0.14
Town hospitals	0.29	0.40	-0.11	0.00***	0.50	0.45	0.05	0.49
County hospitals	0.35	0.24	0.11	0.00***	0.07	0.10	-0.03	0.50
City hospitals	0.08	0.04	0.04	0.00***	0.15	0.07	0.08	0.03**
Private clinics*	0.21	0.13	0.08	0.00***	0.07	0.15	-0.08	0.11
Other facilities	0.08	0.04	0.03	0.00***	0.00	0.02	-0.02	0.35
Female household head	0.31	0.20	0.11	0.00***	0.30	0.17	0.12	0.02*
Household size	3.67	3.92	-0.24	0.00***	3.80	4.30	-0.50	0.03**
Minority ethnicity	0.11	0.16	-0.05	0.00**	0.04	0.12	-0.08	0.08
Married	0.82	0.89	-0.07	0.00***	0.89	0.90	-0.02	0.67
East provinces	0.18	0.32	-0.15	0.00***	0.07	0.22	-0.15	0.01***
Middle provinces	0.30	0.44	-0.14	0.00***	0.93	0.73	0.19	0.00***
Western provinces*	0.52	0.24	0.29	0.00***	0.00	0.05	-0.05	0.11
Age of household head	51.18	48.34	2.84	0.00***	57.71	51.14	6.57	0.00***
Proportion age<18	0.08	0.09	-0.01	0.23	0.02	0.05	-0.03	0.02**
Proportion age>55	0.26	0.24	0.03	0.06*	0.41	0.28	0.14	0.00***
Household income	9.33	9.42	-0.10	0.11	8.51	9.15	-0.64	0.02*
Asset index	1.28	1.14	0.14	0.00***	1.15	1.11	0.04	0.52
Illiterate*	0.22	0.18	0.04	0.03**	0.46	0.37	0.09	0.18
Primary school	0.36	0.36	-0.01	0.81	0.24	0.25	-0.01	0.83
Junior high school	0.29	0.34	-0.06	0.01***	0.24	0.29	-0.04	0.48
Senior high school and above	0.14	0.11	0.02	0.12	0.06	0.09	-0.03	0.39
Household head is a farmer	0.35	0.43	-0.08	0.00***	0.42	0.57	-0.15	0.03**
Ratio of working people in household	0.46	0.50	-0.04	0.01***	0.30	0.41	-0.11	0.02**
SAH excellent or good*	0.53	0.63	-0.10	0.00***	0.62	0.60	0.02	0.81
SAH fair or poor	0.47	0.37	0.10	0.00***	0.38	0.40	-0.02	0.81
Household head has chronic disease	0.11	0.13	-0.03	0.09	0.06	0.08	-0.02	0.59
Household chronic disease ratio	0.06	0.08	-0.01	0.13	0.06	0.05	0.01	0.77
Household head is overweight	0.53	0.61	-0.08	0.00***	0.61	0.69	-0.08	0.22
Household head is abdominal obesity	0.48	0.58	-0.09	0.00***	0.71	0.71	-0.00	0.96
Household head is smoker	0.57	0.58	-0.02	0.47	0.48	0.48	0.00	1.00
Household head is daily drinker	0.19	0.23	-0.04	0.05**	0.17	0.10	0.07	0.09*
Travel cost to the nearest health facility	0.23	0.17	0.06	0.24	0.16	0.27	-0.11	0.48
Waiting time	7.14	4.56	2.58	0.00***	8.46	5.31	3.15	0.02**
Drug availability	0.99	0.98	0.00	0.40	1.00	0.99	0.01	0.58
Treatment cost of a common cold	22.21	20.25	1.95	0.10*	30.88	23.74	7.14	0.21
N	677	1782			54	911		

Notes: * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level.

Table 2.5: The demand for the NRCMS in 2006 based on logit regressions: marginal effects of facility choice on insurance enrolment

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Village clinic	0.15***	0.14***	0.14***	0.12***	0.13***	0.12***	0.12***	0.12***	0.10***	0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Town hospital	0.12***	0.09**	0.09***	0.08**	0.08**	0.09**	0.09**	0.10***	0.12***	0.14***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
County hospital	-0.08**	-0.10***	-0.11***	-0.10***	-0.09**	-0.09**	-0.09**	-0.07*	-0.05	-0.02
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
City hospital	-0.12**	-0.15***	-0.16***	-0.18***	-0.17***	-0.17***	-0.17***	-0.15**	-0.17***	-0.09
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
Other facilities	-0.07	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.09	-0.14
	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.10)
Log likelihood	-1333.83	-1125.12	-1113.75	-1107.33	-1104.41	-993.72	-990.70	-884.58	-785.88	-698.00
No. Parameters	6	12	15	17	20	22	25	29	33	54
No. Observations	2398	2234	2227	2227	2227	1989	1985	1798	1606	1571
Pseudo-R^2	0.046	0.135	0.142	0.147	0.150	0.148	0.149	0.153	0.161	0.245
Added variables		Demographics	Demographics Age	Demographics Age Income	Demographics Age Income Education	Demographics Age Income Education Occupation	Demographics Age Income Education Occupation Health status	Demographics Age Income Education Occupation Health status Health risk	Demographics Age Income Education Occupation Health status Health risk Facility	Demographics Age Income Education Occupation Health status Health risk Facility County FE

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level. [b] The full results are showed in Table A 2.1 (appendix A).

Table 2.6: Average predicted probability of insurance coverage – Model 1 and Model 10

	Model 1		Model 10	
	Estimates	Standard error	Estimates	Standard error
Average predicted probability	0.73	0.10	0.72	0.24
Average predicted probability by provider category				
Village clinic	0.79	0.06	0.76	0.21
Town hospital	0.79	0.07	0.80	0.19
County hospital	0.65	0.10	0.67	0.28
City hospital	0.59	0.11	0.52	0.20

Notes: The average predicted probability is computed using the model estimates with all explanatory variables at their observed values and averaged over the sample. The average predicted probabilities by facility choice are computed by placing each observation in the facility choice category to calculate the probabilities at each data point and then are averaged over the sample.

Table 2.7: Coefficients of selected additional variables – Model 9 and Model 10 (logit marginal effects)

Variable	Model 9	Model 10
Household size	0.06***	0.05***
	(0.01)	(0.02)
Minority ethnicity	0.12**	0.12**
	(0.05)	(0.06)
East provinces	0.30***	---
	(0.05)	(---)
Middle provinces	0.28***	---
	(0.04)	(---)
Asset index	-0.08**	-0.07*
	(0.03)	(0.04)
N	1606	1571

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

[b] The coefficients of eastern and middle provinces are omitted in Model 10 because Model 10 has controlled for county fixed effects.

Table 2.8: The demand for the NRCMS in 2006 across income groups – Model 10 (logit marginal effects)

	Richest 25%	Middle 50%	Poorest 25%
Village clinic	-0.00	0.10*	0.21*
	(0.05)	(0.06)	(0.11)
Town hospital	0.06	0.14*	0.46***
	(0.06)	(0.07)	(0.15)
County hospital	0.07	-0.05	-0.06
	(0.06)	(0.07)	(0.16)
City hospital	-0.13	-0.03	-0.63
	(0.08)	(0.12)	(0.40)
Other facilities	0.03	-0.13	-0.28
	(0.13)	(0.16)	(0.36)
N	208	855	382

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 2.9: The demand for the NRCMS in 2006 across geographic regions – Model 10 (logit marginal effects)

	Eastern provinces	Middle provinces	Western provinces
Village clinic	-0.03	0.08	0.18*
	(0.03)	(0.05)	(0.10)
Town hospital	0.05	0.04	0.26**
	(0.04)	(0.06)	(0.11)
County hospital	0.00	-0.09*	0.02
	(0.04)	(0.05)	(0.12)
City hospital	-0.02	-0.06	---
	(0.07)	(0.05)	(---)
Other facilities	-0.21**	---	-0.18
	(0.10)	(---)	(0.15)
N	482	642	437

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 2.10: Correlation analysis between facility choice and insurance enrolment (logit marginal effects)

Variable	Impact on facility choice	Impact on insurance enrolment
Logit regressions		
Female household head	-0.19***	-0.11**
	(0.06)	(0.04)
Household size	0.04**	0.04***
	(0.02)	(0.01)
Asset index	-0.14***	-0.11***
	(0.04)	(0.03)
Bivariate probit models		
Female household head	-0.48***	-0.39***
	(0.15)	(0.15)
Household size	0.11**	0.14***
	(0.05)	(0.05)
Asset index	-0.37***	-0.34***
	(0.10)	(0.10)
Correlation	0.22***	
	(0.07)	

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Chapter 3

SOCIAL HEALTH INSURANCE AND TREATMENT-SEEKING BEHAVIOUR – EVIDENCE FROM THE NEW RURAL COOPERATIVE MEDICAL SCHEME

3.1 INTRODUCTION

Several low- and middle-income countries have introduced state-sponsored insurance programs for people working in informal sectors with the aim of enhancing access to healthcare and provide financial protection from the burden of illness (Acharya et al., 2012). In China, a new health insurance program, the New Rural Cooperative Medical Scheme (NRCMS), was introduced in 2003. The NRCMS is targeted at rural areas, where 80 percent of people were not covered by any kind of health insurance prior to the NRCMS (Lei and Lin, 2009). Despite the rapid economic growth during the last decade, Chinese economic development shows uneven progress between urban and rural areas, and rural people still tend to be poor compared with their urban counterparts. Before 2003, there was a widespread discontent related to insufficient access to health services and large out-of-pocket health payments among rural residents (Yip and Hsiao, 2009a). To address these problems, the government initiated the NRCMS and provided large subsidies for those who were enrolled. The expansion of the NRCMS was rapid: the insurance scheme covered 10% of rural counties in 2003; by the end of 2012, 2,566 counties and 800.5 million people were covered by the NRCMS, accounting for 98.3 percent of the total rural population (Ministry of Health, 2012).

In recent years, there has been widespread interest in evaluating the impacts of the NRCMS on health care utilization, however, existing studies show quite mixed results. Some studies have shown that the NRCMS increases outpatient and inpatient use of health services (Wagstaff et al., 2009a), while others have found little evidence that having insurance increases overall utilization (Babiarz et al., 2010; Babiarz et al., 2012; Lei and Lin, 2009). Some of these studies also investigate the behavioural responses associated with the NRCMS and have

found that the insurance increases the likelihood of people seeking care at low-level facilities (Babiarz et al., 2010; Babiarz et al., 2012; Hou et al., 2014; Wagstaff et al., 2009a).

This study aims to provide additional evidence regarding the impact of the NRCMS on the utilization of different types of medical care and different levels of health facilities at which care is sought. Establishing the impacts of health insurance is difficult because it is very rare that coverage is allocated randomly. In most cases, the insured and uninsured are likely to be different from each other in terms of observed and unobserved characteristics. Methods such as ordinary least squares (OLS) may fail to account for unobserved heterogeneity that is correlated with participation into the program. This study adopts a unified approach that first pre-processes data with propensity score matching (PSM) and then applies parametric difference-in-difference (DID) analysis on the pre-processed dataset. The two-step procedure is doubly robust since we will get consistent causal estimates if either the matching or the parametric model is correct, but not necessarily both (Ho et al., 2007). The method helps to make estimates based on the subsequent parametric analysis less dependent on modelling choices and specifications. The approach is considered to be a useful and robust extension of the PSM with DID models employed in previous studies (Lei and Lin, 2009; Wagstaff et al., 2009a), which take a straightforward difference in means after PSM approach, without control variables. In addition, more independent variables are also controlled for here, compared with previous studies, including risk preferences and health facility characteristics. These variables are important confounders that may influence the effect of the NRCMS on health care utilization and may have driven some of the results found in previous literature.

New evidence is presented here that while the NRCMS has not increased the overall utilization of formal medical care and preventive care, it increases the likelihood of people seeking medical care from village clinics and county hospitals while reducing the utilization of town hospitals. The insurance appears to change patients' utilization patterns by directing them away from town hospitals to village clinics and county hospitals and help them to access health services more conveniently and of potentially better quality. However, the results are inconsistent from the insurance benefit package design, which provides more generous reimbursement for health care delivered by town hospitals compared with village clinics[22] and county hospitals. Our results may indicate that insured patients are more concerned about the convenience and quality of health care compared with its price.

[22] Village clinics only provide outpatient care, which is usually not covered by the NRCMS.

The lack of effect of the NRCMS on overall utilization may be due to a relatively small program budget. The co-payments of the scheme are high, with large deductibles, low ceilings and high coinsurance rates, so poor households may still face financial barriers when seeking health services. However, the substitution effects away from town hospitals to village clinics and county hospitals indicate that the insurance may help beneficiaries to access more convenient and better quality health care, but they may also be faced with more expensive medical interventions at county hospitals. Careful consideration is therefore needed to address the associated welfare implications.

3.2 INSTITUTIONAL BACKGROUND

The collapse of China's rural health system in the late 1970s led to unaffordable health care and major financial risks associated with large out-of-pocket health payments. To improve health care access for rural residents, the Chinese government established one of the largest social health insurance programs in the world: the New Rural Cooperative Medical Scheme (NRCMS). The program was first implemented in 2003 and initially covered 10 percent of total rural counties in China (Sun et al., 2009). In the following years, it expanded rapidly from 310 out of the total of 2,861 rural counties in 2004, to 1,451 counties in 2006 (Cheng et al., 2015). By the end of 2008, the insurance program was introduced to nearly all rural counties across the country and covered over 90 percent of the total rural population. In 2010, 836 million people were enrolled in the NRCMS, accounting for 96 percent of the whole rural population. The eligibility requirement is that people should hold rural residential status, a residential registration designating a citizen as rural or non-rural. All eligible individuals are accepted into the scheme, irrespective of their health status. Households decide whether to participate every year, and the enrolment is at household level so that rich and healthy individuals cannot opt out.

The insurance financing is partly through flat-rate household contributions and partly through subsidies from four levels of government: central, provincial, county and township. The minimum requirement of the annual premium in 2003 was 30 RMB (US$3.62) per person, with 10 RMB (US$1.21) from households supplemented by a subsidy of 10 RMB (US$1.21) from local governments and 10 RMB (US$1.21) from the central government[23] (Ministry of Health et al., 2003). The premium level has been gradually increased over time. Up to 2012, the total government subsidy had reached 240 RMB (US$38.03), and the individual contribution rose to 60 RMB (US$9.51)

[23] In 2003, the average annual disposable income of rural population was 2,622 RMB (US$316.67). The average medical expense per outpatient visit in public hospitals was 108.2 RMB (US$13.07), and the average medical expense per inpatient visit in public hospitals was 3, 910.7 RMB (US$472.31). The exchange rate was US$1 =8.28 RMB in 2003.

per person[24]. The premiums are not risk-rated at the individual level so that all insured individuals within the same county are offered the same premium. During the period covered by this study (from 2004 to 2006), households could purchase the NRCMS at a premium level of 10 RMB (US$1.25) per person supplemented by government contribution of 40 RMB (US$5.02) per person[25]. The 50 RMB premium level represents around 40 percent of average per capita outpatient expense and only 1 percent of average per capita inpatient expense in 2006.

The benefit package of the NRCMS varies geographically because county administrators are empowered to define the benefits based on local needs and resources (Yip and Hsiao, 2008). The program in all counties covers inpatient care, but differs in the coverage of outpatient services. Approximately three quarters of the counties cover outpatient services through a household saving account or on a pooled basis. Among the rest, half of the counties cover only catastrophic illness, and half do not cover outpatient services at all (Wagstaff et al., 2009a). For those counties that cover outpatient services, the reimbursement is much less generous for outpatient care compared with inpatient care. Detailed reimbursement rules were not specified in national guidelines until 2007. According to "Advice on Developing Reimbursement Rules of the New Rural Cooperative Medical Scheme" (Ministry of Health et al., 2007), deductibles of inpatient services should be set two to four times higher than the average outpatient expense per visit in the last year, and no more than 100 RMB (US$13.14) in central and western areas. Maximum reimbursement caps should amount to six times the annual average per capita income of farmers in 2009 (Ministry of Health, 2009). The reimbursement rate was targeted at 50 percent in 2009 (Ministry of Health, 2009), and increased to 70 percent in 2011 and 75 percent in 2012 (Ministry of Health et al., 2011; 2012). However, even if the national guidelines specify the requirements, there still exist large differences in published and actual reimbursement levels because of insufficient funding (Barber and Yao, 2010). Liang and Langenbrunner (2013) estimated that the average reimbursement rate in many counties was less than 50 percent in 2011.

Table 3.1 shows the reimbursement rules of the NRCMS for inpatient expenses by areas and facilities (You and Kobayashi, 2009). The deductibles vary by locality, with the majority of them from 200 RMB (US$25.09) to 500 RMB (US$62.74). Besides the deductibles, patients still have to pay 40–80 percent of the covered inpatient

[24] In 2012, the average annual disposable income of rural population was 7,917 RMB (US$1254.68). The average medical expense per outpatient visit in public hospitals was 192.5 RMB (US$30.51), and the average medical expense per inpatient visit in public hospitals was 6,980.4 RMB (US$1106.24). The exchange rate was US$1=6.31 RMB in 2012.
[25] In 2006, the average annual disposable income of rural population was 3,587 RMB (US$450.06). The average medical expense per outpatient visit in public hospitals was 128.7 RMB (US$16.15), and the average medical expense per inpatient visit in public hospitals was 4,668.9 RMB (US$585.81). The exchange rate was US$1 =7.97 RMB in 2006.

expenses. The benefit package also caps the benefit payment at 10,000–20,000 RMB (US$1,254.71-2,509.41). Reimbursement is less generous for health care delivered in higher-level facilities, and both deductibles and coinsurance rates increase gradually from township health centre to higher-level hospitals. The eastern areas have the highest deductible levels (from 400 (US$50.19) to 900 RMB (US$112.92)) while their ceilings (20,000 RMB (US$2,509.41)) are also higher than central and western areas.

[Table 3.1 about here]

In parallel with the introduction of the NRCMS, the government has also set up some supporting policies, such as improving the quality and delivery of health care services and strengthening pharmaceutical governance (Bai and Wu, 2014). To transform the health care delivery system from public hospital-centred to integrated primary care-based, great attention has been paid to strengthen the quality and funding for village clinics and town hospitals in rural areas and community health centres in urban areas (Yip and Hsiao, 2014). Government funding has been directed to improve the primary health care infrastructure and train general practitioners. Primary health providers are expected to play a central part in prevention, case detection and management, gatekeeping and referral (Yip and Hsiao, 2014).

Rural China has a three-tiered health system. The bottom tier is village clinics, staffed by clinicians[26] with little formal training and providing basic outpatient services, emergency first aid, immunisations and public health surveillance. Township health centres are the system's middle tier. Staffed by formally trained doctors and nurses, these centres provide inpatient services and treat more complicated outpatient conditions. Town hospitals also play a pivotal role in referring services to higher-level hospitals and act as an intermediary between village clinics and county hospitals. The top tier is county, city and higher-level hospitals that provide relatively expensive and specialized inpatient and outpatient medical care. These hospitals are usually far from most villages, and so incur high transportation costs. Since the NRCMS mainly covers inpatient services, village clinics are usually not reimbursed because they only offer outpatient care. To restrain overall medical expenditure, the NRCMS encourages patients to seek care from low-level health facilities by providing more generous reimbursement for health services delivered by town hospitals compared with county and city hospitals. Therefore, the NRCMS is expected to lead to more patients using inpatient care in town hospitals.

[26] Most village clinicians have not received formal medical school education. They usually have three to six months of training after junior middle school.

3.3 LITERATURE REVIEW

Several studies have investigated the impact of the NRCMS on medical care utilization. A major empirical issue is the self-selection problem related to the voluntary nature of the insurance. The participants (the treatment group) and non-participants (the comparison group) are likely to be different in terms of individual characteristics that influence both their decision to participate in the program and their levels of outcomes. With non-experimental data, econometric methods need to account for selection bias. Lei and Lin (2009) evaluate the impact of the NRCMS on health care utilization using individual fixed effects, instrumental variable and propensity score matching (PSM) with difference-in-difference (DID) based on the China Health and Nutrition Survey (CHNS) from 2000 to 2006. They find that the NRCMS significantly increases the utilization of preventive care. The result is driven mainly by the provision of a free general physical examination if the individual does not use any other services throughout the year. They find no significant effect of the NRCMS on the utilization of formal medical care. Wagstaff et al. (2009a) also use a PSM with DID method based on a dataset collected from program administrators, health facilities and households, which covers 15 counties in 12 provinces. Their results show that the NRCMS increases outpatient and inpatient utilization, and larger impacts appear to have occurred for village clinics and county hospitals. Liu and Tsegai (2011) use a PSM and bounding approach to account for the heterogeneous effects of the program on utilization across different regions and income groups. They find that the NRCMS increases outpatient utilization for rural residents, especially for poor people in western regions. Utilization increases more in village clinics and town hospitals, which corresponds to the policies of shifting demand to low-level facilities to reduce medical expenditure. One concern is that PSM alone cannot completely overcome the endogeneity of insurance participation if unobserved confounding variables between the treatment and comparison groups still exist after balancing the treatment and comparison groups alongside observable dimensions. In this case, due to the selection of unobservables, the PSM estimates may be biased. Babiarz et al. (2010; 2012) employ DID on a two-wave dataset from 25 rural counties across five Chinese provinces[27]. They find that the NRCMS does not increase the likelihood that a sick person would seek medical care, but it may change the composition of health care use by increasing the utilization of low-intensity outpatient care at village clinics and inpatient care at township health centres.

[27] The five provinces are Jiangsu, Sichuan, Shanxi, Jilin and Hebei, which are different from the provinces sampled in this study.

Previous studies provide a mixed picture of the impact of the NRCMS on health care utilization, and they mainly use data that is either from the early years of implementation or are not nationally representative. A further issue is that these studies typically have a sparse control vector, which leads to a concern that their results may be consequently affected by omitted variable bias. This paper seeks to advance the literature by using a large and nationally representative panel dataset to measure the impact of the NRCMS on different types of medical care utilization and people's treatment-seeking behaviour. The analysis employs a unified approach that first pre-processes data using PSM and then applies DID analysis on the pre-processed data. The method is expected to produce more accurate and less model-dependent results compared with the results in previous studies.

3.4 DATA

This paper uses panel data from the China Health and Nutrition Survey (CHNS) conducted in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011[28]. CHNS is an international collaborative project between the Carolina Population Centre at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Centre for Disease Control and Prevention. The dataset covers nine of China's 31 provinces, accounting for nearly 44 percent of China's total population. The provinces are mainly situated in central and eastern China and differ considerably in geography, economic development, public resources and health outcomes[29]. In each province, a multi-stage random cluster process is used to draw the sample. Counties are initially stratified by income (low, middle and high), and four in each province are randomly selected based on a weighted sampling approach. Villages and townships within the counties, and urban and suburban neighbourhoods within the cities, are also selected randomly. CHNS provides comprehensive information covering a wide range of individual, household and community characteristics.

In this study, the sample includes only households living in rural China and not covered by any health insurance before 2006. A small number of households covered by other insurance programs except the NRCMS are excluded[30]. Waves 1991, 1993, 1997, 2000, 2004 and 2006 are used for logit, DID and DID combined with nearest neighbour (NN) matching models. In total, there are 39,316 individuals and 3,006 households from 29 counties (20,247 individuals and 1,707 households from 17 counties that introduced the NRCMS in 2006)[31]. According to

[28] The data can be obtained from http://www.cpc.unc.edu/ .
[29] The surveyed provinces are Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi and Guizhou. The detailed geographical distribution of surveyed regions is presented in Appendix (Figure A 3.1).
[30] The detailed descriptions of the number of observations excluded from the sample are given in Appendix (Table A 3.1).
[31] 8 counties are excluded from the sample because they have pre-existing social insurance programs that may confound the effect of the NRCMS on health care utilization.

the dataset, the coverage rates of the NRCMS in 2006 are 41.6 percent across all counties and 64.5 percent in participating counties.

The dependent variables used in this study include health care utilization (formal medical care, preventive care[32], folk doctor and inpatient care)[33] and treatment-seeking behaviour based on utilization of different levels of health facilities (village clinics, town hospitals, county hospitals, city hospitals and private clinics). Households' preferences towards different types of health facilities are based on the question "If household members are sick or want to see a doctor, dentist, nurse or other health worker, which clinics and hospitals can they use?" Respondents can choose from 15 types of health facilities, including village clinics, town hospitals, county hospitals, city hospitals, private clinics and so on. The facility choice is represented by stated preference instead of actual utilization as the data on actual utilization is limited to people who report feeling sick or were injured in the past four weeks, and it provides no information for the rest of the population. On the contrary, the stated household preference has a large sample size and indicates the health facility choice of all households no matter whether they used health services recently or not.

The key independent variable is enrolment in the NRCMS. It is based on the survey question: "what type of medical insurance do you have?". The question from 1991 to 2006 only provides information on the choice of cooperative medical insurance (CMS), but does not distinguish between the old CMS from the current NRCMS. The solution here is to identify whether the county has introduced the NRCMS and define an individual who reports enrolment in the CMS and is living in a county that had offered the NRCMS as insured (Lei and Lin, 2009)[34]. We use the NRCMS enrolment at household level, which equals one if the household head reports to be enrolled. The reason for using this variable is that some household members may be unaware of their insurance status if only the household head makes the decision of enrolment. In DID estimation, treatment group is defined as people enrolled in the NRCMS in 2006, and the comparison group includes people who lived in non-NRCMS counties and did not have the option of joining the NRCMS in 2006. The reason for comparing participants with non-exposed

[32] Preventive care includes general physical examination, blood test, blood pressure screening, tumour screening, vision or hearing exam, prenatal exam, postnatal exam, gynaecological exam and so on.
[33] The survey questions are based on the use of health care in the last four weeks. Since insured respondents decide whether to enroll in the NRCMS at the beginning of the year, they should have already been covered by the insurance during the period the survey covered. However, this may not be the case for the use of folk doctors since the survey asked about utilization in the last year. Therefore, the utilization data may be from pre-treatment period before the insured were covered by the NRCMS.
[34] Lei and Lin (2009) use the implementation dates of CMS reported by community health workers and define those programmes introduced after 2003 as the NRCMS. In this study, we did not follow this method because there is inconsistency of the introduction years reported by health workers in the same community but in different waves. Instead, we use the question: "Does this village/neighbourhood have this type of medical insurance?" We define the community as NRCMS community in a particular wave (after 2003) if the health workers reported "yes" for the CMS in any wave after 2003 and "no" in the previous wave. The reason to use this question is that health workers may be unclear about the introduction year of the NRCMS in their communities, but they should know whether the insurance is available at the moment. Therefore, the question used in our study should have less reporting bias. A county is defined as an NRCMS county in a particular wave if at least one community within that county is known to have adopted the NRCMS in that wave.

people is that non-participants who live in the NRCMS counties may suffer from adverse selection problems and make enrolment decisions based on unobserved variables that change over time (Wagstaff et al., 2009a).

Other independent variables consist of individual-, household- and community-level characteristics, including age, gender, household size, marital status, ethnicity, geographic dummies (eastern, middle or western provinces), household income, asset index, education level, occupation, presence of major illness (hypertension, diabetes, heart diseases, apoplexy and bone fracture), health risk variables (overweight, smoking and daily drinking) and community health facility characteristics (presence of public health facility in the community, travel time to the nearest health facility, travel cost to the nearest health facility, waiting time and treatment cost of a common cold). Both the NN matching and DID analysis use the same set of covariates.

Table 3.2 presents the descriptive statistics of dependent and independent variables by insurance status in 2006. The uninsured people are those who live in non-NRCMS counties and hence do not have the option to enrol. In general, the insured are less likely to use folk doctors, town hospitals, city hospitals and private clinics, while more likely to use village clinics. In terms of the individual-level characteristics, the insured tend to be married, working people, are more likely to be a farmer and have chronic diseases. There is some variation in household-level characteristics as well. Insured households are more likely to be led by a younger and male household head, have a smaller household size, live in eastern provinces, earn higher income but own less household assets. People who are enrolled also have better access to health care services with shorter travelling time and waiting time, however, they are faced with higher treatment costs.

[Table 3.2 about here]

3.5 METHODOLOGY

3.5.1 LOGIT ESTIMATION

As an initial step, logit estimation is used to provide results for the purpose of comparison. The effect of participating in the NRCMS on medical care utilization is estimated as:

$$Y_{it} = F(\alpha_0 + \alpha_1 D_{it} + \alpha_2 X_{it} + u_{it}) \qquad (3.1)$$

where Y_{it} is the measure of utilization in year t for household/individual i. The function F takes the form of a logit function. D_{it} is an indicator of whether a household is enrolled in the NRCMS or not; X_{it} is a set of individual-,

household- and community-level characteristics including age, gender, marital status, ethnicity, geographic dummies, education level, occupation, household income, asset index, chronic diseases, health risk preference and community health facility characteristics. u_{it} is the error term of mean zero and assumed to be uncorrelated with the regressors X_{it}.

In most applications, the goal of policy evaluation is to estimate the average effect for a particular population. This leads to several areas of interest for averages of all or a subset of observations in the dataset. The average policy effect among the whole population is represented by the average treatment effect (ATE):

$$ATE = E(Y_{it}^1 - Y_{it}^0 | X = X_{it}) \tag{3.2}$$

where Y_{it}^1 and Y_{it}^0 are the with-treatment and no-treatment outcomes for a given individual. A more prominent parameter of interest in the literature is the average treatment effect on the treated (ATT), which only calculates the policy effect on those individuals who actually participate in the program. ATT is defined as the difference between the with-treatment outcomes of the insured people and the outcomes of the same group of people if they were not covered:

$$ATT = E(Y_{it}^1 - Y_{it}^0 | X = X_{it}, D_{it} = 1) \tag{3.3}$$

ATT is usually easier to retrieve, and it only focuses on the policy effect among the individuals whom the program was intended. Therefore, evaluation literature tends to report ATT in most cases, and this paper will also calculate the ATT of the NRCMS.

Since the mean counterfactual outcomes of the insured people ($\mathrm{E}(\mathrm{Y}_{\mathrm{it}}^0 | \mathrm{X} = \mathrm{X}_{\mathrm{it}}, \mathrm{D}_{\mathrm{it}} = 1)$) is not observed, logit estimation uses the mean outcome of the uninsured people ($\mathrm{E}(\mathrm{Y}_{\mathrm{it}}^0 | \mathrm{X} = \mathrm{X}_{\mathrm{it}}, \mathrm{D}_{\mathrm{it}} = 0)$) for substitution. However, these two may be different if the insured and uninsured people differ in key aspects that are not observed by researchers. As the NRCMS is offered on a voluntary basis, those who are covered may be more likely to be sick or utilize health services and therefore tend to benefit more from the NRCMS compared with those who are not covered. Therefore, simply comparing the mean outcomes of the insured and uninsured people may give a biased result. This is a common challenge arising in program evaluation if the treatment assignment is not random. Logit estimation cannot account for self-selection bias, and more advanced econometric methods are required to address potential bias from unobserved characteristics.

3.5.2 Difference-in-difference models and intention-to-treat analysis

I start by presenting the standard linear DID model for a continuous and uncensored outcome that is defined as follows:

$$Y_{it} = \alpha_0 + \alpha_1 D_{it} + \alpha_2 X_{it} + u_{it} \tag{3.4}$$

The individual-specific treatment effect is defined as the difference of outcomes between treated and untreated people:

$$Y_{it}^1 - Y_{it}^0 = \alpha_1 + g(X_{it}) + u_{it}^1 - u_{it}^0 \tag{3.5}$$

If longitudinal data are available, the additional time dimension can be used to estimate the treatment effect under less restrictive assumptions. Suppose a survey has been conducted at time t_2 after the treated group has acquired insurance coverage, and the same individuals have been surveyed at time t_1 before they were covered. The difference in mean outcomes between the treated and untreated at time t_2 is first taken:

$$\begin{aligned} &E[Y_{it}|X = X_{it}, D = 1, t = t_2] - E[Y_{it}|X = X_{it}, D = 0, t = t_2] = ATT(X_{it}) + \\ &(E(u_{it}|X = X_{it}, D = 1, t = t_2) - E(u_{it}|X = X_{it}, D = 0, t = t_2)) \end{aligned} \tag{3.6}$$

Then the difference in mean outcomes between the two groups at time t_1 is also taken, when neither the treated nor the untreated has received the treatment. We get

$$\begin{aligned} &E[Y_{it}|X = X_{it}, D = 1, t = t_1] - E[Y_{it}|X = X_{it}, D = 0, t = t_1] = \\ &E(u_{it}|X = X_{it}, D = 1, t = t_1) - E(u_{it}|X = X_{it}, D = 0, t = t_1) \end{aligned} \tag{3.7}$$

Subtracting Equation (3.7) from Equation (3.6) gives the DID estimator, which is the change in the difference between the treated and untreated groups over time:

$$\begin{aligned} &DID = \{E[Y_{it}|X = X_{it}, D = 1, t = t_2] - E[Y_{it}|X = X_{it}, D = 0, t = t_2]\} - \\ &\{E[Y_{it}|X = X_{it}, D = 1, t = t_1] - E[Y_{it}|X = X_{it}, D = 0, t = t_1]\} = ATT(X_{it}) + \\ &\big\{\big(E(u_{it}|X = X_{it}, D = 1, t = t_2) - E(u_{it}|X = X_{it}, D = 0, t = t_2)\big) - \\ &(E(u_{it}|X = X_{it}, D = 1, t = t_1) - E(u_{it}|X = X_{it}, D = 0, t = t_1))\big\} \end{aligned} \tag{3.8}$$

Linear DID model rely on the parallel trend assumption that the treated and untreated groups have the same trend in unobserved characteristics over time, so that the last two round brackets in Eq. (3.8) are equal to one another. Therefore, DID reduces to ATT(X_{it}). The DID estimators enable the untreated individuals to act as the "counterfactual" for the treated ones and gives an estimate of the outcomes of the treatment group at time t_2 if they were not covered by the insurance. However, DID approach would only provide an unbiased estimate of the treatment effect if any differences in unobservables between treatment and control groups are not time-varying.

The following econometric model can be constructed to obtain the DID estimator of the effect of the NRCMS on linear outcomes:

$$Y_{it} = \beta_0 + \beta_1 NRCMS_t + \beta_2 Treated_i + \beta_3 NRCMS_t \times Treated_i + \beta_4 X_{it} + \varepsilon_{it} \qquad (3.9)$$

where $NRCMS_t$ equals one for time after the insurance introduction (2006) and 0 otherwise. $Treated_i$ is an indicator variable that equals 1 if individual/household was enrolled in the NRCMS in 2006, 0 if the individual/household lives in non-NRCMS counties (counties that did not introduce the NRCMS in 2006). There are two types of untreated people: non-participants (people who live in NRCMS counties and choose not to enrol) and non-exposed (people who live in non-NRCMS counties and do not have the option of enrolment). We only use the non-exposed people as our comparison group since the non-participants may select themselves into the program based on unobservables that change over time. They may deliberately choose not to enrol because they are confident of their health status and will not need any health services in the near future. Therefore, the DID identification assumption would be violated. The selection bias may be less if we compare the outcomes of participants with the non-exposed people (Wagstaff et al., 2009a). However, it should also be noted that there may still remain a residual risk of selection bias that cannot be eliminated even if we compare those who enrol with all of those in a county in which the NRCMS is not offered. The coefficient on the interaction term β_3 is the DID estimator, indicating the relative impact of the NRCMS on utilization outcomes for an individual/household living in the treated counties in 2006 compared to the one living non-treated counties in 2006.

Since the outcome variables used in this study are dummy variables,

$$Y_{it} = F(\beta_0 + \beta_1 NRCMS_t + \beta_2 Treated_i + \beta_3 NRCMS_t \times Treated_i + \beta_4 X_{it} + \varepsilon_{it}) \qquad (3.10)$$

where F is the conditional distribution function of the logistic distribution. The treatment effect becomes the incremental effect of the coefficient of the interaction term β_3, which can be obtained by calculating the marginal effect averaged over the treatment group in the post-treatment period.

When estimating the treatment effect of enrolling in the NRCMS, the DID model compares treated households with untreated ones and requires that the household-level unobservables are parallel across time. To reduce the endogeneity problem related to household characteristics (rich and more health-conscious households may be more likely to take up the insurance), intention-to-treat (ITT) analysis is employed to estimate the treatment effect of offering the NRCMS in a county. The method uses all households in NRCMS counties as the treatment group and all households in non-NRCMS counties as the comparison group regardless of their actual enrolment

status. Therefore, ITT analysis compares the outcomes of all households in NRCMS counties with those living in non-NRCMS counties and relies on a weaker assumption that the unobserved county-level (rather than household-level) characteristics of treatment and comparison groups should show parallel trends prior the insurance.

3.5.3 PROPENSITY SCORE MATCHING TO PRE-PROCESS DATA

The main purpose of matching is to choose a comparison group from the untreated individuals such that their outcomes act as the correct counterfactuals for the treated group had they not received the treatment (Blundell and Dias, 2002). PSM is based on two assumptions: (a) treatment assignment is independent of the potential outcomes conditional on the observed baseline covariates and (b) every subject has a nonzero probability to receive either treatment (Rosenbaum and Rubin, 1983). The assumption (a) indicates that the selection only occurs on observables so that all the differences in outcomes between the treatment and comparison groups are attributed to their observed characteristics. The assumption (b) guarantees that all treated individuals have a counterpart in the untreated group given the observables.

Since conditioning on all relevant covariates would lead to a dimensionality problem, Rosenbaum and Rubin (1983) suggest using a balancing score. One commonly used balancing score is the propensity score, the probability of receiving the treatment conditional on observed baseline covariates. According to Rosenbaum and Rubin (1983; 1984), the assumption (a) remains valid if controlling for the propensity score instead of covariates. Therefore, if potential outcomes are independent of treatment conditional on covariates, they are also independent of treatment conditional on a balancing score (Caliendo and Kopeinig, 2008). We use a probit model to estimate the propensity score and include individual-, household- and community-level characteristics that influence both participation decision and outcome variables. All the covariates are measured before insurance coverage is available. The estimation results and histograms of the propensity score are shown in Appendix (Table A 3.1 and Figure A 3.1). The distribution of people in the comparison group is skewed to the left, while the distribution of people in the treatment group is skewed (to a lesser extent) to the right. The region of common support is ample and relatively few individuals will be dropped because they lie off the common support.

We apply propensity score matching (PSM) to pre-process the data before employing DID models in order to improve balance in the observed characteristics between the treated and comparison groups. PSM helps to

minimize selection bias associated with non-experimental data by selecting individuals from non-participants who are similar to the participants in observed pre-treatment characteristics (Axelson et al., 2009). Pre-processing data with matching before parametric analysis helps to reduce bias and inefficiency and produce less model-dependent causal inferences (Ho et al., 2007). The combination of PSM with DID has been explored by Heckman et al. (1997; 1998) and Abadie (2005), who proposed a regression-adjusted semi-parametric conditional DID matching estimator. The estimator is constructed using a two-step strategy: (i) estimate the propensity score and compute the weights for the untreated sample; (ii) impose the weights on untreated individuals to obtain the ATT. The main objective is to avoid comparing the incomparable and restrict the application of nonexperimental methods to regions of common support (Heckman et al., 1997). In this paper, we use NN matching without replacement[35] to adjust the data by constructing a match for each treated individual using the closest comparison unit in terms of the propensity score[36]. This type of matching has the advantage that the calculations are simple and quick to run when the sample size is large. To achieve close balancing, we impose a tolerance level on the maximum propensity score distance with a caliper of 0.01[37].

3.6 RESULTS

3.6.1 INITIAL ESTIMATES

Table 3.3 shows the estimates of the effects of the NRCMS on utilization of formal medical care, preventive care, folk doctors and inpatient care[38] based on logit models since all these outcomes are dummy variables. For each dependent variable, estimation results are first shown based on models with only demographic characteristics, and then additional covariates that may be correlated with the insurance status are added in the models. The only significant effect occurs for preventive care, and the probability of using preventive care is 1.4% higher for the insured compared to the uninsured with only demographic characteristics, while the magnitude of the coefficient is largely reduced after controlling for other covariates but still remains to be significant at the 1% level.

[35] Since the propensity score distribution is very similar across the treatment and comparison groups (Figure A 3.2), NN without replacement can achieve good matching quality. In addition, NN without replacement will make use of more uninsured people from the comparison group to construct the counterfactual outcome and thereby reduces the variance of the estimates.
[36] We use NN matching instead of kernel matching or Mahalanobis distance matching because NN can achieve balance with the maximum amount of covariates. Since omitting important variables can seriously increase bias in estimates, the outcomes will be more likely to be independent of treatment under the NN matching.
[37] The sensitivity of results to three other choices of caliper (0.005, 0.0025, 0.00125) is shown in Appendix (Table A 3.2). We also try NN without replacement in both ascending and descending order (Table A 3.3). The estimates remain similar across different choices of caliper and order in which observations get matched.
[38] The sample size of inpatient care use is particularly small compared to other dependent variables since the survey question is only answered by people who reported feeling sick or were injured during the last 4 weeks.

Tables 3.4 and 3.5 take a further look at the utilization of different levels of health facilities based on both actual utilization and stated household preference. In Table 3.4, the probability of using village clinics is 12% to 17% higher among the insured people compared to the uninsured ones. The same significant effect is also found in Table 3.5 using stated preference data. Insured households are around 13% to 20% more likely to use village clinics, and the effect is significant at 1% level. Meanwhile, the likelihood of using town, county and city hospitals is around 11%, 19% and 2.5% lower among the insured, respectively. The estimates in Table 3.4 are quite similar to the ones in Table 3.5 with the same signs and similar magnitudes of the coefficients. However, the results based on stated household preference (Table 3.5) are more precise given the larger sample size and lower variance. Therefore, in the following sections only results based on stated household preference are presented.

[Tables 3.3, 3.4 and 3.5 about here]

The results from logit estimation provide suggestive evidence that the NRCMS is related to an increase in the use of preventive care and village clinics and a decrease in the use of county and city hospitals. However, the results here may not be reliable if the treated and comparison groups differ prior to treatment in ways that matter for the outcomes under study. Since the NRCMS is offered on a voluntary basis, it is very likely that the participants and non-participants may be different in terms of unobserved individual characteristics that influence both their decision to participate in the program and their levels of outcomes. For instance, the insured people may deliberately select themselves into the NRCMS because they expect to use many health services and benefit more from the insurance. Therefore, simply employing logit models conditional on observables may provide a misleading estimate of the effect of the program due to omitted variable bias.

3.6.2 IMPACT ESTIMATES

To reduce the self-selection bias related with observational data, DID and NN matching are used to control for the observed and unobserved characteristics between the insured and uninsured subjects. Table 3.6 shows the treatment effects of the NRCMS based on six waves of data (1991, 1993, 1997, 2000, 2004 and 2006). We first show the results based on DID estimation only and then employ NN matching before DID to make the selected non-treated group as similar as possible to the treated group in terms of their observed characteristics. For both models, the NRCMS appears to have negative impact on the use of folk doctors, with the insured 2% to 3% less likely to use health services provided by folk doctors. Both the use of village clinics and county hospitals appear to

be around 10% higher for the insured compared to the uninsured, although the coefficient for county hospitals is only significant at 10% level under the DID combined with NN matching model. The insured households also appear to be around 16% to 20% less likely to use town hospitals.

[Table 3.6 about here]

To investigate whether the significant results are driven by the change of the sample or the addition of covariates, a series of logit regressions are estimated for all significant outcome variables (e.g. folk doctors, village clinics, town hospitals and county hospitals). The estimation starts with the model with only demographic characteristics and subsequently adds different groups of independent variables such as income, education status, occupation, chronic disease, health risk preference and community health facility characteristics (from Model 1 to Model 7). The treatment effects of the NRCMS on the use of town hospitals and county hospitals are significant and robust across all models. However, there is only a statistically significant effect of the NRCMS on the use of folk doctors and village clinics in the last model. It is possible that the significance is driven by the change of the size or composition of the sample since Model 7 has the least number of observations compared with previous models. Therefore, Models 1-6 are re-run based on the sample of Model 7 for the use of folk doctors and village clinics (Appendix). The significance of folk doctors seems to be related to the change of the sample in the last model, while the significance of village clinics is merely due to the addition of facility characteristics [39]. Since facility characteristics are important covariates that may confound the effect of the NRCMS on health care utilization and needs to be controlled for in the complete model, the significant treatment effect on the use of village clinics should also be regarded as robust.

[Tables 3.7, 3.8, 3.9 and 3.10 about here]

Similar results are also observed when we combine ITT analysis with DID models (Table 3.11). The NRCMS is found to decrease the likelihood of using folk doctors and town hospitals by 3% and 12-15%, respectively, and increase both the probabilities of using village clinics and county hospitals by more than 10%. All the estimates are significant at the 1% level. The robustness check still shows that the significance for village clinics, town

[39] Table A 3.4 (Appendix) shows that all the treatment effects become significant when we use the sample based on Model 7, indicating that the significance of folk doctors is mainly driven by the change of the sample size or composition. Table A 3.5 shows that the significance of village clinics still appears in the last model and should be related with the addition of facility characteristics.

hospitals and county hospitals are consistent across various specifications with different groups of independent variables[40].

[Table 3.11 about here]

Tables 3.12 and 3.13 present the DID estimates for different subgroups. In Table 3.12, the impact of the NRCMS is estimated for different income groups. The results suggest that the decrease in the use of folk doctors is mainly driven by low- and middle-income households, suggesting that the poor are less likely to use informal health services with insurance coverage. The rich have seen a significant increase in the use of village clinics and a decrease in the use of town hospitals. It suggests that the NRCMS seems to be more favourable to the rich in obtaining more convenient access to health services from village clinics. Table 3.13 presents the heterogeneous impact of the NRCMS across regions since the insurance program differs geographically[41]. Larger impacts of the NRCMS are observed for eastern and western provinces. The insured from the eastern provinces are significantly less likely to use folk doctors, village clinics and town hospitals while significantly more likely to use county hospitals and private clinics. On the other hand, people from western provinces have seen significant increase in the use of village clinics, county hospitals and city hospitals while significant decrease in the use of town hospitals and private clinics.

[Tables 3.12 and 3.13 about here]

In conclusion, although the NRCMS appears to have no effect on the use of formal medical care, preventive care and inpatient care, it seems to be associated with a change in type of health facility used when ill. The insured are less likely to use town hospitals, but more likely to use village clinics and county hospitals[42]. The shift from town hospitals to village clinics and county hospitals is inconsistent from the design of the insurance benefit package. The NRCMS provides little coverage for outpatient care delivered by village clinics, and the rate of reimbursement is generally lower in county hospitals than in town hospitals. However, similar results have been found in

[40] Tables A 3.6-A 3.9 (Appendix) show that the significance for the use of town and county hospitals is consistent across different models with various independent variables, while the significance for the use of folk doctors and village clinics only appears in the last model. Similar as before, Table A 3.10 (Appendix) suggests that the significance for the use of folk doctors is driven by the reduction of the sample size, and Table A 3.11 (Appendix) suggests that the significance for the use of village clinics may be due to the addition of facility characteristics. Therefore, the treatment effects on the use of village clinics, town hospitals and county hospitals should be robust.

[41] The eastern provinces are the richest compared with the other two areas while the western provinces are the poorest. Eastern provinces include Liaoning and Shandong provinces. Middle provinces include Heilongjiang, Henan, Hubei and Hunan provinces. Western provinces include Guangxi and Guizhou provinces.

[42] Further robustness checks are shown in Tables A 3.3 and A 3.12 (Appendix). Table A 3.3 presents the results based on different calipers and matching orders for nearest neighbour matching. The significance on the use of village clinics disappears in all four models. In Table A 3.12, we adjust the standard errors by clustering at the community level. The standard errors become much larger, leading to smaller t-statistics and less significant results. The significant effects on the use of village clinics and county hospitals all disappear. However, there may be problems with too few clusters since the number of clusters here is only 28. According to , the number of clusters is considered to be too small if it ranges from less than 20 to less than 50 clusters for balanced clusters and even more for unbalanced clusters.

previous studies as well (Babiarz et al., 2010; Wagstaff et al., 2009a). The results suggest that the NRCMS not only leads to more use of primary care, but also helps patients to receive more specialized and better quality medical care provided by high-level health facilities. The decrease in the use of town hospitals given relatively more generous reimbursement rates may indicate that insured patients are more concerned about the accessibility and quality of health care compared to its price.

3.7 DISCUSSION AND CONCLUSION

This study has evaluated the impact of the NRCMS on health care utilization and people's treatment-seeking behaviour. The programme is found to have little impact on the utilization of formal medical care and preventive care. The results are generally in line with previous studies that suggest limited effectiveness of the NRCMS on overall medical care use in rural China (Babiarz et al., 2010; Babiarz et al., 2012). In addition, this study further looks at the change in treatment-seeking behaviour in terms of different types of health care facilities contacted. The NRCMS is found to redistribute utilization across different levels of health facilities through its substitution effects: from town hospitals towards village clinics and county hospitals. The effects are robust across all three causal models. The increase in village clinics and county hospitals is consistent with previous work by Wagstaff et al. (2009a), however, this study is the first to find the reduction of town hospitals utilization and the substitution effect across different levels of health facilities.

The limited effects of the NRCMS on overall utilization of formal medical care and preventive care suggest that the insurance may still leave patients with a significant financial burden, which may be attributed to limited coverage benefits with large deductibles, low ceilings and high coinsurance rates under the scheme. Therefore, adequate financial resources may have to be put in place to support the insurance programme effectively. However, it has also been found that many rural counties keep a large surplus of the NRCMS funds in order to prevent the outbreak of large disease shocks that would affect the entire population in the county (Mao, 2005). County administrators are afraid that it would lead to the bankruptcy of the NRCMS financial system, and therefore set high co-payment rates to save money. To address this problem, policy makers are advised to enlarge the NRCMS risk pooling level gradually from local-level to provincial-level and even the national-level, which will help to establish a broader financing pool but will also lead to a high administrative cost.

The substitution effect across different levels of health facilities may be an indication that the NRCMS alleviates financial barriers to accessing village clinics and higher levels of care and thus responds to an unmet need. The insured may have received health care more conveniently since village clinics are usually the easiest to be accessed for most rural residents in China. However, it may increase patient flow and shift uncompensated responsibilities to village clinics. The increase in the use of county hospitals indicates that insured people may be able to use better quality of care, since county hospitals are generally better-equipped and staffed than town hospitals. However, the opportunity cost of accessing care at higher-level health facilities may also be large, and the potential barriers are particularly high for the rural poor. Therefore, policy makers should perhaps pay more attention to upgrade town hospitals and build a functioning referral system to ensure that patients can be treated at the most appropriate and cost-effective level of care. More funding and training at primary health care level may be needed to strengthen the infrastructure of village clinics in rural areas.

One caveat should be noted here. Since the utilization of different levels of health facilities is based on the type of care the respondent declares that the household could use, there may be some deviation between actual utilization and the response to this question. In fact, the correlation between the actual utilization of different levels of health facilities and what respondents claim to use is around 20-30% among people who reported to be sick in the last four weeks. Therefore, attention should be paid to interpret our findings here since the change in the stated utilization pattern may not reflect any change in actual behaviour.

Future research should focus on how the type of health care that patients receive changes as a result of the insurance. As patients become more inclined to seek care from county hospitals, it is worthwhile to see whether they would receive more costly tests, drugs and medical interventions that the patients would not have chosen if they are not covered by the insurance. Future studies can also examine the magnitude of the health gains associated with the change in the utilization pattern and how far welfare can be improved after expanding insurance coverage. In addition, the cost-effectiveness of the insurance depends on the size of deductibles and ceiling, the coinsurance rate and the range and type of services covered may also be of interest. As the NRCMS continues to expand and evolve, it is worthwhile to explore the variations of benefit designs in different regions and compare the effectiveness of different benefit packages. Such research would be particularly meaningful if they can give appropriate deductibles and co-payment rates to maximize population health under financial constraint.

Table 3.1: Reimbursement rules of the NRCMS for inpatient spending by area

Area	Healthcare provider level	Reimbursement rule (median)		
		Deductible (RMB)	Ceiling (RMB)	Coinsurance (%)
National	Township health centre	200	10,000	45-65
	County hospital	305	10,000	50-70
	Higher level hospital	500	10,000	55-80
East	Township health centre	400	20,000	40-70
	County hospital	500	20,000	50-75
	Higher level hospital	900	20,000	52-80
Central	Township health centre	100	10,000	45-70
	County hospital	300	10,000	50-70
	Higher level hospital	551	10,000	50-75
West	Township health centre	100	5,000	50-55
	County hospital	200	5,000	55-70
	Higher level hospital	400	5,350	60-70

Sources: The New Cooperative Medical Scheme in China (You and Kobayashi, 2009)

Table 3.2: Summary statistics of dependent and independent variables

	Uninsured	Insured	Difference	p-value
Dependent variables				
Formal medical care	0.01	0.01	0.00	0.83
Preventive care	0.02	0.03	-0.01	0.02*
Folk doctor utilization	0.06	0.03	0.04	0.00***
Inpatient care	0.06	0.07	-0.01	0.67
Village clinics (actual utilization)	0.25	0.46	-0.21	0.00***
Town hospitals (actual utilization)	0.24	0.17	0.07	0.05
County hospitals (actual utilization)	0.14	0.14	-0.00	0.99
City hospitals (actual utilization)	0.14	0.05	0.09	0.00**
Private clinics (actual utilization)	0.18	0.13	0.05	0.12
Village clinics (household preference)	0.35	0.56	-0.21	0.00***
Town hospitals (household preference)	0.38	0.31	0.07	0.00***
County hospitals (household preference)	0.18	0.17	0.00	0.81
City hospitals (household preference)	0.12	0.04	0.09	0.00***
Private clinics (household preference)	0.24	0.12	0.11	0.00***
Independent variables				
Individual-level characteristics				
Age	44.03	43.31	0.72	0.21
Female	0.52	0.52	0.00	0.80
Marital status	0.83	0.87	-0.04	0.00**
Illiterate	0.33	0.30	0.03	0.05*
Primary	0.21	0.27	-0.06	0.00***
Junior high school	0.32	0.33	-0.01	0.52
Senior high school and above	0.14	0.10	0.04	0.00***
Working	0.59	0.68	-0.09	0.00***
Farmer	0.38	0.52	-0.14	0.00***
Chronic diseases	0.08	0.11	-0.03	0.00**
Overweight	0.37	0.40	-0.03	0.07
Smoker	0.24	0.27	-0.02	0.08
Daily alcohol drinker	0.07	0.08	-0.01	0.12
Household-level characteristics				
Age of household head	52.48	49.30	3.18	0.00***
Fraction age <18	0.09	0.10	-0.01	0.02*
Fraction age >55	0.28	0.25	0.03	0.00**
Female household head	0.21	0.17	0.04	0.00**
Household size	4.36	3.93	0.44	0.00***
Minority ethnicity	0.21	0.18	0.03	0.02*
Household head married	0.87	0.89	-0.02	0.02*
Eastern provinces	0.11	0.30	-0.20	0.00***
Middle provinces	0.60	0.49	0.11	0.00***
Western provinces	0.30	0.21	0.09	0.00***
Household income	9.25	9.43	-0.19	0.00***
Asset index	1.43	1.25	0.17	0.00***
Household head illiterate	0.32	0.22	0.10	0.00***
Household head completed primary school	0.24	0.27	-0.02	0.09
Household head completed junior high school	0.31	0.36	-0.05	0.00***
Household head completed senior high school or above	0.12	0.15	-0.02	0.03*
Household head is a farmer	0.41	0.57	-0.16	0.00***
Working ratio	0.40	0.46	-0.06	0.00***
Household head has chronic disease	0.10	0.11	-0.01	0.12
Chronic disease ratio	0.06	0.08	-0.02	0.00***
Household head is overweight	0.66	0.66	0.00	0.76
Household head is smoker	0.55	0.55	0.00	0.94
Household head is daily drinker	0.15	0.18	-0.03	0.01**
Travel time to the nearest health facility	13.17	10.18	2.99	0.00***
Travel cost to the nearest health facility	0.36	0.50	-0.14	0.10
Waiting time	7.93	3.76	4.17	0.00***
Treatment cost of a common cold	24.81	33.73	-8.92	0.00***
Presence of public health facilities in the community	0.68	0.81	-0.13	0.00***
N	2670	1883		

Notes: * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level.

*** indicates statistical significant at the 1% level.

Table 3.3: Impact of the NRCMS on formal medical care, preventive care, folk doctors and inpatient care from 1991 to 2006 (logit marginal effects)

	Formal medical care	Formal medical care	Preventive care	Preventive care	Folk doctor utilization	Folk doctor utilization	Inpatient care	Inpatient care
NRCMS	-0.006*	-0.003	0.014***	0.005***	-0.001	-0.005	-0.018	0.019
	(0.003)	(0.003)	(0.002)	(0.001)	(0.005)	(0.006)	(0.018)	(0.018)
Age	0.000***	0.000***	-0.000***	-0.000	0.001***	0.001***	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Female	0.004**	-0.001	0.003***	0.003**	0.005*	0.002	0.001	-0.014
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.005)	(0.011)	(0.015)
Household size	-0.000	0.000	-0.001	-0.000	0.002*	0.002	-0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)	(0.004)
Minority ethnicity	-0.005	-0.003	-0.010***	-0.006***	-0.010*	-0.003	0.037**	0.022
	(0.003)	(0.003)	(0.003)	(0.002)	(0.005)	(0.005)	(0.015)	(0.015)
Married	0.000	0.002	-0.007***	-0.002*	0.000	0.002	-0.005	-0.001
	(0.003)	(0.003)	(0.001)	(0.001)	(0.004)	(0.005)	(0.013)	(0.015)
Eastern provinces	-0.007**	-0.007**	-0.000	0.002	-0.004	0.006	0.029*	0.021
	(0.003)	(0.003)	(0.002)	(0.002)	(0.005)	(0.006)	(0.016)	(0.018)
Middle provinces	-0.010***	-0.009***	-0.000	0.001	-0.016***	-0.003	0.030**	0.007
	(0.003)	(0.002)	(0.002)	(0.001)	(0.005)	(0.005)	(0.014)	(0.015)
Household income		0.001		0.001***		0.001		0.001
		(0.001)		(0.000)		(0.001)		(0.007)
Asset index		-0.002		0.002		-0.005		-0.008
		(0.002)		(0.001)		(0.004)		(0.012)
Primary school		0.005**		-0.002		-0.017***		-0.011
		(0.003)		(0.001)		(0.005)		(0.015)
Junior high school		0.000		-0.003		-0.018***		-0.011
		(0.003)		(0.002)		(0.006)		(0.020)
Senior high school or above		-0.001		0.001		-0.020**		-0.054*
		(0.004)		(0.002)		(0.009)		(0.032)
Working		-0.003		-0.001		-0.005		0.000
		(0.003)		(0.001)		(0.006)		(0.019)
Farmer		-0.004		-0.003**		0.005		-0.035*
		(0.003)		(0.001)		(0.006)		(0.019)
Chronic diseases		0.012***		0.005***		-0.005		0.036**
		(0.002)		(0.001)		(0.006)		(0.014)
Overweight		0.001		0.002**		-0.002		-0.033**
		(0.002)		(0.001)		(0.004)		(0.014)
Smoker		-0.003		-0.001		-0.001		-0.033*
		(0.003)		(0.001)		(0.005)		(0.018)
Daily alcohol drinker		-0.015***		-0.000		-0.006		-0.007
		(0.006)		(0.002)		(0.007)		(0.031)
Travel time to nearest health facility		-0.000		0.000**		0.000		-0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Travel cost to nearest health facility		0.000**		-0.000		0.001*		0.011***
		(0.000)		(0.000)		(0.001)		(0.003)
Waiting time		0.000***		0.000		-0.000		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Treatment cost of a common cold		0.000		0.000		-0.000		-0.000

		(0.000)		(0.000)		(0.000)		(0.000)
Presence of public health facilities in the community		0.003		0.000		0.000		-0.016
		(0.002)		(0.001)		(0.005)		(0.015)
N	9114	6085	36275	19617	12069	7829	2463	1546

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 3.4: Impact of the NRCMS on actual utilization of village clinics, town hospitals, county hospitals, city hospitals and private clinics from 1991 to 2006 (logit marginal effects)

	Village clinics	Village clinics	Town hospitals	Town hospitals	County hospitals	County hospitals	City hospitals	City hospitals	Private clinics	Private clinics
NRCMS	0.123***	0.174***	-0.044	-0.047	-0.020	-0.041	-0.056***	-0.030	-0.032	-0.050
	(0.031)	(0.040)	(0.032)	(0.042)	(0.026)	(0.034)	(0.021)	(0.023)	(0.029)	(0.036)
Age	-0.000	0.002**	-0.001	-0.000	0.001*	-0.001	0.001*	0.000	-0.001**	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Female	-0.018	0.009	-0.018	-0.017	0.050***	0.029	-0.001	0.002	-0.006	0.022
	(0.020)	(0.031)	(0.017)	(0.027)	(0.016)	(0.027)	(0.010)	(0.015)	(0.017)	(0.025)
Household size	0.003	0.006	-0.003	0.001	0.005	-0.001	0.005	0.005	-0.010	-0.014*
	(0.009)	(0.010)	(0.007)	(0.008)	(0.007)	(0.008)	(0.004)	(0.004)	(0.007)	(0.008)
Minority ethnicity	-0.065	-0.086*	0.068	0.074*	0.049	0.084**	-0.086***	-0.070***	0.023	0.000
	(0.049)	(0.050)	(0.043)	(0.043)	(0.035)	(0.036)	(0.027)	(0.026)	(0.037)	(0.035)
Married	0.001	-0.024	0.018	0.037	-0.008	-0.005	0.015	0.034**	-0.027	-0.039
	(0.028)	(0.033)	(0.026)	(0.031)	(0.022)	(0.028)	(0.014)	(0.016)	(0.021)	(0.025)
Eastern provinces	0.142***	0.153***	0.033	0.022	-0.034	-0.064*	-0.025	-0.013	-0.096***	-0.059*
	(0.045)	(0.050)	(0.040)	(0.045)	(0.031)	(0.035)	(0.021)	(0.020)	(0.036)	(0.036)
Middle provinces	0.056	0.099**	0.075**	0.066	-0.054*	-0.038	-0.007	-0.007	-0.061*	-0.092***
	(0.040)	(0.040)	(0.035)	(0.041)	(0.029)	(0.030)	(0.018)	(0.018)	(0.032)	(0.033)
Household income		-0.015		-0.003		0.011		-0.004		0.022**
		(0.012)		(0.011)		(0.009)		(0.004)		(0.009)
Asset index		-0.126***		-0.027		0.097***		0.012		-0.003
		(0.027)		(0.023)		(0.018)		(0.010)		(0.020)
Primary school		0.045		-0.016		0.008		-0.017		0.020
		(0.037)		(0.031)		(0.029)		(0.015)		(0.028)
Junior high school		0.037		-0.038		-0.001		-0.003		0.007
		(0.042)		(0.035)		(0.034)		(0.018)		(0.031)
Senior high school or above		0.011		-0.075		-0.046		0.022		0.050
		(0.056)		(0.056)		(0.048)		(0.021)		(0.044)
Working		0.103**		-0.010		0.007		-0.047***		-0.047
		(0.044)		(0.037)		(0.030)		(0.014)		(0.030)
Farmer		-0.000		0.033		-0.078***		-0.006		0.074**
		(0.037)		(0.036)		(0.029)		(0.018)		(0.029)
Chronic diseases		-0.066*		0.020		0.029		0.011		-0.049
		(0.037)		(0.030)		(0.026)		(0.014)		(0.035)
Overweight		0.021		-0.025		-0.021		0.019		-0.001
		(0.028)		(0.024)		(0.022)		(0.013)		(0.023)
Smoker		-0.019		0.019		-0.039		0.035**		0.023
		(0.035)		(0.033)		(0.032)		(0.016)		(0.026)
Daily alcohol drinker		0.091*		-0.044		-0.019		-0.010		-0.008
		(0.049)		(0.052)		(0.042)		(0.023)		(0.041)
Travel time to nearest health facility		-0.002		0.000		0.001**		-0.000		-0.000
		(0.002)		(0.000)		(0.000)		(0.000)		(0.000)
Travel cost to nearest health facility		-0.035*		0.004		0.009		0.002		-0.023*
		(0.020)		(0.006)		(0.018)		(0.002)		(0.013)
Waiting time		-0.001		0.000		0.001		0.000		-0.000
		(0.002)		(0.001)		(0.001)		(0.000)		(0.001)
Treatment cost of a common cold		-0.001		-0.000		-0.000		0.000*		0.000

		(0.001)		(0.000)		(0.000)		(0.000)		(0.000)
Presence of public health facilities in the community		0.131***		0.043		0.035		-0.040***		-0.120***
		(0.037)		(0.032)		(0.029)		(0.015)		(0.024)
N	2510	1509	2510	1509	2510	1509	2510	1509	2510	1509

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 3.5: Impact of the NRCMS on stated household preference of village clinics, town hospitals, county hospitals, city hospitals and private clinics from 1991 to 2006 (logit marginal effects)

	Village clinics	Village clinics	Town hospitals	Town hospitals	County hospitals	County hospitals	City hospitals	City hospitals	Private clinics	Private clinics
NRCMS	0.127***	0.204***	-0.120***	-0.108***	-0.183***	-0.191***	-0.026***	-0.024***	-0.016	-0.030*
	(0.018)	(0.025)	(0.018)	(0.025)	(0.019)	(0.025)	(0.008)	(0.008)	(0.013)	(0.016)
Age of household head	0.000	0.000	0.000	-0.001	-0.001**	-0.001	0.000	-0.000	0.001***	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Fraction age <18	0.045	-0.066*	0.165***	0.113***	-0.051*	0.010	-0.042***	-0.016	-0.037*	-0.044*
	(0.029)	(0.037)	(0.030)	(0.036)	(0.026)	(0.033)	(0.012)	(0.011)	(0.019)	(0.023)
Fraction age >55	-0.007	-0.047	0.007	-0.037	0.003	0.034	-0.018*	-0.007	-0.022	-0.027
	(0.024)	(0.030)	(0.025)	(0.030)	(0.021)	(0.027)	(0.009)	(0.008)	(0.015)	(0.017)
Female household head	-0.110***	-0.066***	-0.070***	-0.016	0.100***	0.075***	0.005	-0.008	-0.014	-0.034***
	(0.015)	(0.019)	(0.016)	(0.019)	(0.013)	(0.016)	(0.006)	(0.005)	(0.009)	(0.012)
Household size	0.015***	0.002	0.023***	0.012**	0.004	0.008	-0.001	0.002	-0.007***	-0.007**
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.003)
Minority ethnicity	-0.155***	-0.161***	-0.074***	-0.086***	0.043**	0.084***	-0.085***	-0.056***	0.061***	0.044***
	(0.020)	(0.021)	(0.023)	(0.025)	(0.017)	(0.018)	(0.011)	(0.008)	(0.009)	(0.011)
Household head married	-0.007	-0.040*	0.019	0.013	-0.021	0.004	0.000	0.001	-0.008	-0.015
	(0.017)	(0.021)	(0.018)	(0.021)	(0.014)	(0.018)	(0.006)	(0.005)	(0.010)	(0.012)
Eastern provinces	0.182***	0.092***	0.235***	0.266***	0.098***	0.125***	-0.061***	-0.042***	-0.143***	-0.132***
	(0.020)	(0.023)	(0.022)	(0.025)	(0.016)	(0.019)	(0.007)	(0.006)	(0.010)	(0.013)
Middle provinces	0.082***	0.094***	0.139***	0.147***	-0.093***	-0.091***	-0.045***	-0.030***	-0.071***	-0.094***
	(0.019)	(0.021)	(0.021)	(0.023)	(0.016)	(0.018)	(0.006)	(0.005)	(0.009)	(0.011)
Household income		-0.010**		0.011**		0.009**		-0.001		0.005
		(0.005)		(0.005)		(0.004)		(0.001)		(0.003)
Asset index		-0.174***		-0.077***		0.080***		0.017***		0.007
		(0.014)		(0.013)		(0.011)		(0.003)		(0.007)
Household head completed primary school		0.029		-0.082***		-0.002		0.022***		-0.009
		(0.020)		(0.021)		(0.017)		(0.006)		(0.012)
Household head completed junior high school		0.021		-0.084***		-0.004		0.010		0.013
		(0.023)		(0.023)		(0.020)		(0.006)		(0.013)
Household head completed senior high school or above		0.018		-0.071**		0.046**		0.016**		-0.013
		(0.029)		(0.028)		(0.023)		(0.007)		(0.017)
Working ratio		0.076***		-0.006		0.004		-0.001		-0.044***
		(0.027)		(0.027)		(0.024)		(0.007)		(0.015)
Household head is a farmer		0.077***		0.142***		-0.120***		-0.022***		-0.024**
		(0.016)		(0.016)		(0.014)		(0.005)		(0.010)
Household head has chronic disease		-0.022		-0.050		-0.002		-0.007		0.027
		(0.032)		(0.033)		(0.028)		(0.009)		(0.019)
Chronic disease ratio		-0.053		-0.015		0.029		0.026*		-0.026
		(0.059)		(0.061)		(0.052)		(0.015)		(0.035)
Household head is overweight		0.040***		-0.069***		-0.001		0.004		0.019**
		(0.015)		(0.015)		(0.012)		(0.004)		(0.009)
Household head is smoker		-0.033**		-0.013		0.033***		-0.007*		0.008
		(0.014)		(0.014)		(0.013)		(0.004)		(0.008)
Household head is daily drinker		0.020		0.035**		-0.038**		0.003		-0.017*
		(0.017)		(0.017)		(0.015)		(0.004)		(0.010)
Travel time to nearest health facility		-0.008***		0.002**		0.002***		0.000*		0.000

		(0.001)		(0.001)		(0.000)		(0.000)		(0.000)
Travel time to nearest health facility		-0.036***		-0.015**		0.004		0.004*		-0.003
		(0.012)		(0.006)		(0.004)		(0.002)		(0.006)
Waiting time		-0.003***		-0.001		0.002***		0.000***		-0.003***
		(0.001)		(0.000)		(0.000)		(0.000)		(0.001)
Treatment cost of a common cold		-0.003***		-0.000		-0.001**		0.000***		-0.001***
		(0.001)		(0.000)		(0.000)		(0.000)		(0.000)
Presence of public health facilities in the community		0.257***		0.128***		0.010		-0.024***		-0.086***
		(0.017)		(0.017)		(0.014)		(0.004)		(0.009)
N	42079	23445	42079	23445	42079	23445	42079	23445	42079	23445

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 3.6: Impact of the NRCMS on medical care utilization and stated preference of different levels of health facilities using DID and NN matching with DID (logit marginal effects)

	Formal care	Preventive care	Folk doctor use	Inpatient care	Village clinics	Town hospitals	County hospitals	City hospitals	Private clinics
Difference-in-difference estimation									
NRCMS treatment effect	-0.001	0.001	-0.020**	0.043	0.117***	-0.160***	0.097***	0.009	-0.000
	(0.005)	(0.001)	(0.009)	(0.035)	(0.038)	(0.036)	(0.034)	(0.009)	(0.023)
NRCMS treatment group	0.003	0.000	-0.009	0.008	0.154***	-0.020	-0.110***	-0.021***	-0.084***
	(0.003)	(0.001)	(0.007)	(0.023)	(0.023)	(0.023)	(0.018)	(0.005)	(0.013)
After policy period 2006	-0.003	-0.001	0.009	0.012	-0.063**	-0.028	-0.119***	-0.009	-0.048***
	(0.004)	(0.001)	(0.008)	(0.031)	(0.030)	(0.027)	(0.028)	(0.007)	(0.014)
N	3952	9480	4740	714	14793	14793	14793	14793	14793
Difference-in-difference estimation weighted by nearest neighbour matching									
NRCMS Treatment effect	0.005	0.004*	-0.029**	0.000	0.113**	-0.195***	0.102*	---	0.002
	(0.006)	(0.002)	(0.012)	(---)	(0.055)	(0.049)	(0.053)	(---)	(0.033)
Treatment group	0.002	-0.001	-0.001	-0.003	0.192***	0.022	-0.090***	---	-0.101***
	(0.003)	(0.001)	(0.007)	(0.005)	(0.030)	(0.029)	(0.022)	(---)	(0.016)
Policy period	-0.006	-0.003	0.014	---	-0.060	0.019	-0.139***	---	-0.060***
	(0.005)	(0.002)	(0.012)	(---)	(0.041)	(0.037)	(0.039)	(---)	(0.020)
N	1635	4394	2268	109	7984	7984	7984	---	7984

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level. Control variables for DID models that are used in the model but not reported include: age, gender, household size, ethnicity, marital status, household income, asset index, education levels, occupation, chronic disease, community health facility characteristics and geographical dummies. [b] Since the question 'Any formal medical care in last four weeks' is only asked in survey waves 2004 and 2006, samples used for formal care are only from these two waves. [c] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement. [d] --- means that the coefficient of the variable is omitted in the regression.

Table 3.7: Impact of the NRCMS on use of folk doctors using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Folk doctors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.020	-0.021	-0.020	-0.021	-0.021	-0.020	-0.029**
	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)	(0.014)	(0.012)
NRCMS	-0.004	-0.002	-0.001	-0.001	-0.001	0.000	-0.001
	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.007)
2006	0.024**	0.024**	0.022**	0.022**	0.023**	0.022*	0.014
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Time trends	0.009*	0.009**	0.010**	0.010**	0.009**	0.009**	0.009*
	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Age	0.001***	0.001***	0.001**	0.000	0.000	0.000	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.010**	0.009**	0.006	0.004	0.004	0.005	0.001
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.007)	(0.006)
Household size	0.003**	0.003*	0.003*	0.003*	0.003*	0.003*	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Minority ethnicity	-0.008	-0.008	-0.008	-0.008	-0.009	-0.005	0.005
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Married	0.019**	0.015*	0.015*	0.016**	0.016**	0.014*	0.010
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Eastern provinces	0.009	0.005	0.004	0.002	0.002	0.004	0.014
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Middle provinces	-0.019**	-0.019**	-0.018**	-0.019**	-0.020**	-0.018**	0.001
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)
Household income		0.005	0.005	0.006	0.006	0.006	0.005**
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
Asset index		-0.017***	-0.015***	-0.016***	-0.016***	-0.017***	-0.008
		(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)
Primary school			-0.014*	-0.014*	-0.015*	-0.015*	-0.014**
			(0.008)	(0.008)	(0.008)	(0.009)	(0.006)
Junior high school			-0.011	-0.011	-0.011	-0.010	-0.001
			(0.010)	(0.010)	(0.010)	(0.010)	(0.008)
Senior high school or above			-0.008	-0.008	-0.008	-0.006	0.003
			(0.014)	(0.014)	(0.014)	(0.015)	(0.010)
Working				-0.012	-0.012	-0.010	-0.005
				(0.010)	(0.011)	(0.011)	(0.010)
Farmer				0.006	0.006	0.006	0.001
				(0.010)	(0.010)	(0.011)	(0.009)
Chronic diseases					0.005	0.007	0.005
					(0.008)	(0.009)	(0.008)
Overweight						-0.002	-0.004
						(0.006)	(0.005)
Smoker						0.003	-0.000

						(0.008)	(0.006)
Daily alcohol drinker						-0.013	-0.004
						(0.013)	(0.009)
Travel time to nearest health facility							0.000**
							(0.000)
Travel cost to nearest health facility							-0.010*
							(0.005)
Waiting time							-0.001
							(0.001)
Treatment cost of a common cold							-0.000
							(0.000)
Presence of public health facilities in the community							-0.001
							(0.007)
N	2793	2793	2792	2786	2774	2584	2268

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table 3.8: Impact of the NRCMS on stated household preference of village clinics using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Village clinics	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.004	-0.005	-0.005	-0.008	-0.014	-0.014	0.113**
	(0.044)	(0.045)	(0.045)	(0.044)	(0.044)	(0.044)	(0.055)
NRCMS	0.163***	0.161***	0.163***	0.154***	0.160***	0.162***	0.192***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.030)
2006	-0.044	-0.045	-0.051	-0.051	-0.045	-0.039	-0.060
	(0.031)	(0.032)	(0.032)	(0.032)	(0.033)	(0.033)	(0.041)
Time trends	0.014***	0.032***	0.033***	0.041***	0.040***	0.038***	0.040***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)
Age of household head	0.001	0.000	-0.000	-0.001	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	-0.094*	-0.113**	-0.114**	-0.057	-0.058	-0.048	-0.050
	(0.055)	(0.056)	(0.056)	(0.061)	(0.062)	(0.061)	(0.068)
Fraction age >55	-0.039	-0.065	-0.071	-0.046	-0.043	-0.032	-0.028
	(0.050)	(0.051)	(0.050)	(0.051)	(0.051)	(0.051)	(0.054)
Female household head	-0.069**	-0.039	-0.047	-0.030	-0.038	-0.041	-0.012
	(0.032)	(0.032)	(0.032)	(0.033)	(0.033)	(0.035)	(0.037)
Household size	0.010	0.013	0.013	0.021**	0.020**	0.017**	0.012
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Minority ethnicity	-0.215***	-0.223***	-0.225***	-0.221***	-0.217***	-0.222***	-0.238***
	(0.034)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.036)
Household head married	-0.050	-0.045	-0.035	-0.048	-0.058	-0.066*	-0.048
	(0.036)	(0.037)	(0.038)	(0.038)	(0.036)	(0.037)	(0.040)
Eastern provinces	0.108**	0.091**	0.090**	0.105**	0.093**	0.051	-0.084*
	(0.044)	(0.041)	(0.041)	(0.041)	(0.042)	(0.043)	(0.047)
Middle provinces	0.110***	0.099***	0.101***	0.113***	0.104***	0.082**	0.065*
	(0.034)	(0.035)	(0.035)	(0.036)	(0.036)	(0.036)	(0.038)
Household income		-0.001	-0.001	-0.003	-0.001	-0.001	-0.006
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)
Asset index		-0.169***	-0.166***	-0.166***	-0.163***	-0.173***	-0.171***
		(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.030)
Household head completed primary school			-0.049	-0.043	-0.035	-0.038	-0.061*
			(0.032)	(0.032)	(0.032)	(0.032)	(0.036)
Household head completed junior high school			-0.038	-0.031	-0.026	-0.022	-0.007
			(0.036)	(0.036)	(0.036)	(0.037)	(0.039)
Household head completed senior high school or above			-0.047	-0.042	-0.032	-0.028	-0.024
			(0.050)	(0.052)	(0.052)	(0.052)	(0.055)
Working ratio				0.150***	0.148***	0.131***	0.150***
				(0.050)	(0.050)	(0.051)	(0.056)
Household head is a farmer				0.049*	0.048*	0.060**	0.056*

				(0.027)	(0.027)	(0.027)	(0.030)
Household head has chronic disease					-0.005	0.000	-0.000
					(0.050)	(0.051)	(0.058)
Chronic disease ratio					-0.032	-0.078	-0.058
					(0.113)	(0.114)	(0.117)
Household head is overweight						0.095***	0.117***
						(0.024)	(0.027)
Household head is smoker						-0.013	-0.028
						(0.023)	(0.026)
Household head is daily drinker						-0.002	0.006
						(0.029)	(0.032)
Travel time to nearest health facility							-0.008***
							(0.002)
Travel cost to nearest health facility							-0.039*
							(0.024)
Waiting time							-0.000
							(0.001)
Treatment cost of a common cold							-0.006***
							(0.001)
Presence of public health facilities in the community							0.243***
							(0.029)
N	13135	13135	13117	10177	9897	9791	7984

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table 3.9: Impact of the NRCMS on stated household preference of town hospitals using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Town hospitals	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.107**	-0.109**	-0.107**	-0.113***	-0.104**	-0.107**	-0.195***
	(0.043)	(0.044)	(0.044)	(0.041)	(0.041)	(0.043)	(0.049)
NRCMS	0.025	0.024	0.023	0.013	0.008	-0.002	0.022
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)
2006	0.049	0.048	0.040	0.030	0.021	0.014	0.019
	(0.032)	(0.032)	(0.033)	(0.032)	(0.032)	(0.033)	(0.037)
Time trends	-0.028***	-0.018***	-0.016***	-0.015**	-0.014**	-0.011*	-0.007
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Age of household head	0.001	0.000	-0.000	0.000	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	0.150**	0.144**	0.142**	0.137**	0.139**	0.130**	0.187***
	(0.059)	(0.058)	(0.058)	(0.060)	(0.061)	(0.061)	(0.064)
Fraction age >55	-0.044	-0.052	-0.054	-0.066	-0.051	-0.062	-0.056
	(0.050)	(0.051)	(0.051)	(0.050)	(0.051)	(0.051)	(0.056)
Female household head	-0.040	-0.023	-0.031	-0.017	-0.012	-0.038	-0.014
	(0.029)	(0.029)	(0.028)	(0.027)	(0.027)	(0.029)	(0.030)
Household size	-0.001	-0.001	-0.000	-0.006	-0.006	0.000	-0.008
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Minority ethnicity	-0.027	-0.030	-0.029	-0.029	-0.027	-0.027	-0.006
	(0.041)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Household head married	-0.017	-0.015	-0.009	-0.003	0.003	0.006	-0.015
	(0.039)	(0.039)	(0.040)	(0.037)	(0.037)	(0.038)	(0.040)
Eastern provinces	0.294***	0.286***	0.286***	0.306***	0.315***	0.373***	0.346***
	(0.046)	(0.047)	(0.047)	(0.047)	(0.047)	(0.050)	(0.052)
Middle provinces	0.232***	0.230***	0.229***	0.225***	0.226***	0.253***	0.251***
	(0.041)	(0.040)	(0.040)	(0.040)	(0.041)	(0.041)	(0.041)
Household income		0.009	0.009	0.010	0.012*	0.010	0.018**
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)
Asset index		-0.105***	-0.104***	-0.056**	-0.051**	-0.044*	-0.034
		(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Household head completed primary school			-0.051	-0.065*	-0.066*	-0.059*	-0.061*
			(0.034)	(0.034)	(0.034)	(0.034)	(0.036)
Household head completed junior high school			-0.052	-0.057	-0.063*	-0.063*	-0.069*
			(0.037)	(0.037)	(0.037)	(0.037)	(0.038)
Household head completed senior high school or above			0.016	-0.002	-0.003	-0.001	-0.015
			(0.052)	(0.051)	(0.051)	(0.052)	(0.051)
Working ratio				-0.011	-0.017	-0.003	-0.011
				(0.045)	(0.046)	(0.046)	(0.049)
Household head is a farmer				0.135***	0.138***	0.127***	0.138***

				(0.026)	(0.026)	(0.027)	(0.029)
Household head has chronic disease					-0.032	-0.038	-0.030
					(0.053)	(0.055)	(0.058)
Chronic disease ratio					-0.127	-0.106	-0.120
					(0.099)	(0.100)	(0.111)
Household head is overweight						-0.113***	-0.099***
						(0.024)	(0.025)
Household head is smoker						-0.067***	-0.040
						(0.023)	(0.025)
Household head is daily drinker						0.015	0.002
						(0.027)	(0.029)
Travel time to nearest health facility							0.003**
							(0.001)
Travel cost to nearest health facility							-0.025**
							(0.012)
Waiting time							0.001
							(0.001)
Treatment cost of a common cold							0.000
							(0.001)
Presence of public health facilities in the community							0.072**
							(0.029)
N	13135	13135	13117	10177	9897	9791	7984

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table 3.10: Impact of the NRCMS on stated household preference of county hospitals using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

County hospitals	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	0.121***	0.114***	0.114**	0.117***	0.113**	0.121***	0.102*
	(0.044)	(0.044)	(0.044)	(0.045)	(0.045)	(0.045)	(0.053)
NRCMS	-0.112***	-0.109***	-0.110***	-0.102***	-0.099***	-0.100***	-0.090***
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.022)
2006	-0.177***	-0.174***	-0.172***	-0.159***	-0.161***	-0.159***	-0.139***
	(0.031)	(0.030)	(0.031)	(0.031)	(0.031)	(0.032)	(0.039)
Time trends	-0.006	-0.021***	-0.022***	-0.027***	-0.025***	-0.025***	-0.029***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Age of household head	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	-0.154***	-0.138***	-0.140***	-0.164***	-0.157***	-0.154***	-0.168***
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.052)	(0.058)
Fraction age >55	-0.008	0.019	0.016	0.029	0.022	0.028	0.047
	(0.040)	(0.041)	(0.041)	(0.040)	(0.041)	(0.042)	(0.046)
Female household head	0.079***	0.056**	0.059**	0.036	0.036	0.057**	0.073***
	(0.024)	(0.023)	(0.023)	(0.022)	(0.022)	(0.024)	(0.027)
Household size	0.005	0.002	0.002	0.005	0.007	0.003	0.007
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Minority ethnicity	0.060**	0.071***	0.073***	0.090***	0.090***	0.094***	0.098***
	(0.028)	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)	(0.028)
Household head married	0.010	0.004	0.001	-0.005	-0.004	-0.004	-0.016
	(0.028)	(0.027)	(0.027)	(0.026)	(0.026)	(0.027)	(0.030)
Eastern provinces	0.226***	0.243***	0.243***	0.249***	0.243***	0.239***	0.233***
	(0.027)	(0.027)	(0.027)	(0.026)	(0.026)	(0.027)	(0.031)
Middle provinces	-0.057**	-0.044*	-0.044*	-0.039	-0.043	-0.044*	-0.072**
	(0.028)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.028)
Household income		0.017**	0.016**	0.017**	0.019**	0.018**	0.025**
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.010)
Asset index		0.123***	0.121***	0.100***	0.101***	0.097***	0.099***
		(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.022)
Household head completed primary school			0.013	0.019	0.019	0.019	0.026
			(0.025)	(0.025)	(0.025)	(0.025)	(0.027)
Household head completed junior high school			0.029	0.034	0.037	0.038	0.039
			(0.028)	(0.027)	(0.028)	(0.027)	(0.031)
Household head completed senior high school or above			0.023	0.018	0.022	0.028	0.055
			(0.035)	(0.034)	(0.033)	(0.033)	(0.038)
Working ratio				-0.005	-0.009	-0.016	0.004
				(0.034)	(0.034)	(0.034)	(0.039)
Household head is a farmer				-0.083***	-0.081***	-0.080***	-0.071***

				(0.024)	(0.024)	(0.024)	(0.026)
Household head has chronic disease					-0.058	-0.059	-0.055
					(0.046)	(0.046)	(0.049)
Chronic disease ratio					0.161*	0.174*	0.163*
					(0.094)	(0.094)	(0.096)
Household head is overweight						0.004	0.008
						(0.018)	(0.020)
Household head is smoker						0.069***	0.068***
						(0.019)	(0.022)
Household head is daily drinker						-0.013	-0.019
						(0.022)	(0.025)
Travel time to nearest health facility							0.002**
							(0.001)
Travel cost to nearest health facility							0.007
							(0.008)
Waiting time							0.001
							(0.001)
Treatment cost of a common cold							0.000
							(0.001)
Presence of public health facilities in the community							0.047**
							(0.024)
N	13135	13135	13117	10177	9897	9791	7984

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table 3.11: ITT analysis of the impact of the NRCMS on medical care utilization and stated preference of different levels of health facilities using DID and NN matching with DID (logit marginal effects)

	Formal care	Preventive care	Folk doctor use	Inpatient care	Village clinics	Town hospitals	County hospitals	City hospitals	Private clinics
Difference-in-difference estimation									
NRCMS treatment effect	-0.000	-0.001	-0.026***	0.041	0.103***	-0.152***	0.132***	0.004	-0.012
	(0.004)	(0.002)	(0.008)	(0.032)	(0.034)	(0.032)	(0.033)	(0.010)	(0.019)
NRCMS treatment group	0.002	0.000	-0.006	-0.005	0.120***	-0.005	-0.067***	-0.019***	-0.075***
	(0.002)	(0.001)	(0.005)	(0.018)	(0.019)	(0.019)	(0.015)	(0.005)	(0.011)
After policy period 2006	-0.005	0.001	0.021***	0.007	-0.054*	0.004	-0.152***	-0.014*	-0.043***
	(0.004)	(0.002)	(0.006)	(0.031)	(0.028)	(0.026)	(0.029)	(0.008)	(0.014)
N	5564	16713	6882	1258	19992	19992	19992	19992	19992
Difference-in-difference estimation weighted by nearest neighbour matching									
NRCMS Treatment effect	0.003	0.003	-0.026**	---	0.125***	-0.121***	0.113**	-0.000	-0.069**
	(0.005)	(0.002)	(0.011)	(---)	(0.048)	(0.042)	(0.046)	(0.012)	(0.031)
Treatment group	0.003	-0.001	-0.004	-0.009	0.147***	0.029	-0.079***	-0.017***	-0.089***
	(0.002)	(0.001)	(0.006)	(0.017)	(0.026)	(0.025)	(0.021)	(0.006)	(0.014)
Policy period	-0.006	-0.002	0.018**	---	-0.040	-0.005	-0.112***	-0.007	-0.038**
	(0.004)	(0.002)	(0.008)	(---)	(0.038)	(0.032)	(0.037)	(0.009)	(0.018)
N	2795	6940	3517	247	10063	10063	10063	10063	10063

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level. Control variables for DID models that are used in the model but not reported include: age, gender, household size, ethnicity, marital status, household income, asset index, education levels, occupation, chronic disease, community health facility characteristics and geographical dummies. [b] Since the question 'Any formal medical care in last four weeks' is only asked in survey waves 2004 and 2006, samples used for formal care are only from these two waves. [c] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement. [d] --- means that the coefficient of the variable is omitted in the regression.

Table 3.12: Income subgroup analysis of the impact of the NRCMS on medical care utilization and stated preference of different levels of health facilities using DID (logit marginal effects)

	Richest 25%	Middle 50%	Poorest 25%
Formal medical care	0.002	0.003	-0.003
	(0.004)	(0.005)	(0.004)
Preventive care	-0.004	0.003	0.000
	(0.008)	(0.005)	(0.000)
Folk doctors	0.013	-0.027**	-0.041**
	(0.010)	(0.013)	(0.017)
Inpatient care	0.000	-0.000	0.019
	(---)	(0.043)	(0.023)
Village clinics	0.232**	0.126**	0.049
	(0.102)	(0.051)	(0.067)
Town hospitals	-0.165*	-0.165***	-0.111*
	(0.094)	(0.050)	(0.064)
County hospitals	-0.011	0.144***	0.054
	(0.091)	(0.046)	(0.054)
City hospitals	0.046	-0.012	0.015
	(0.034)	(0.014)	(0.010)
Private clinics	-0.037	-0.027	-0.021
	(0.067)	(0.031)	(0.042)

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level.

Table 3.13: Regional subgroup analysis of the impact of the NRCMS on medical care utilization and stated preference of different levels of health facilities using DID (logit marginal effects)

	Eastern provinces	Middle provinces	Western provinces
Formal medical care	0.016	0.004	-0.002
	(0.010)	(0.005)	(0.006)
Preventive care	0.010	0.007*	0.007
	(0.008)	(0.004)	(0.010)
Folk doctors	-0.048**	-0.018	-0.014
	(0.023)	(0.012)	(0.020)
Inpatient care	-0.024	0.057	0.027
	(0.060)	(0.042)	(0.034)
Village clinics	-3.581***	0.001	0.342***
	(0.118)	(0.050)	(0.081)
Town hospitals	-1.097***	0.091**	-0.162**
	(0.245)	(0.046)	(0.065)
County hospitals	3.263***	0.063	0.157**
	(0.154)	(0.040)	(0.070)
City hospitals	0.053	-0.005	0.077***
	(0.035)	(0.012)	(0.022)
Private clinics	0.706***	0.019	-0.227***
	(0.084)	(0.025)	(0.072)

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level.

Chapter 4

INCOME-RELATED INEQUITY IN ACCESS TO HEALTH CARE IN CHINA: EVIDENCE FROM A LONGITUDINAL HOUSEHOLD SURVEY FROM 2000 TO 2009

4.1 INTRODUCTION

Policy makers are concerned not just with average health outcomes but also with their distribution. China launched a nationwide health care reform in 2003 and committed to achieving affordable and equitable basic health care for all by 2020. Equitable access has been officially declared by the State Council to be the primary aim of the rural health care reform (Yang, 2013). Following the market-liberalizing reforms in 1978, both demand-side subsidies to social health insurance programs, and supply-side subsidies to health facilities disproportionately serve the better-off (Wagstaff et al., 2009b). Health insurance coverage decreased dramatically in the 1990s, especially in rural areas where communes collapsed along with their associated health insurance schemes. In addition, government spending on health is also unequally distributed across provinces given the important role of local governments in the finance of health care systems and inequalities in fiscal capacity. The health care financing relied heavily on out-of-pocket health payments, and the wealthy generally have better access to health care compared to the poor. Consequently, the health and health care utilization in China are decidedly pro-rich by international standards, and there is a widening gap in health status and utilization between urban and rural residents and between the poor and rich population groups (Gao et al., 2002; Liu et al., 1999; Wagstaff, 2009; Zhang and Kanbur, 2005).

This chapter investigates income-related inequity in access to different types of health services and different levels of health facilities in rural China. The analysis focuses on horizontal inequity – people in equal need ought to be treated equally – and compares the actual distribution of medical care use by income with the distribution of need. It then tests for the extent of any observed differentials in use across income groups that cannot be accounted for by need differences. The analysis allows us to address two major issues concerning rural China's current health care system. First, it helps us to find out whether equity in the use of health care has improved in recent years, especially after the expansion of social health insurance in rural areas. Second, to what extent do the non-need factors drive the income-related inequity in health care utilization after controlling for the need differences. The empirical findings in this study will feed back into the policy making process and provide useful insights for other developing countries in moving towards an efficient and equitable health care system.

Recent studies that examine income-related inequity in health care utilization in rural China have found a pro-rich inequity in the use of outpatient and inpatient care (Chen et al., 2015; Wang et al., 2012; Xie, 2011; Zhang et al., 2015; Zhou et al., 2011), preventive care (Yang, 2013), maternal health services (Li et al., 2015; Shen et al., 2014) and treatment of major chronic conditions (Elwell-Sutton et al., 2013; Xie et al., 2014). This paper extends and develops the existing literature in a number of aspects. First, while previous studies only focus on aggregate health care utilization, such as formal medical care, preventive care and folk doctors, this study also shows results for the choice of different levels of health facilities, including village clinics, town hospitals, county hospitals and private clinics. Since various health providers indicate different quality levels of health services, the findings on facility choice could indicate whether the poor have the same access of good quality health care as the rich. Secondly, results on income-related inequity are presented across four waves of data, which last for nearly ten years and cover the period before and after the health care reforms. Since previous studies mainly limit their analysis to a given point of time (Li et al., 2015; Wang et al., 2012; Xie et al., 2014; Zhang et al., 2015), it is worth extending the time period to obtain a more robust picture on how the equity of health care utilization changes over time. Thirdly, the dataset used in this analysis covers nine of China's 31 provinces and provides a much broader picture on health care inequity compared with previous studies, which mainly focus on one or two provinces (Chen et al., 2015; Elwell-Sutton et al., 2013; Li et al., 2015; Shen et al., 2014; Wang et al., 2012).

The paper is organized as follows. Section 2 provides some background information on the health care reform in China since 2003. Sections 3 and 4 describe the model and introduce the dataset. Results are presented in section 5. Section 6 concludes with the implications of the findings for the ongoing efforts to achieve a more equitable health care system in China as well as many other developing countries.

4.2 INSTITUTIONAL BACKGROUND

During the late 1970s, China began transforming itself from a closed centralized planned economy to a market economy. These economic reforms brought dramatic changes to China's health care system and turned it into a market-oriented health system within a few years. China's health care system switched from one that provided preventive and affordable basic health care to all people to one in which many people could not afford basic care and many families are driven into poverty because of large medical expenses (Yip and Hsiao, 2008). The economic liberalization policy in health care sectors caused many problems, including unaffordable access to health services, high rates of financial catastrophe due to large out-of-pocket payments, widened disparities in health and health care utilization and rapidly rising health care costs (Wagstaff et al., 2009b). Among all these problems, the inequity issue in health and health care utilization raised great interest among both academics and policy makers. Some recent studies found a widening gap in health status and utilization from 1978 onwards between urban and rural residents (Liu et al., 1999; Shen et al., 1996; Zhang and Kanbur, 2005) and across people with different income levels (Wagstaff, 2009). Wagstaff et al. (2009) also found that the substantial pro-rich inequalities in child malnutrition in China is high by international standards in the early 2000s.

In 2002, the Chinese government publicly acknowledged the limitations of the health care system and began to implement a series of reforms aimed at addressing various challenges within the system (Central Committee of the Communist Party and State Council, 2002). President Hu stated that the goal of the reform is to ensure that every citizen has equal access to affordable basic health care by 2012 (Yip et al., 2009). The ambitious health care reform plan involves the expansion of health insurance coverage to achieve universal coverage, establishment of a national essential medicines system, improvement of the primary health care at grass-roots level, expansion of the coverage of basic public health services and reform of public hospitals (Yip et al., 2012). The government decided to re-instate its role in health care system for the purposes of equity and provision of public goods. In rural areas, a heavily subsidized voluntary health insurance program known as the New Rural Cooperative Medical Scheme (NRCMS)[43] was introduced, together with a health expenses safety-net program known as Medical Assistance (MA)[44]. On the supply side, large-scale investments were promised to rehabilitate and equip rural health facilities, with a particular focus on investment in infrastructure and provider training at primary health care level (Wagstaff et al., 2009b). Low-level health facilities, such as village clinics and town hospitals, are expected to serve a gate-keeping function in the long run.

The NRCMS was introduced to improve access to health care and provide financial protection to rural residents regardless of demographic and socio-economic characteristics. The key feature of the NRCMS includes being government-led, offering voluntary enrolment, being critical disease-oriented, and being based at the county level (Dong, 2009). The governments provide significant demand subsidies for rural populations to enrol in the NRCMS. The scheme was initiated in 2003 and piloted in hundreds of counties in four provinces. The insurance expanded gradually in the following years and became widespread in all rural counties by 2008. The program is organized and supported by four levels of government: central, provincial, county and township. Local governments have the power to implement the plan at their own discretion. The premium is subsidized by both local and central governments, with central government helping local governments in poor regions. The premium contribution from rural residents is relatively limited[45]. The program is operated at the county level, and county authorities have been given considerable discretion in the design of the benefit packages in terms of risk covered, reimbursement rules for inpatient and outpatient expenses and so on (Wagstaff et al., 2009a). Therefore, the benefit packages vary geographically, but most packages include the coverage for hospitalization and outpatient expenses incurred in the treatment of critical diseases, aiming to alleviate poverty resulting from catastrophic diseases. Deductibles, ceilings and reimbursement rates differ across different levels of health facilities, with favourable policies provided for low-level facilities, such as village clinics and town hospitals. The government tried to direct funds toward primary health care to mitigate the current

[43] NRCMS program is aimed to provide health insurance to more than 800 million rural citizens (around 66 percent of total population) in China.
[44] MA program is aimed to provide financial assistance with health care payments for poorest in both rural and urban areas, especially those covered by the Wu Bao, Te Kun and Di Bao social assistance programs.
[45] When the program was initiated in 2003, the central government contributed 10 yuan per person per year, and local governments matched that contribution with no less than 10 yuan and rural residents contributed 10 yuan per person per year. The premium level keeps increasing over time. In 2008, the central and local governments' contribution increased to 40 yuan per person per year, and individual contribution increased to 20 yuan per person per year.

pressure at city and higher-level hospitals. The insurance coverage and government subsidies have become more generous as more funding goes into the program over time.

On the supply side, the government has tried to reduce the cost of health care by encouraging patients to seek care in low-level health facilities. However, gatekeeping is virtually non-existent in China, where patients traditionally have been free to self-refer to any providers. In addition, patients have a distrust of the quality of care provided by village clinics and town hospitals, and therefore a large share of outpatient and inpatient visits occur at secondary and tertiary hospitals (Eggleston, 2012). In 2005, the government announced its intention to strengthen the primary health care facilities by investing in infrastructure and training of general practitioners. Recent reforms in rural areas include upgrading primary health facilities, encouraging medical students to work for low-level facilities in the central and western parts of the country, and provision of general practitioner training for doctors and health care professionals at town hospitals and village clinics. Providers of primary health care are expected to provide high-quality preventive, primary and home care, and at the same time to serve as gate-keepers, managing referrals to specialist care and hospitals. However, the effort to build up a reliable network of non-hospital-based primary care providers is a difficult and long-term process.

Despite the fact that the NRCMS covered more than 98% of total rural population by the end of 2012, problems such as inadequate financial protection associated with high co-payments still persist, especially for the rural poor. Since the NRCMS mainly covers hospitalization and critical diseases, the enrolled still have to pay for most outpatient fees by themselves (Dong, 2009). In addition, the insurance offers the same benefit packages to all the participants regardless of the fact that the poor usually have greater health needs and spend a larger fraction of their income on health care utilization (Yang, 2013). On the supply side, primary health care facilities have not been able to play a gate-keeping role. Health care delivery remains hospital-centred since most visits and admissions continue to take place at secondary and tertiary hospitals. This creates a barrier for the poor to access health care since hospitals are usually seated far away from most poor households and services are charged at a higher price. The major challenge in strengthening primary health care is a shortage of human resources since retention of qualified health professionals in rural areas has been difficult, especially in poor regions (Yip et al., 2012). Therefore, the effect of the health care reform on reducing inequity in health and health care is expected to be limited.

4.3 DATA

The dataset used in this study is the China Health and Nutrition Survey (CHNS), collected collaboratively by the Carolina Population Centre at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Centre for Disease Control and Prevention. [46] The survey followed a large sample of individuals and households in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011. The CHNS covers nine of China's 31 provinces[47], which spread across eastern,

[46] The China Health and Nutrition Survey is available at: http://www.cpc.unc.edu/projects/china.
[47] The nine provinces are: Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi and Guizhou.

central and western regions and vary substantially in economics and health-related indicators. All counties within the surveyed provinces were stratified by income, and four of them were randomly selected from each province based on a weighted sampling scheme. Villages and townships within the counties were then selected randomly. The survey questions cover demographic, social and economic factors as well as public health risk factors and health outcomes at individual, household and community levels (Popkin et al., 2010).

In this study, three recent waves of the CHNS data (2000, 2004 and 2006) are used to measure the income-related inequity among residents living in rural areas.[48] The analysis is restricted to those rural communities without urban social insurance programs since the urban schemes are designed differently from the rural ones and may confound the contribution of the rural social health insurance to total inequity. The analysis includes a sample of 27,492 observations from four waves.[49]

4.3.1 HEALTH CARE UTILIZATION

The income-related inequity is computed for the utilization of different types of health services (formal medical care, preventive care, folk doctors and inpatient care) and utilization of different levels of health facilities (village clinics, town hospitals, county hospitals and private clinics). Measurement of utilization of formal medical care is based on the question "Did you seek care from a formal medical provider during the past 4 weeks?" A similar question referring to a 4 weeks reference period is used for preventive care: "During the past 4 weeks, did you receive any preventive health service, such as health examination, eye examination, blood test, blood pressure screening, tumour screening?" However, the utilization of folk doctors has a 12-month recall period. The relevant survey question is that "Did you visit a folk doctor last year?" [50]

The utilization of inpatient care and different levels of health facilities is restricted to people who reported to be sick in the last 4 weeks, and therefore has a much smaller sample size. The survey first asks "During the past 4 weeks, have you been sick or injured? Have you suffered from a chronic or acute disease?" and if so "Where did you see a doctor?" and "Was it an outpatient or inpatient visit?" Respondents can choose from 15 types of health facilities in the question on facility choice, which includes both public and private health facilities. Four main categories are selected for health facility choice: village clinic, town hospitals, county hospitals and private clinic. All the utilization variables are defined as 0/1 dummies.

4.3.2 INCOME

[48] These four waves cover the period both before and after the health care reforms. The 2011 wave is not used here because the data is still incomplete. I also exclude 2009 here since it does not have questions about self-assessed health status. In addition, waves before 2000 are not used since they only covered eight provinces. One province was dropped (Liaoning) and one new province was added (Heilongjiang) in 1997 survey. Both the old and new provinces were surveyed since 2000.

[49] Detailed information on the number of observations excluded from the analysis is shown in Table A 4.1 (Appendix). There are 8,293 observations in 2000, 6,854 observations in 2004, 6,369 observations in 2006 and 5,976 observations in 2009. The follow-up rate is not very high. Only 2,965 individuals appear in 4 waves; 2,130 individuals appear in 3 waves; 2,371 individuals appear in 2 waves and 4,500 individuals appear in 1 wave.

[50] Folk doctors are informal medical providers who do not have the licence to practice medicine.

Per capita income data is used as the measure of living standards. The CHNS income measure is net monetary income received by the household members during the reference year and is inflated to 2011 (the last wave of the survey). It includes income from farming, fishing, gardening, livestock and small commercial household business. As the analysis uses health care utilization at individual level as outcome variables, per capita income is computed by dividing the household income by the number of people in the household.

However, previous studies suggest that household income data has limitations in both accuracy and measurement, particularly in the developing countries context. For instance, households may have temporary fluctuations in income levels but still maintain consumption through savings or insurance (Grosh and Glewwe, 2000; O'Donnell et al., 2008). However, household income data may be the only appropriate indicator to be used in this study since China has the highest saving rate in the world, and expenditure or consumption may be distorted by the propensity to save (Sun et al., 2010; Yang, 2013). Therefore, individuals are ranked by income levels here.

4.3.3 NEED FACTORS

Health need is defined as the health care utilization that an individual is expected to receive given his or her age, gender and health status. Age is captured by six dummy variables, namely 18-24, 25-34, 35-44, 45-54, 55-64, 65 and above. 12 variables are created by interacting age with gender, and the reference group is males who are aged between 18 and 24. Health status is measured by self-reported health status, the number of major diseases[51] and illness during the last four weeks preceding the survey[52]. Instead of using a dummy variable to indicate the presence of major diseases, the analysis controls for the number of disease types since poor people are more likely to suffer from more than one conditions (O'Donnell and Propper, 1991; Van Doorslaer et al., 1992). In addition, the symptoms and severity of illness during the past four weeks are also included here since the health utilization variables on inpatient care and different levels of health facilities are only responded by people who report illness during the last month.

4.3.4 NON-NEED FACTORS

The information on insurance coverage includes the enrolment in rural social health insurance, free medical insurance and commercial health insurance. The rural social health insurance variable is based on household level, which equals one if household head reports to be enrolled. The reason to use the household level enrolment is that some household members may be unaware of their enrolment status if only the head makes the decision for the whole household. The relevant survey question is: “what type of medical insurance do you have?”, and respondents can choose from nine types of insurance programs,

[51] Major diseases include hypertension, diabetes, heart disease, stroke and bone fracture.
[52] The 2009 wave is not used here since self-assessed health status (SAH) is missing in the 2009 CHNS survey.

including rural cooperative medical scheme, free medical insurance[53] and commercial health insurance[54]. We define all insurance variables as a 0/1 dummies.

Other non-need/socioeconomic factors include: log of household income, asset index, household size, ethnicity of household head (Han and ethnic minority), marital status, education levels (illiterate, primary school, junior high school, senior high school and above), employment status and geographic dummies (eastern, middle and western provinces).

4.4 METHODOLOGY

Our aim is to measure and explain income-related inequity in health care utilization. A common approach adopted in health economics literature is to focus on horizontal inequity, defined as unequal treatment for people with equal need (Van Doorslaer et al., 2000; Van de Poel et al., 2012; Wagstaff and Van Doorslaer, 2000). It proceeds by comparing the actual observed distribution of medical care use by income with the distribution of need. To measure horizontal inequity in health care utilization, we use the Concentration Indices (CI) to compare the actual observed distribution of medical care use by income with the distribution of health need (O'Donnell et al., 2008; Van Doorslaer et al., 2000; Wagstaff and Van Doorslaer, 2000). The method involves four steps: (1) estimating a model of determinants of health care utilization using a set of need (age, gender and health status) and non-need/socioeconomic variables; (2) predicting need-standardized health utilization for each outcome variable; (3) calculating the CI for actual health care use and for need-standardized health care use; (4) decomposing the contribution of both need and non-need/socioeconomic factors to total inequity.

4.4.1 INDIRECT STANDARDIZATION FOR UTILIZATION OF HEALTH SERVICES

Since health care utilization differs across population groups not only by socio-economic characteristics, but by health needs as well, such as age, gender and health status. The inequality in health care utilization must be standardized for differences in need before it can be interpreted as inequity. After standardization, any residual inequality in utilization by income is regarded as horizontal inequity (HI), which represents the avoidable inequity in health care use. HI is expressed by a difference of actual inequality and need-standardized health care utilization.

There are two ways of standardizing need differences: the direct and indirect methods. In this study, we use indirect standardization because of the following two advantages: i) it is computationally more straightforward; ii) it can be easily applied to individual level data (Van Doorslaer et al., 2000). The indirect method takes the difference between the actual distribution of health care use and the need-expected use. The latter is obtained by standardizing the need variables and setting all the non-need

[53] Free medical insurance is provided for workers working at governmental institutions and their family members. The burden of medical expenses mainly falls on public finance, and individuals pay for a certain proportion of expenses for drugs and hospitalization.
[54] Very few rural residents are covered by other insurance types, such as health insurance for women and children, expanded program of immunization insurance for children and other insurance programs. In addition, the analysis excludes communities where urban social health insurance programs are available.

variables at their sample means. Although the measures of health care use are dummy variables, we use linear estimators since results from non-linear models depend on the arbitrary choice of reference values.

We begin with estimating a linear model of health utilization:

$$y_i = \alpha + \sum_j \beta_j x_{ji} + \sum_k \gamma_k z_{ki} + \varepsilon_i \qquad (4.1)$$

where y_i is utilization of different types of health services (eg. formal medical care, preventive care, folk doctors and inpatient care) or utilization of different levels of health facilities (eg. village clinics, town hospitals, county hospitals and private clinics); *i* denotes the individual; and x_j are a set of need variables associated with health demands that need to be standardized and the z_k are non-need variables for which we do not want to standardize but to control for in order to estimate partial correlations between the need variables and the outcome variables. Probit parameter estimates ($\hat{\alpha}, \widehat{\beta_j}, \widehat{\gamma_k}$), individual values of the need variables (x_{ji}) and sample means of the non-need variables ($\overline{z_k}$) are then used to predict the need-expected health care use $\hat{y}_i^X$:

$$\hat{y}_i^X = \hat{\alpha} + \sum_j \widehat{\beta_j} x_{ji} + \sum_k \widehat{\gamma_k} \overline{z_k} \qquad (4.2)$$

Estimates of need-standardized utilization, $\hat{y}_i^{IS}$ is then given by the difference between actual and need-expected health care use, plus the mean of actual utilization:[55]

$$\hat{y}_i^{IS} = y_i - \hat{y}_i^X + \overline{y_i} \qquad (4.3)$$

The value of $\hat{y}_i^{IS}$ can be interpreted as the distribution of health care utilization that would be expected to be observed, irrespective of differences in the distribution of the need factors across income.

4.4.2 MEASURING INCOME-RELATED INEQUITY IN HEALTH CARE UTILIZATION

The degree of horizontal inequality in health care use can be measured using the well-established method based on the Concentration Curve (CC) and the Concentration Index (CI) (O'Donnell et al., 2008). The CC (Figure 4.1) plots the cumulative distribution of health care utilization against the cumulative distribution of the population ranked by income. If everyone uses exactly the same amount of health care irrespective of his or her income levels, the concentration curve will be a 45-degree line (the line of equality). If the health care use concentrates among the rich (poor) people, the curve will lie below (above) the line of equality.

[Figure 4.1 about here]

The CI is used to quantify the degree of socioeconomic inequality in health care utilization (d'Uva et al., 2009; Van Doorslaer et al., 2000; Van Doorslaer et al., 2004; Van Doorslaer et al., 2006). The CI is defined as twice the area between the CC and the line of equality. CI is zero if the distribution is equal. The index takes a negative value when the curve lies above the line of equality, indicating disproportionate

[55] The reason to add the mean of the need-expected utilization is to ensure that the mean of standardized utilization equals that of actual utilization (O'Donnell et al. 2008).

concentration of the health care utilization among the poor, and a positive value when it lies below the line of equality.

Formally, the CI is defined as:

$$C = 1 - 2\int_0^1 L_h(p)dp \tag{4.4}$$

The CI can be computed by using the "convenient covariance" or "convenient regression". The former one is defined as the covariance between the health care utilization and the fractional rank in the living standards distribution:

$$C = \frac{2}{\mu} cov(y, r) \tag{4.5}$$

where y is health care use and μ is its mean. r is the rank of household income.

Given the relationship between covariance and ordinary least squares (OLS) regression, an equivalent estimate can be obtained using "convenient regression", which regresses a transformation of the health care use on the fractional rank in income (Kakwani et al., 1997):

$$2\sigma_r^2\left(\frac{y_i}{\mu}\right) = \alpha + \beta r_i + \varepsilon_i \tag{4.6}$$

where r_i is the weighted relative fractional rank ($r_i = \frac{1}{N}\sum_{j=1}^{i-1} w_j + \frac{1}{2}w_i$, where w_i is the sampling weight and N is the sample size[56]), and σ_r^2 is the variance of the fractional rank. The OLS estimate of β is an estimate of the Concentration Index equivalent to that obtained from Equation (4.5). In this paper, we use "convenient regression" without transforming the left-hand-side variable but equivalently transforming the rank coefficient. The method helps us to derive the standard error of the CI that takes sampling variability into account. From the regression

$$y_i = \alpha_1 + \beta_1 r_i + \varepsilon_i \tag{4.7}$$

The estimate of the CI is given by

$$CI = (\frac{2\sigma_r^2}{\hat{\mu}})\widehat{\beta_1} \tag{4.8}$$

However, the degree of inequality in the use of health care will indicate inequity only if the need for health care does not vary with income. If this is not the case, we need to compare it with the degree of inequality in health need. The index of horizontal inequity (HI) is computed by using the CI of inequality in need-standardized utilization (Wagstaff and Van Doorslaer, 2000). Robust standard errors clustered at community level are used to account for serial correlation.

[56] The observations are sorted in ascending order of living standard, and the sample weight w_i is sum to 1. However, CHNS dataset doesn't have sampling weight, so we set weight equal to one for all the observations used in this study.

Several recent studies suggest some limitations of the use of CI. Wagstaff (2005) shows that if the outcome variables are binary, the minimum and maximum values of the CI depend on the mean of the outcomes. The bounds are much wider for populations with a low mean than for populations with a high mean. This would complicate the comparison of the values of the CI for populations with different mean levels in health care utilization. Since all the health care utilization variables used in this study are binary, we use Erreygers' Index (EI) to ensure that the range of the inequality indices are always between -1 and 1 (Erreygers, 2009). The EI is formulated as follows:

$$EI = \frac{4\mu}{(b_y - a_y)} CI \tag{4.9}$$

where a_y and b_y denote the lower and upper bound of health care utilization y_i, μ is the population mean of y_i, and CI represents the standard CI specified in Eq. (4.8). In general, the difference between CI and EI is that CI measures relative inequality in the distribution of a variable according to income, while EI measures absolute inequality. In this study, both indices are used to test the sensitivity of our results.

4.4.3 Explaining income-related inequity through decomposition analysis

To explain the potential sources of horizontal inequity in health care utilization, we can decompose the inequity indices into the contribution of various determinants to income-related inequality. Based on OLS regressions, it is computed as the product of the elasticity of health utilization with respect to the factor and the degree of income-related inequality in that factor (Wagstaff et al., 2003).

Although the binary nature of the outcome variables requires a non-linear estimation, decomposition analysis can be applied to non-linear models only by using approximation techniques, which are difficult to implement and interpret (Van Doorslaer et al., 2004). In addition, previous studies have shown that equity measurements calculated by OLS regressions do not differ much from the non-linear estimation (Van Doorslaer et al., 2000; Van Doorslaer and Masseria, 2004). Therefore, OLS regression is used for decomposition analysis. y_i is assumed to be a linear and additively separable function of need (x_{ji}) and non-need (z_{ki}) variables as follows:

$$y_i = \alpha + \sum_j \beta_j x_{ji} + \sum_k \gamma_k z_{ki} + u_i \tag{4.10}$$

The CI for health care utilization can be written as a weighted sum of the concentration indices of the explanatory variables for the use of health services, where the weights represent the sensitivity of health care utilization with respect to each explanatory variable (Wagstaff et al., 2003).

$$CI = \sum_j (\beta_j \bar{x}_j/\mu) C_j + \sum_k (\gamma_k \bar{z}_k/\mu) C_k + GC_u/\mu \tag{4.11}$$

where $\bar{x}_j$ and $\bar{z}_k$ are the means of x_{ji} and z_{ki}, C_j and C_k are the concentration indices for x_{ji} and z_{ki}, and GC_u is the generalized Concentration Index for the error term u_i. The weights for x_{ji} and z_{ki} are the

elasticity of y_i with respect to x_{ji} ($\beta_j \bar{x_j}/\mu$) and z_{ki} ($\gamma_k \bar{z_k}/\mu$), respectively. The first term denotes the partial contribution of need variables, and the second term represents the contribution of the non-need variables. The last term in Equation (4.11) is the residual part, which reflects the income-related inequality in health care utilization that is left unexplained by the model.

The decomposition can be extended to EI by multiplying the CI by 4 and μ:

$$EI = 4 * \left[\sum_j (\beta_j \bar{x_j}) C_j + \sum_k (\gamma_k \bar{z_k}) C_k + GC_u \right] \quad (4.12)$$

The estimated inequality in health care utilization is a weighted sum of the inequality of each explanatory variable, with the weights equal to the elasticity of the variable (Van Doorslaer and Koolman, 2004). Therefore, total inequality can be partitioned into 'potentially avoidable' and 'unavoidable' inequality. The unavoidable part of the inequality is the inequality in utilization outcomes due to need factors (age, gender and health status), while the potentially avoidable inequality is the one driven by non-need factors. Most of the need variables are expected to contribute to pro-poor inequality with positive use elasticity combined with negative concentration indices, while non-need variables usually contribute to pro-rich inequality with positive elasticity and positive concentration indices (Van Doorslaer et al., 2004). In addition, the decomposition method also allows us to identify the importance of each factor in contributing to the income-related inequality of health care utilization.

4.5 RESULTS

The first part of the results shows the trends of average levels of actual health care utilization across years, and then presents the distribution of the actual and need-standardized utilization by income quantiles. Concentration Indices (CI) and Erreygers' Indices (EI) of actual and need-standardized utilization are calculated for different types of health services and different levels of health facilities. Finally, decomposition analysis is conducted to provide details on the explanatory factors driving the inequities in health care utilization.

4.5.1 DIFFERENCES IN HEALTH CARE UTILIZATION ACROSS YEARS

Figure 4.2 shows the variation in the average levels of health care utilization from 2000 to 2009. On average, around 1.3% of the adult population used formal medical care and about 2% used preventive care during the last four weeks. The use of folk doctors refers to a longer recall period that lasts for one year, this may be why the average proportion is higher (3.9%). The fraction of using inpatient care is the highest at around 7.0%, but it has a much smaller sample size given that the question is only answered by people who report to be sick in the last four weeks. From 2000 to 2009, there is a slight decrease in the use of formal medical care while a steady increase in the use of preventive care. Both the utilization of folk doctors and inpatient care decreases from 2000 to 2004, but increases gradually in the following years.

In terms of the utilization of different levels of health facilities[57], village clinics are the most common source of treatment (on average 33%), and visits to town and county hospitals (both average around 20%) rank as the second. Around 16% of the respondents use private clinics. From 2000 to 2009, the probability of seeking care in village clinics increases from 29.8% to 38.7%, while the probability of using private clinics decreases from 17.9% to 13.7%. The likelihood of using town and county hospitals remain stable across years. The increase in the use of village clinics may be closely related to the investment in infrastructure and staff training at primary health facilities along with the health care reform, making village clinics more accessible and offer better quality health services. The decrease in the use of private clinics may indicate that insurance reduces financial burden of patients to access better public health services since the private health care is usually considered to be cheap but of inferior quality. However, these differences should be interpreted carefully since they may reflect differences in the need for health care across years. It is therefore more appropriate to use the need-standardized utilization of health services and facilities for further analysis.

[Figure 4.2 about here]

4.5.2 QUANTILE DISTRIBUTIONS OF HEALTH CARE UTILIZATION

Table 4.1 presents unstandardized and need-standardized quantile distributions of the utilization of different types of health services and different levels of health facilities. The ratio between the top and bottom income quantiles is calculated in the last column. Need is proxied by a vector of 12 age-sex dummies, number of major diseases, one dummy for the presence of illness during the last four weeks, and number of symptoms and severity related to illness. Standardized utilization is obtained by adding the difference between the actual and need-expected health care use per quantile to the mean of the need-expected use. Expected use was estimated based on probit models that standardize only need factors and set all the non-need factors at their sample means.

The use of formal medical care shows a pro-rich inequality in 2004 and a pro-poor inequality in 2006. The magnitudes of the inequality appear to be similar before and after need standardization. The top income group is around 40 per cent more likely to use the formal medical care than the bottom group in 2004, while becomes 20%-35% less likely in 2006.

The use of preventive care is clearly in favour of the high income groups in most years, indicating that the rich appear to receive a higher amount of preventive care than the poor. The largest top-to-bottom quantile ratio appears in 2004, where the top income group reports twice the use of preventive care compared with the bottom group.

The picture is quite different for visits to folk doctors: the top-to-bottom quantile ratio is substantially below one across all waves. The pro-poor inequality increases over years, and the largest difference between the top and bottom quantiles is observed in 2006, with the bottom group 60% more likely to

[57] Similar as the use of inpatient care, the utilization question about health facilities is only answered by people who report to be sick during the last four weeks.

seek care from folk doctors than the top group. The pro-poor distribution pattern may be due to the lower price levels of health services provided by folk doctors compared with those offered by formal medical facilities. However, the quality of care is also perceived to be low for most folk doctors[58]. Poorer people may take the risk of obtaining inferior or even inappropriate treatment from informal medical providers in order to pay a cheap price.

There is some variation in the top-to-bottom ratio for the use of inpatient services across years, which is largely due to the small sample size since very few individuals report using inpatient services during the last four weeks. After standardization, the distributions are generally in favour of the higher income groups. The only exceptions are the top quantile in 2004, where the utilization among the top group appears to be the lowest. The extremely small probability of using inpatient care of the top quantiles should be related to the bias due to small sample size[59]. The gradients based on other quantiles in 2004 still show a pro-rich trend. In general, the rich are still getting a higher share of inpatient services than expected on the basis of their need characteristics.

In terms of the utilization of different levels of health facilities, it is worth noting from Table 4.1 that across all years, people in the poorest quantile are more likely to use village clinics and town hospitals, but less likely to use county hospitals. Almost all the top-versus-bottom ratios for village clinics and town hospitals are below one, while all the ratios are above one for the utilization of county hospitals. The gap between the top and bottom income quantiles stays similar for the use of town hospitals across years, but for the use of village clinics and county hospitals, the gap reduces gradually over time. Until 2006, people in the richest quantile are 45% and 12% less likely to seek care from village clinics and town hospitals, respectively, while nearly 30% more likely to use county hospitals than those in the poorest quantile. Therefore, the rich tend to receive better quality health services than the poor given that county hospitals are usually better equipped and staffed than village clinics and town hospitals.

While the top-versus-bottom ratios are useful in providing insights into the differences in the distributions of health care utilization, the information is incomplete in the sense that they do not depend on the distribution of the middle three quantiles. In the next section, we examine whether the general patterns observed correspond to the results when we use more appropriate inequity measures.

[Table 4.1 about here]

4.5.3 INDICES FOR TOTAL INEQUALITY AND HORIZONTAL INEQUITY

Tables 4.2 and 4.3 present the concentration indices (CI) and Erreygers' indices (EI) for utilization of each type of health care and each level of health facilities by year. Both indices are calculated for actual and need-standardized health care utilization[60]. Any inequality remaining in need-standardized use is interpreted as horizontal inequity (HI), and the magnitude of the indices shows the degree to which there

[58] Folk doctors refer to those private providers who do not have licence to practice medicine and have only limited medical training.
[59] In 2004, only 46 individuals report to use inpatient services, and 5 of them are from the top quantile group.
[60] The graphs of concentration curves for the use of different types of health services and different levels of health facilities can be found in Figure A4.1 – 4.8 (Appendix).

is inequality related to income. Positive (negative) values indicate inequality favouring the rich (poor), and a zero or non-significant value indicates that the use is distributed equally across income groups. The scatter diagrams of horizontal inequity based on CI and EI along with 95% confidence intervals are shown in Figure 4.3.

The probability of using formal medical care shows little evidence of inequality both before and after need standardization. All the CI and EI indices are generally small and insignificant, which indicates that the likelihood of using formal medical care is distributed fairly equally across income groups. The picture is somewhat different for the use of preventive care. The CI and EI indices are positive and mostly significant, suggesting that higher income groups are more intensive users of preventive care than lower income groups. However, the pro-rich trend disappears in 2006 and there is no significant difference of utilization across income groups. We also find substantial pro-poor inequality in the likelihood of contacting folk doctors based on both actual and need-standardized health care utilization. While not all indices are significant, the pro-poor inequality becomes larger over time and lower income groups are about 15-30% more likely to seek medical care from folk doctors in 2006. With respect to the use of inpatient care, both CI and EI indices appear to be insignificant and close to zero in 2000 and 2004. The exception is in 2006 that the indices are significantly positive, indicating the distribution of the use of inpatient care reveals significant pro-rich trend.

The second parts of Tables 4.2 and 4.3 present the CI and EI indices of the utilization in different levels of health facilities, which confirms the trend we observe in Table 4.1. The indices suggest that the use of village clinics is much more frequent among lower-income groups, while the use of county hospitals is more frequent among higher-income groups. We observe a large and significant degree of pro-poor inequity in the use of village clinics in 2004 and 2006, while a significant degree of pro-rich inequity in the use of county hospitals in 2000 and 2004. Possible reasons behind the pro-rich inequity of accessing county hospitals may be that: i) the treatment costs at county hospitals are generally high; ii) county hospitals are usually situated far away from most villages, which leads to a high transport costs; iii) county hospitals often have longer waiting times. Therefore, poorer people are usually only able to use village clinics given the lower price and easy access, even if their quality of care is perceived to be lower.

After standardizing for age, sex, major diseases and illness during the last four weeks, both CI and EI indices have the same sign and significance level and similar magnitudes as the unstandardized ones. In addition, we use EI indices to account for the binary nature of the outcome variables, but the resulting indices do not differ much from the CI indices. In conclusion, there is pro-rich inequity (significantly positive CI and EI indices for need standardized health care utilization) for the use of preventive care and county hospitals, while pro-poor inequity (significantly negative CI and EI indices for need standardized health care utilization) for the use of folk doctors and village clinics. It means that higher income groups are more likely to seek preventive care and receive better quality health services compared with the lower income groups.

[Tables 4.2 and 4.3 about here]

[Figures 4.3-4.8 about here]

4.5.4 DECOMPOSITION ANALYSIS

Having compared the differences in income-related inequities across years and types of health services, it is useful to investigate the potential sources of any inequities using decomposition methods. Tables 4.4-4.6 present the results of decomposition analysis for the EI indices based on OLS regressions, depicting the contribution of both need and non-need/socioeconomic factors to total inequity. All the results are also presented in graphs (Figure 4.9-4.11). The inequality is decomposed into the contribution of three main sources: i) need factors, including age, gender and health status; ii) non-need factors, including household income, education, employment status, insurance, region and other demographics (ethnicity and marital status); iii) residual term. One disadvantage of aggregating the contributions of several variables is that positive and negative contributions may cancel out in the aggregate so that a small contribution may hide larger contributions (Van Doorslaer et al., 2004). Therefore, these three main sources are further divided into more detailed categories: i) age and gender interactions; ii) health status; iii) income; iv) education; v) employment status; vi) health insurance coverage; vii) region; viii) other demographics; ix) residual. The following sections go through each of the contributor.

4.5.4.1 Contribution of need factors

The partial contribution of need factors is, with very few exceptions, negative for nearly all types of care (except for the use of private clinics). It indicates that unequal need distributions account for the pro-poor inequality and lead to less positive or more negative inequity indices. The largest contribution is observed for the use of formal medical care, mainly driven by the very strong pro-poor distribution of health status. However, the extent of the pro-poor distribution of formal medical care itself is not sufficient to match the pro-poor distribution of need. The same is true for the use of preventive care and county hospitals. On the other hand, the actual distribution of folk doctors, village clinics and town hospitals is more pro-poor than required on the basis of needs. It indicates that other socio-economic factors may also play an important role in contributing to the horizontal inequity. Therefore, in the following parts, we decompose the EI indices further into other contributing factors.

4.5.4.2 Contribution of income

In most years, the unequal distribution of income contributes to a more pro-rich distribution of the use of preventive care, county hospitals and private clinics and a more pro-poor distribution of the use of folk doctors, village clinics and town hospitals. It means that the contribution of income is to reduce the use of low quality health services provided by informal doctors and low-level health facilities, while increasing the utilization of better quality health services provided by high-level hospitals. The size of the contribution is quite large, mostly between 30% and 80%. The main difference between income-related inequity in health care utilization (CI and EI indices for need-standardized health care use) and the marginal contribution of income is that the former is obtained by controlling only need factors while the latter is obtained by controlling all other variables except income (Van Doorslaer and Masseria, 2004). Any discrepancy between the inequity indices and the income contribution to inequity must be due to the

contributions of the other non-need variables included. For example, the EI indices for the need-standardized use of preventive care is large and significant while the partial income contribution is relatively small and accounts for less than half of the total inequity. Apparently, the pro-rich inequity is generated through other non-need factors like regional differences. However, the opposite phenomenon occurs for the use of county hospitals in 2000 and 2004: horizontal inequity is to a large extent (nearly 100%) driven by the unequal distribution of income, and the contribution of other non-need factors appears to be negligible. For most types of health care use, the income contribution is smaller than the HI, indicating the importance of other socio-economic factors except income.

4.5.4.3 Contribution of education and employment status

Education and employment status are two other important socio-economic characteristics that may affect the utilization of health care. Differences in medical care use by education level mostly mirror the utilization patterns by income. We also find that more highly educated people are less likely to seek care from folk doctors, village clinics and town hospitals. The contribution of education to pro-rich inequity is particularly large for the use of folk doctors and town hospitals, which suggests that demand-side barriers to health service access may not be fully explained by the lack of income but also related to taste differences in treatment-seeking behaviour in the use of health services.

In theory, labour force participation is not directly related to health care use, therefore, being employed seems to exert very little influence on the degree to which utilization patterns vary by income, with a few exceptions in the use of formal medical care, village clinics and town hospitals. The contribution of employment status appears to be the opposite of the contribution of income and education to horizontal inequity: it contributes to the pro-poor direction for the use of formal medical care, inpatient care and county hospitals, while contributes to the pro-rich direction for the use of village clinics and town hospitals. This could be for two reasons. First, employed people may have higher time costs in terms of accessing health services. Second, those people who are not in the work force may be less healthy and in greater need of care. This might explain why employment status acts in the opposite direction from income and education.

4.5.4.4 Contribution of health insurance coverage

Inequalities in the degree of health insurance coverage may also exert an influence on patterns of health care use by income. We include three insurance dummies: one for cooperative medical insurance, one for commercial health insurance and one for the free medical care insurance. It is worth emphasizing that all rural residents are eligible for cooperative medical insurance irrespective of their income or health status, and this insurance scheme entitles them to basic outpatient and inpatient care subject to a certain amount of co-payments. However, free medical care only targets at people working at governmental institutions, while commercial health insurance usually covers certain hospital services and luxury treatments and targets at the rich population.

The three insurance dummies have the expected opposite effects: commercial health insurance and free medical care increase the pro-rich distribution of most types of health care use, while cooperative

medical scheme decreases it. On average, the cooperative medical scheme does not fully compensate the positive effect of commercial health insurance and free medical care, and therefore, the total contribution of insurance coverage is mostly pro-rich. The only exception is for the use of private clinics, which are not covered by any type of health insurance and mainly provide low-quality health services at a cheap price. The pro-rich contribution of health insurance is particularly large for the use of preventive care, inpatient care, town hospitals and county hospitals. The reason for this turns out to be that the health insurance coverage may help patients to obtain better quality health services.

4.5.4.5 Contribution of regional disparities

Regional disparities in health care utilization are related to health policy making and often mirror the income and socio-economic differences (Van Doorslaer and Masseria, 2004). The nine surveyed provinces are broadly divided into three regions: eastern, middle and western provinces[61]. Income differences appear to be large across these three regions: the eastern provinces have the highest income levels, while the west has the lowest. Income heterogeneity may lead to differences in health care need and access to medical facilities. People living in the eastern region mainly use insurance to protect themselves against catastrophic medical expenses incurred as a result of hospitalization, while people living in the western region may still have difficulties to access basic health services, and a relatively small amount of medical expense can lead to financial hardship and push them below the poverty line. In addition, the eastern region is well supplied with medical services, while the western region has a much more limited availability of good quality health services.

For most types of care, regional variation contributes a great deal to total income-related inequity. It is not surprising that its contribution to income-related use differentials matches the income-related inequity patterns. There are pro-rich regional contributions for the use of formal medical care, preventive care, village clinics and county hospitals and pro-poor regional contributions for the use of folk doctors, inpatient care, town hospitals and private clinics. The regional differences can be interpreted by income differences that capture the regional variations. They reflect that people living in eastern and middle provinces tend to be wealthier and have better access to good quality health services than people living in western provinces. However, the decomposition by region appears to be of particular interest for the use of inpatient care and village clinics. The contribution of region is negative for inpatient care use while positive for village clinic use, which are opposite to the direction of income-related inequity. Possible reasons may be that primary health facilities in eastern and middle provinces are more accessible and of better quality than the western region since the west is still faced with a serious shortage of health resources, which may lead to the dysfunction of village clinics (Liu and Tsegai, 2011). Given limited access to primary health facilities, poor people living in western provinces can only give up outpatient services at primary health facilities and seek inpatient care from high-level hospitals when their illness becomes serious. Hence, the use differences across regions acts differently from income-related use inequalities.

[61] Easter provinces include: Liaoning, Jiangsu and Shandong; Middle provinces include Heilongjiang, Henan, Hubei and Hunan; Western provinces include Guangxi and Guizhou. The reference group is the western provinces.

The picture is much clearer if the decomposition analysis is presented using bar charts (Figures 4.9-4.11). If the health care utilization is equitably distributed across income, the sum of the bars would be equal to the need bar (Van Doorslaer et al., 2004). Any discrepancies between the actual and need-expected distribution would lead to other bars, which are driven by factors such as income, other socio-economic variables or variables not included in the equation. Income accounts for most of the significant pro-rich inequality in the use of preventive care and county hospitals and the significant pro-poor inequality in the use of folk doctor and village clinics. The contribution of insurance and region is generally positive but rather modest compared with income. All other variables show relatively small contributions. Therefore, the substantial horizontal inequity in the use of health care is mainly a consequence of the unequal distribution of income.

[Tables 4.4, 4.5 and 4.6 about here]

[Figures 4.9-4.11 about here]

4.6 DISCUSSION AND CONCLUSION

This paper provides new evidence on the degree to which the utilization of different types of health care services and different levels of health facilities are unequally distributed by income. While it builds on previous work (Yang, 2013), it also offers a number of advances, both in terms of new data analysed and in terms of new methods used. First, it exploits new data on the use of different levels of health facilities. The inequity in seeking care from different health providers may help us to find out whether people from various socio-economic groups consume similar quality levels of health care. Secondly, it extends the data to four waves, covering almost a decade, encompassing the period both before and after the introduction of health care reforms. Finally, it employs new methods for indirect standardization with nonlinear models. Since measures of health care use are typically 0/1 dummy, and ordinary least squares regression would not guarantee that the predicted values from the standardizing regression lie within the range of (0,1), it would be more appropriate to model the determinants of the use/non-use probability using probit models. While such non-linear models have been deployed previously in the European context (Van Doorslaer et al., 2002; Van Doorslaer et al., 2004), they have not been used to standardize differences in health utilization for equity studies in China.

Both simple quantile distribution and inequality indices (the CI and EI) are estimated using regression models to assess the extent to which people in equal need for health care have unequal rates of medical care utilization. The results provide a number of new insights. First, there appears to be relatively little reason for concern about the access to formal medical care. The small and insignificant HI indices suggest that there is little or no horizontal inequity in the case of formal medical care use. Secondly, the distributional pattern is quite different for the use of preventive care. In all years except 2006, the use of preventive care is more concentrated among higher income groups. With respect to folk doctor use, it is clear that the distribution tends to favour the lower income groups. Finally, in terms of the utilization of different levels of health facilities, the poor individuals appear to use village clinics (low-level health

providers) more than the rich, while the rich are more likely to use county hospitals (high-level health providers) and receive better quality health care. Both the CI and EI indices show similar results, that higher income people do have better chances of receiving more preventive care and obtaining better quality health services from higher level hospitals. Decomposition analysis provides further information that the pro-rich inequity is mainly driven by the unequal distribution of income. Other socio-economic characteristics play a relatively modest role in affecting the income-related inequity in health care utilization.

The findings in this paper suggest the existence of pro-rich inequity in the use of preventive care and county hospitals and pro-poor inequity in the use of folk doctors and village clinics. Rich people are significantly more likely to obtain better health services than the poor. The decomposition analysis further helps to track down the sources of inequity for each type of medical care use. It reveals that income itself is the most important factor leading to income-related patterns of use. Among other socio-economic factors, regional disparities and health insurance coverage are the ones that raise greater interest to health policy makers. Differences in health care utilization between richer and poorer regions do make some contribution to income-related inequity in the use of different levels of health facilities. There are pro-rich contributions of regional differences in terms of the use of village clinics and county hospitals and pro-poor contributions for the use of town hospitals and private clinics. The results reflect that eastern regions are better supplied with more convenient and better quality health facilities. The decomposition analysis on health insurance coverage reveals that cooperative medical insurance reduces the pro-rich inequity in health care use; however, the effect is very limited and cannot fully compensate the opposite effects of commercial health insurance and free medical care. Unfortunately, neither regional disparities nor health insurance coverage shows a large and universal contribution to income-related inequity.

The paper suggests that inequities in the use of health care still exist in China's health care system. Based on the empirical findings of this paper, recent health care reforms have had limited impacts on improving equitable access to health services. The poor are still less likely to use preventive care and tend to obtain poor quality health services from low-level health facilities. A possible policy solution is to link co-payments to household income so that to offer better financial protection to the poor. More attention needs to be paid to poor people in rural areas, potentially by offering additional benefits in the social insurance program. A well-designed and regulated health insurance would be helpful in providing more comprehensive coverage for low income participants to help them access more preventive care and better quality health services.

Figure 4.1: Concentration curve of health care use (pro-rich case)

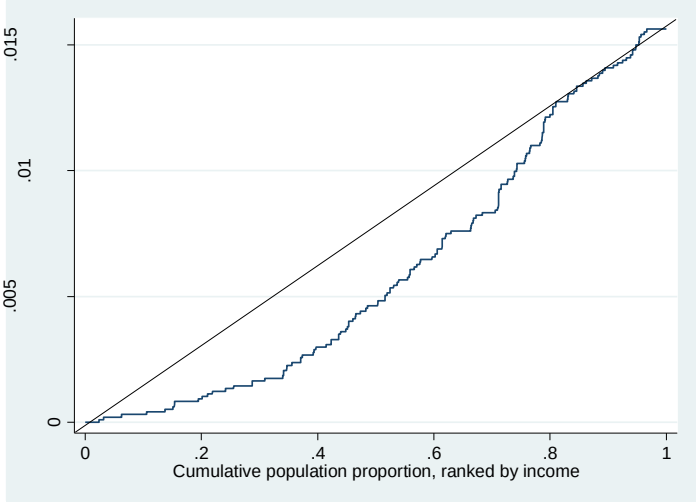
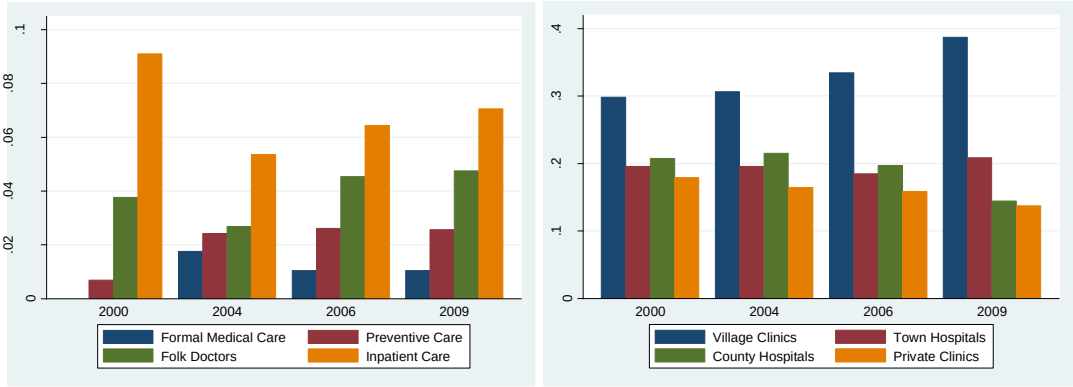


Figure 4.2: Actual utilization of different types of health services and different levels of health facilities across years

(a) (b)



Notes: (a) Average level of actual utilization of formal medical care, preventive care, folk doctors and inpatient care across years (b) Average level of actual utilization of village clinics, town hospitals, county hospitals and private clinics across years

Table 4.1: Quantile distributions of actual and need-standardized utilization of different types of health services and different levels of health facilities

	Poorest	2nd Poorest	Middle	2nd richest	Richest	Q5/Q1
Formal medical care 2004						
Actual Utilization	0.015	0.015	0.017	0.019	0.021	1.373
Need-standardized Utilization	0.014	0.013	0.019	0.021	0.020	1.411
Formal medical care 2006						
Actual Utilization	0.015	0.008	0.006	0.012	0.010	0.653
Need-standardized Utilization	0.014	0.007	0.005	0.013	0.011	0.814
Preventive care 2000						
Actual Utilization	0.015	0.015	0.017	0.019	0.021	1.373
Need-standardized Utilization	0.014	0.013	0.019	0.021	0.020	1.411
Preventive care 2004						
Actual Utilization	0.018	0.013	0.021	0.025	0.043	2.370
Need-standardized Utilization	0.017	0.014	0.019	0.028	0.043	2.508
Preventive care 2006						
Actual Utilization	0.025	0.022	0.024	0.031	0.026	1.039
Need-standardized Utilization	0.025	0.023	0.026	0.031	0.025	1.004
Folk doctors 2000						
Actual Utilization	0.060	0.030	0.042	0.029	0.038	0.626
Need-standardized Utilization	0.058	0.035	0.046	0.031	0.040	0.686
Folk doctors 2004						
Actual Utilization	0.026	0.035	0.036	0.026	0.014	0.558
Need-standardized Utilization	0.024	0.035	0.037	0.026	0.014	0.584
Folk doctors 2006						
Actual Utilization	0.058	0.056	0.046	0.049	0.022	0.377
Need-standardized Utilization	0.056	0.057	0.045	0.047	0.022	0.399
Inpatient care 2000						
Actual Utilization	0.071	0.112	0.045	0.086	0.145	2.029
Need-standardized Utilization	0.033	0.121	0.059	0.078	0.135	4.055
Inpatient care 2004						
Actual Utilization	0.051	0.046	0.076	0.071	0.029	0.582
Need-standardized Utilization	0.054	0.051	0.079	0.079	0.037	0.676
Inpatient care 2006						
Actual Utilization	0.031	0.063	0.061	0.059	0.104	3.343
Need-standardized Utilization	0.034	0.063	0.058	0.057	0.057	1.646
Village clinics 2000						
Actual Utilization	0.262	0.348	0.330	0.271	0.268	1.022
Need-standardized Utilization	0.274	0.299	0.279	0.259	0.183	0.667
Village clinics 2004						
Actual Utilization	0.416	0.314	0.246	0.248	0.284	0.683
Need-standardized Utilization	0.432	0.333	0.272	0.249	0.285	0.660

Village clinics 2006						
Actual Utilization	0.395	0.377	0.368	0.298	0.208	0.526
Need-standardized Utilization	0.409	0.402	0.366	0.297	0.225	0.551
Town hospitals 2000						
Actual Utilization	0.310	0.124	0.148	0.229	0.169	0.546
Need-standardized Utilization	0.298	0.182	0.195	0.247	0.217	0.728
Town hospitals 2004						
Actual Utilization	0.180	0.234	0.175	0.235	0.154	0.856
Need-standardized Utilization	0.174	0.219	0.186	0.240	0.162	0.929
Town hospitals 2006						
Actual Utilization	0.232	0.160	0.153	0.179	0.192	0.827
Need-standardized Utilization	0.228	0.162	0.166	0.176	0.201	0.882
County hospitals 2000						
Actual Utilization	0.107	0.202	0.193	0.200	0.366	3.418
Need-standardized Utilization	0.085	0.200	0.172	0.199	0.354	4.165
County hospitals 2004						
Actual Utilization	0.157	0.137	0.269	0.196	0.337	2.144
Need-standardized Utilization	0.146	0.131	0.253	0.195	0.333	2.282
County hospitals 2006						
Actual Utilization	0.162	0.206	0.160	0.232	0.215	1.328
Need-standardized Utilization	0.167	0.204	0.161	0.226	0.215	1.286
Private clinics 2000						
Actual Utilization	0.202	0.225	0.182	0.229	0.056	0.278
Need-standardized Utilization	0.213	0.216	0.205	0.253	0.097	0.456
Private clinics 2004						
Actual Utilization	0.157	0.211	0.146	0.209	0.095	0.602
Need-standardized Utilization	0.158	0.209	0.139	0.202	0.077	0.485
Private clinics 2006						
Actual Utilization	0.119	0.131	0.139	0.179	0.254	2.135
Need-standardized Utilization	0.118	0.126	0.141	0.184	0.243	2.058

Notes: [a] Q5/Q1=the ratio between the utilization of top income quantile and the utilization of the bottom income quantile

Table 4.2: Concentration indices for total inequality and horizontal inequity for utilization of different types of health services and different levels of health facilities across years

	2000		2004		2006	
	Actual	Standardized	Actual	Standardized	Actual	Standardized
Formal medical care	---	---	0.050	0.076	-0.026	0.015
	---	---	(0.054)	(0.052)	(0.087)	(0.091)
Preventive care	0.337***	0.216**	0.223***	0.228***	0.037	0.016
	(0.072)	(0.086)	(0.057)	(0.055)	(0.063)	(0.058)
Folk doctors	-0.140	-0.122	-0.104**	-0.090*	-0.159***	-0.151***
	(0.140)	(0.148)	(0.047)	(0.049)	(0.042)	(0.043)
Inpatient care	0.092	0.108	-0.046	-0.023	0.217***	0.223***
	(0.108)	(0.110)	(0.079)	(0.078)	(0.065)	(0.068)
Village clinics	-0.029	-0.088	-0.084**	-0.088**	-0.120***	-0.120***
	(0.050)	(0.061)	(0.042)	(0.039)	(0.033)	(0.034)
Town hospitals	-0.060	-0.030	-0.018	-0.018	-0.025	-0.016
	(0.062)	(0.062)	(0.054)	(0.056)	(0.057)	(0.054)
County hospitals	0.164***	0.187***	0.149***	0.171***	0.065	0.054
	(0.061)	(0.070)	(0.053)	(0.055)	(0.041)	(0.043)
Private clinics	-0.111	-0.049	-0.062	-0.086*	0.144***	0.141***
	(0.081)	(0.078)	(0.047)	(0.050)	(0.049)	(0.050)

Notes: [a] Robust standard errors clustered at community level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table 4.3: Erreygers indices for total inequality and horizontal inequity for utilization of different types of health services and different levels of health facilities across years

	2000		2004		2006	
	Actual	Standardized	Actual	Standardized	Actual	Standardized
Formal medical care			0.004	0.005	-0.001	0.001
			(0.004)	(0.004)	(0.004)	(0.004)
Preventive care	0.009***	0.007**	0.021***	0.022***	0.004	0.002
	(0.003)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)
Folk doctors	-0.021	-0.018	-0.011**	-0.010**	-0.029***	-0.027***
	(0.022)	(0.023)	(0.005)	(0.005)	(0.009)	(0.008)
Inpatient care	0.032	0.035	-0.010	-0.006	0.057***	0.060***
	(0.040)	(0.037)	(0.017)	(0.018)	(0.020)	(0.021)
Village clinics	-0.031	-0.084	-0.102**	-0.111**	-0.154***	-0.160***
	(0.059)	(0.058)	(0.051)	(0.049)	(0.043)	(0.046)
Town hospitals	-0.051	-0.027	-0.014	-0.013	-0.021	-0.014
	(0.048)	(0.053)	(0.042)	(0.043)	(0.042)	(0.040)
County hospitals	0.138**	0.142**	0.129***	0.142***	0.052*	0.043
	(0.057)	(0.062)	(0.049)	(0.049)	(0.033)	(0.034)
Private clinics	-0.075	-0.035	-0.040	-0.052*	0.092***	0.088**
	(0.056)	(0.059)	(0.031)	(0.031)	(0.034)	(0.034)

Notes: [a] Robust standard errors clustered at community level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Figure 4.3: CI indices (with 95% confidence intervals) for need-standardized health care use in 2000

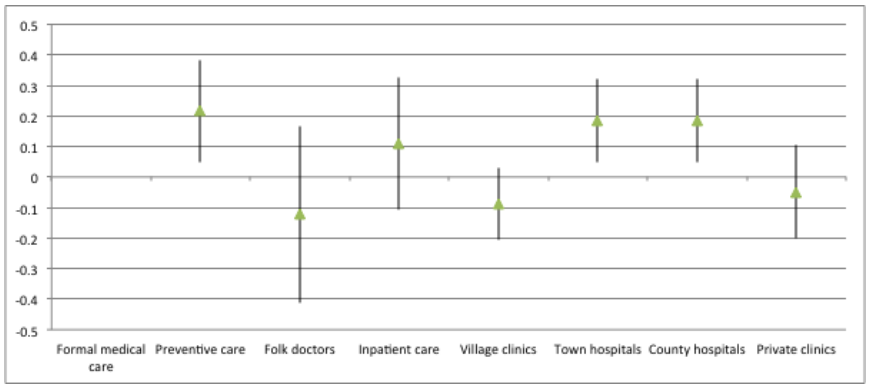


Figure 4.4: EI indices (with 95% confidence intervals) for need-standardized health care use in 2000

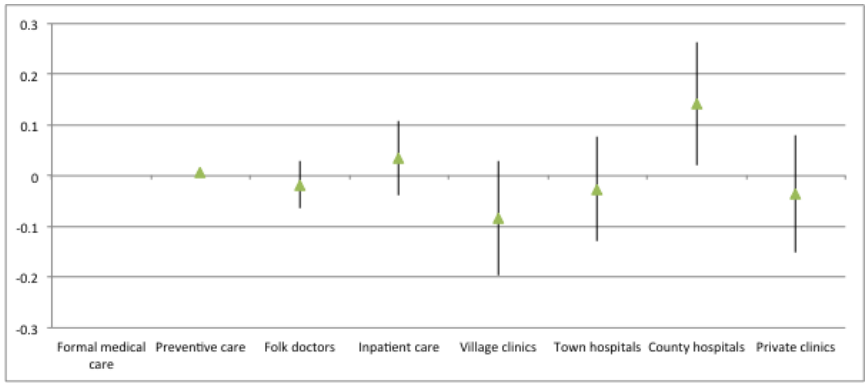


Figure 4.5: CI indices (with 95% confidence intervals) for need-standardized health care use in 2004

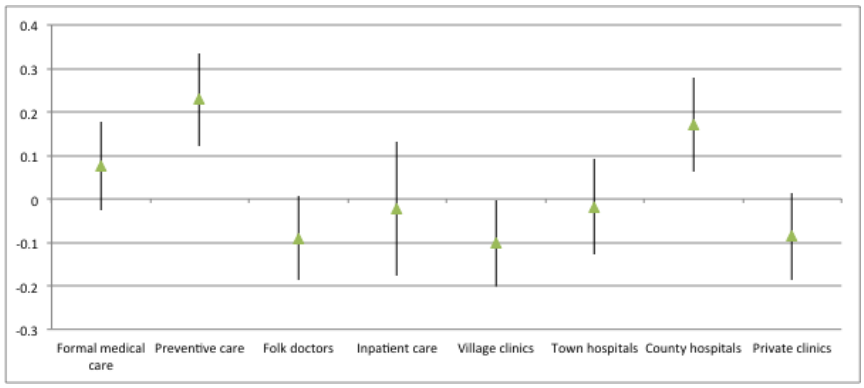


Figure 4.6: EI indices (with 95% confidence intervals) for need-standardized health care use in 2004

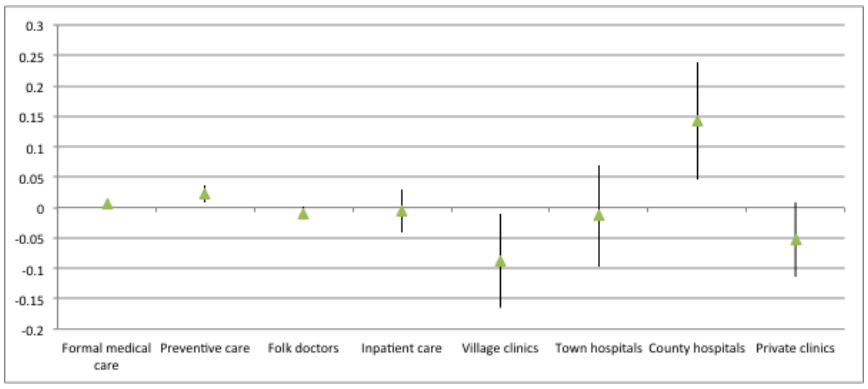


Figure 4.7: CI indices (with 95% confidence intervals) for need-standardized health care use in 2006

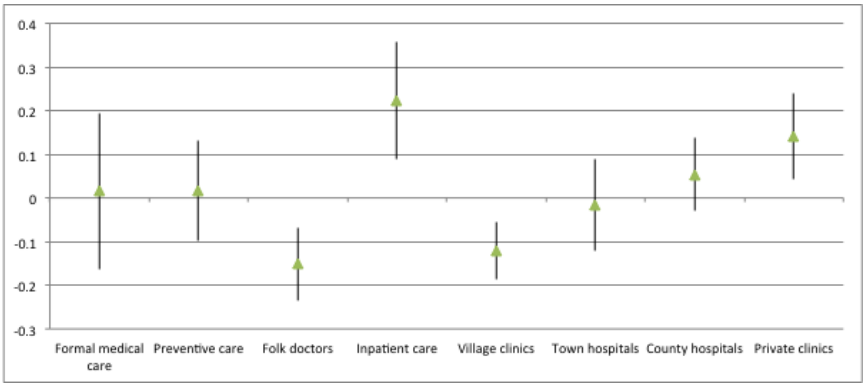


Figure 4.8: EI indices (with 95% confidence intervals) for need-standardized health care use in 2006

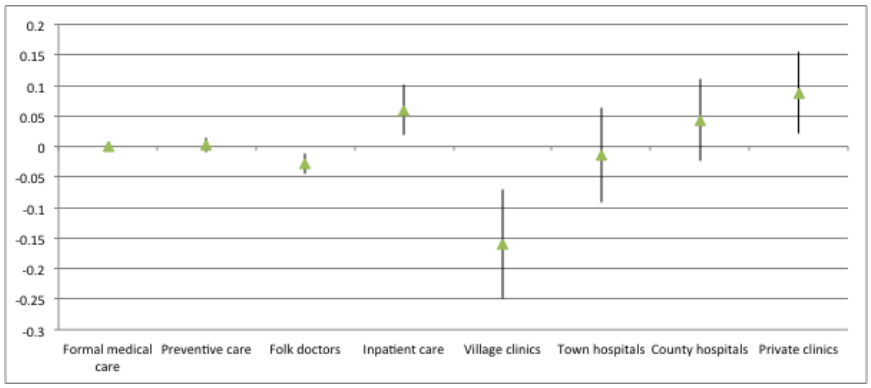


Table 4.4: Decomposition of EI indices for the utilization of different types of health care and different levels of health facilities in 2000

	Formal medical care		Preventive care		Folk doctors		Inpatient care		Village clinics		Town hospital		County hospital		Private clinics	
	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage
Need factors																
Age-sex			-0.000	-0.9%	-0.000	-0.2%	-0.001	-1.7%	-0.006	-17.8%	-0.001	-1.6%	0.002	1.3%	0.008	11.2%
Health status			-0.000	-3.7%	0.001	3.8%	-0.002	-6.3%	0.000	1.5%	0.002	4.4%	-0.001	-0.5%	-0.000	-0.1%
Subtotal			-0.000	-4.7%	0.001	3.6%	-0.003	-8.1%	-0.005	-16.2%	0.001	2.9%	0.001	0.8%	0.008	11.1%
Non-need factors																
Income			0.003	33.8%	0.009	44.5%	-0.015	-48.3%	-0.161	-517.2%	-0.031	-61.1%	0.200	145.0%	0.022	29.2%
Education			-0.000	-2.1%	-0.006	-28.8%	-0.003	-9.4%	0.024	77.3%	-0.013	-26.5%	-0.029	-21.1%	-0.007	-10.0%
Employment			-0.000	-0.7%	0.000	0.0%	0.002	6.1%	0.006	17.8%	0.001	2.6%	-0.001	-0.8%	0.000	0.7%
Insurance			-0.001	-13.4%	-0.006	-29.4%	0.010	31.5%	0.018	56.9%	0.013	26.7%	-0.008	-6.1%	-0.022	-29.8%
Region			0.002	17.0%	0.000	2.4%	-0.014	-43.5%	0.035	112.8%	-0.024	-47.5%	0.013	9.5%	0.001	1.5%
Other			-0.000	-0.5%	0.005	25.2%	-0.002	-6.2%	-0.006	-20.6%	0.003	6.8%	-0.003	-2.3%	0.005	6.5%
Subtotal			0.003	34.1%	0.002	9.2%	-0.022	-69.8%	-0.085	-273.1%	-0.050	-98.9%	0.171	124.2%	-0.002	-3.2%
Residual			0.007	70.5%	-0.023	-112.8%	0.056	177.8%	0.059	189.3%	-0.002	-4.0%	-0.034	-25.0%	-0.080	-107.9%
Total			0.009	100%	-0.021	-100%	0.032	100%	-0.031	-100%	-0.051	-100%	0.138	100%	-0.075	-100%

Table 4.5: Decomposition of EI indices for the utilization of different types of health care and different levels of health facilities in 2004

	Formal medical care		Preventive care		Folk doctors		Inpatient care		Village clinics		Town hospital		County hospital		Private clinics	
	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage
Need factors																
Age-sex	-0.001	-19.2%	-0.001	-4.6%	0.001	5.9%	-0.001	-13.9%	-0.005	-5.0%	0.002	-14.7%	-0.000	-0.3%	0.000	1.3%
Health status	-0.003	-80.0%	0.000	0.2%	-0.004	-31.7%	0.001	5.6%	0.004	3.6%	-0.003	-24.0%	-0.011	-8.4%	0.010	24.6%
Subtotal	-0.004	-99.2%	-0.001	-4.4%	-0.003	-25.8%	-0.001	-8.3%	-0.001	-1.4%	-0.001	-9.3%	-0.011	-8.8%	0.010	25.8%
Non-need factors																
Income	0.001	25.0%	0.008	35.5%	-0.009	-82.2%	-0.012	-129.1%	-0.070	-68.9%	-0.011	-82.4%	0.105	81.6%	-0.041	-102.7%
Education	0.000	7.5%	0.001	6.9%	-0.002	-14.0%	-0.002	-15.9%	-0.007	-7.1%	-0.008	-56.9%	0.005	3.6%	0.006	14.9%
Employment	-0.001	-19.2%	0.000	0.0%	0.000	0.9%	-0.003	-35.6%	0.016	15.9%	0.001	8.8%	-0.009	-7.4%	-0.002	-4.3%
Insurance	0.000	3.6%	0.005	23.4%	0.001	11.5%	0.004	45.3%	0.000	0.4%	0.004	28.4%	0.013	10.4%	-0.010	-24.4%
Region	-0.001	-29.2%	0.003	16.0%	-0.002	-15.0%	-0.004	-40.3%	-0.001	-1.1%	0.001	6.4%	0.006	5.0%	-0.004	-10.4%
Other	0.001	29.7%	0.001	2.7%	0.000	0.6%	0.002	25.2%	0.004	4.3%	-0.005	-34.8%	-0.003	-2.3%	-0.003	-7.6%
Subtotal	0.001	17.4%	0.018	84.7%	-0.011	-98.3%	-0.014	-150.4%	-0.058	-56.5%	-0.018	-130.6%	0.117	90.9%	-0.053	-134.5%
Residual	0.007	181.8%	0.004	19.8%	0.003	24.1%	0.006	58.6%	-0.043	-42.1%	0.005	39.9%	0.023	17.8%	0.003	8.6%
Total	0.004	100%	0.021	100%	-0.011	-100%	-0.010	-100%	-0.102	-100%	-0.014	-100%	0.129	100%	-0.040	-100%

Table 4.6: Decomposition of EI indices for the utilization of different types of health care and different levels of health facilities in 2006

	Formal medical care		Preventive care		Folk doctors		Inpatient care		Village clinics		Town hospital		County hospital		Private clinics	
	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage	Absolute	Percentage
Need factors																
Age-sex	-0.001	-60.6%	-0.000	-11.1%	0.002	6.9%	-0.005	-8.3%	-0.008	-5.0%	0.003	12.2%	0.004	6.7%	0.006	7.1%
Health status	-0.003	-208.7%	-0.000	-2.9%	-0.004	-13.2%	-0.006	-10.6%	0.019	12.2%	-0.001	-2.5%	-0.015	-29.0%	-0.001	-1.5%
Subtotal	-0.004	-269.3%	-0.001	-13.9%	-0.002	-6.3%	-0.011	-18.9%	0.011	7.2%	0.002	9.7%	-0.012	-22.3%	0.005	5.5%
Non-need factors																
Income	-0.003	-177.2%	0.001	15.4%	-0.015	-53.0%	0.011	19.5%	-0.147	-95.6%	0.032	151.6%	-0.016	-30.2%	0.090	98.0%
Education	-0.000	-17.0%	-0.002	-43.2%	-0.005	-19.2%	0.002	4.3%	-0.001	-0.5%	-0.014	-67.6%	0.009	17.5%	-0.009	-9.7%
Employment	-0.000	-27.9%	-0.000	-6.9%	-0.002	-6.9%	-0.005	-9.3%	0.010	6.2%	0.009	41.8%	-0.010	-18.6%	0.000	0.3%
Insurance	0.000	3.1%	0.005	126.3%	-0.004	-14.8%	0.009	16.3%	0.008	5.0%	-0.001	-5.6%	0.013	24.9%	-0.010	-10.8%
Region	-0.000	-3.3%	-0.003	-66.8%	0.006	21.1%	0.002	3.8%	0.015	9.6%	-0.005	-24.0%	-0.005	-9.6%	0.000	0.0%
Other	0.000	1.1%	0.001	17.2%	0.002	6.0%	-0.000	-0.4%	0.002	1.4%	0.000	1.7%	-0.003	-6.1%	-0.002	-2.1%
Subtotal	-0.003	-221.3%	0.002	42.0%	-0.019	-66.8%	0.020	34.2%	-0.113	-73.7%	0.021	97.9%	-0.011	-22.0%	0.069	75.7%
Residual	0.006	390.7%	0.003	71.9%	-0.007	-26.9%	0.048	84.6%	-0.051	-33.5%	-0.044	-207.6%	0.075	144.3%	0.017	18.7%
Total	-0.002	-100%	0.004	100%	-0.028	-100%	0.057	100%	-0.154	-100%	-0.021	-100.0%	0.052	100%	0.091	100%

Figure 4.9: Decomposition of horizontal inequity for health care utilization in 2000

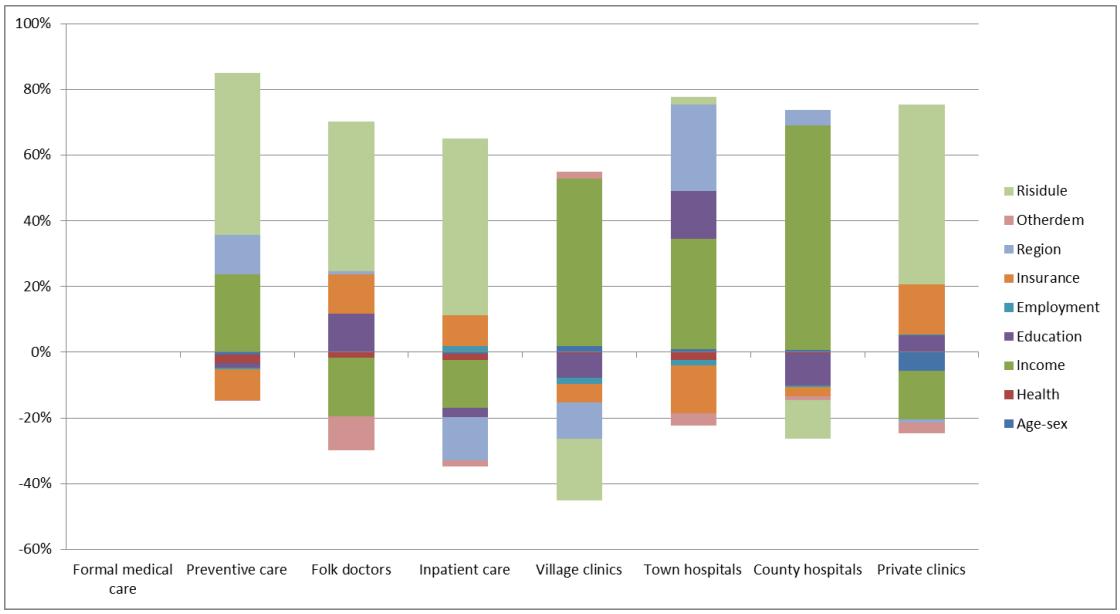


Figure 4.10: Decomposition of horizontal inequity for health care utilization in 2004

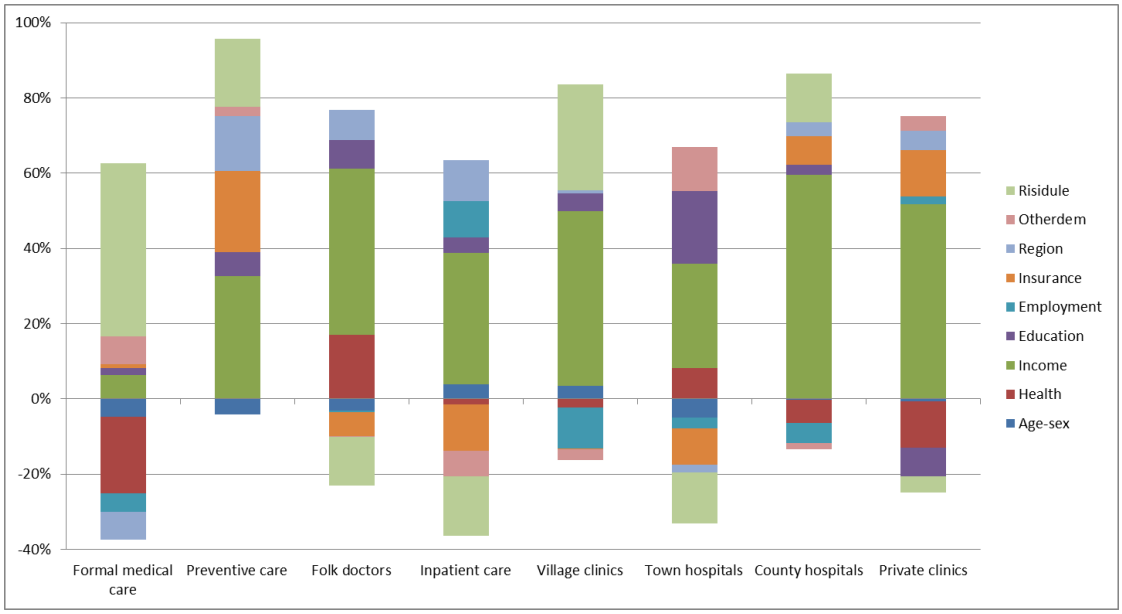
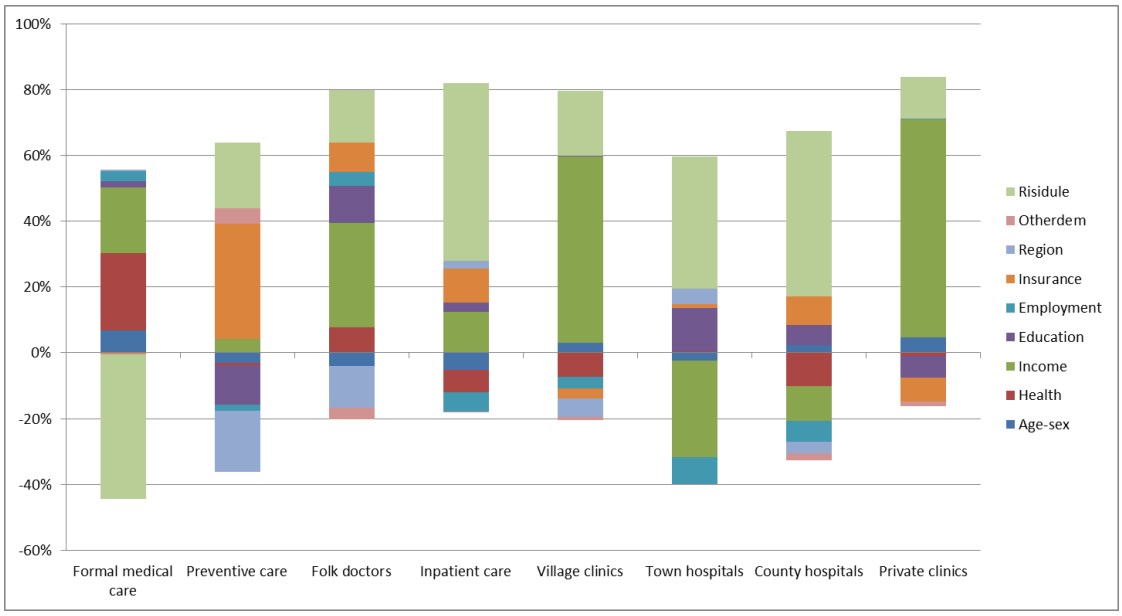


Figure 4.11: Decomposition of horizontal inequity for health care utilization in 2006



Chapter 5

CONCLUSION

5.1 SUMMARY OF THE FINDINGS

This thesis contributes significant new knowledge to the research on the evaluation of health care reforms in developing countries by conducting quantitative analysis based on a large panel dataset in the context of rural China. The study time covers the period before the introduction of a major reform to health care, the pilot phase and the period following the expansion of the reforms across the whole country.

The analysis comprises three main components. It has examined the demand for the rural social health insurance program – the New Rural Cooperative Medical Scheme (NRCMS); the impact of the NRCMS on health care utilization and treatment-seeking behaviour; and the potential for income-related inequity in the use of health care across time. This last chapter synthesizes findings from the empirical chapters and embeds them within the institutional background of rural China. Policy implications include options around designing more comprehensive insurance packages and improving the quality of care delivered by low-level health facilities. The limitations of this study are also discussed, and recommendations are suggested in the final section.

Chapter 2 focuses on the relationship between the demand for the NRCMS and people's facility choice. People who use village clinics or town hospitals (low-level health facilities) are found to be more likely to be insured while people who use county or city hospitals (high-level health facilities) are less likely to be covered. These results reflect the issues, such as various reimbursement rates across facilities, poor quality of primary level care and an inefficient referral system. Since the insurance requires patients to seek care from low-level health facilities and provides relatively limited reimbursement for health services delivered by high-level facilities, people who use high-level hospitals cannot benefit a great deal from the NRCMS. This is particularly true if the quality of health services delivered by primary health centres is perceived to be low, and referral from low-level to high-level facilities involves complicated paperwork and procedures. People who use high-level facilities may give up insurance benefits and incur full treatment fees in order to seek care at better hospitals.

Chapter 3 evaluates the impact of the NRCMS on the utilization of different types of health services and different levels of health facilities. Although the introduction of the NRCMS is not clearly related to the overall use of medical care, it has directed patients away from town hospitals towards village clinics and county hospitals. The increase in the use of village clinics corresponds to this policy aim by directing

patients to low-level facilities in order to improve efficiency of health care delivery systems and reduce overall medical costs. Implications related to the increase in the use of county hospitals, however, depend on whether the increase is regarded as necessary or not. If the increase in the use of county hospitals is considered to be necessary, it indicates that the insurance may help patients to obtain better quality and more specialized health care. If the increase is unnecessary, insured patients may be faced with more expensive drugs and health interventions. There is no information in the available data about how the type of health care that patients receive changes as a result of the insurance. Therefore, future research could usefully investigate the issue of whether the extra utilization at county hospitals the NRCMS has encouraged is medically necessary or not.

Chapter 4 presents new results on income-related inequity in the use of different types of health services and different levels of health facilities. The rich are found to be more likely to use preventive care and county hospitals and less likely to use village clinics and folk doctors. The results indicate that there is pro-rich inequity in the quality of health services received by patients since county hospitals usually provide more specialized and high quality health services than village clinics and folk doctors. Income appears to be the most important contributor of total inequity. Recent health reforms have had limited impacts on improving the equitable access to health services since the significance and magnitude of inequity indices remain similar over time. In the most recent wave, 2009, the poor are still less likely to use preventive care and obtain health services from county hospitals.

5.2 POLICY IMPLICATIONS

Drawing from the empirical results presented in this thesis, a number of policy recommendations can be made here. First, the NRCMS needs more comprehensive benefit packages for inpatient and outpatient care. Although government claimed that the reimbursement rates are around 40-70% for outpatient care and 45-75% for inpatient care (Ministry of Health, 2008)[62], the actual reimbursement rates are reported to be less than 50% (Liang and Langenbrunner, 2013). The large differences in published and actual reimbursement rates are mainly attributed to insufficient funding (Barber and Yao, 2010). Under the current design of the NRCMS, the government subsidies, benefit packages and reimbursement schemes are relatively limited. According to Barber and Yao (2010), the inpatient reimbursement rate should have increased to around 70-80% in order to reduce the incidence of catastrophic expenditure. Therefore, more comprehensive benefit packages, lower deductibles and co-payments and higher ceilings for the NRCMS could help to better improve health care access and provide financial protection for rural residents.

Secondly, primary health care still needs to be strengthened given that most visits and admissions continue to take place at secondary and tertiary hospitals. Higher reimbursement rates for primary level care under the NRCMS create some incentives for patients to access health services at low-level facilities,

[62] According to (Barber and Yao, 2010), the reimbursement for inpatient care depends on the level of health facilities that care is sought. The claimed reimbursement rates by the government are no less than 75% for village clinics/town hospitals, 55%for county/district hospitals and 45% for city/province hospitals. The objective is to improve efficient use of medical care and to avoid patients seeking unnecessary care at secondary and tertiary hospitals.

however, the poor quality of care remains one of the most important barriers to prevent people from seeking primary care. In recent years, large scale investments have been made to improve safety, quality and efficiency of village clinics and town hospitals (Yip and Hsiao, 2014). Promoting utilization of primary health care requires shifting qualified human resources and technology to primary level and increasing quality of care, particularly for the management of chronic conditions that require more qualified staff and stronger referral systems (Barber and Yao, 2010). Once the primary level care is strengthened, it would be feasible for village clinics and town hospitals to function as a gatekeeping system and offer basic outpatient consultations. To achieve a more cost-effective and high-quality health care delivery system, primary health care is expected to play a central part in prevention, case detection and management, gatekeeping, referral and care coordination within the system (Yip and Hsiao, 2014).

5.3 LIMITATIONS AND FUTURE STUDY

Several limitations should be noted. First, facility choice variables are based on stated preference rather than actual utilization. There may be some differences between people's willingness to use the facilities and their ability to pay. The CHNS dataset has information on actual utilization of different types of health facilities, however, these questions are only answered by those people who are sick in the last four weeks. Therefore, regression analysis based on actual utilization may lead to large standard errors given the small sample size. The task of examining the impact of the NRCMS on actual utilization pattern is left to future research with more comprehensive data.

Second, the analysis is limited by the time scope of the survey. In order to apply difference-in-difference methods, chapter 2 only applies data until 2006, when some rural counties were still not covered by the NRCMS. It will be interesting for future work to consider the long-run effects of the NRCMS on various outcomes, such as health care utilization, medical expenditure and health outcomes. As the NRCMS continues to expand and evolve, more research is needed to understand the effects of recent changes of the health care reforms on rural China's health system.

Third, the dataset provides no information about the quality of care received by patients. Facility choice may act as a proxy for quality of care since high-level hospitals tend to provide a higher quality of care than low-level facilities. However, these variables may not be sufficient to fully explain the variation in quality levels. Future research might investigate how the type of health care that patients receive changes as a result of the insurance. It may be worth investigating the potential existence of moral hazard or supply-induced demand, especially concerning whether patients have received more costly tests, drugs and medical interventions that they would not have chosen if they are not covered by the insurance.

Fourth, the analysis sheds only limited light on how the impact of the NRCMS varies with insurance design and implementation characteristics. The insurance participation is only defined as a dummy, however, the demand and impact of the NRCMS may also depend on deductibles, reimbursement rates and reimbursement caps due to the wide variation in design and implementation features across regions.

Future research can further compare the demand and effectiveness of the NRCMS across different benefit packages in various regions.

Finally, the findings here may not be generalizable for China as a whole. This is partly because of non-random program placement and partly because the sampled provinces may not be representative of the whole country. Estimation methods such as matching and difference-in-difference can help to remove some bias, but unobserved heterogeneity may still remain.

This thesis has found limited impact of the health care reforms in China on improving access to health services and reducing income-related inequity in the use of health care. The results indicate that various challenges still remain in reforming the health care system. More policies aimed at improving efficiency and quality should be adopted to better pursue universal health coverage.

REFERENCE

Abadie, A. 2005. Semiparametric Difference-in-Differences Estimators. *The Review of Economic Studies,* 72(1), 1-19.

Acharya, A., Vellakkal, S., Taylor, F., Masset, E., Satija, A., Burke, M. & Ebrahim, S. 2012. Impact of National Health Insurance for the Poor and the Informal Sector in Low-and Middle-Income Countries. London: Institute of Education, University of London,.

Alkenbrack, S., Jacobs, B. & Lindelow, M. 2013. Achieving Universal Health Coverage through Voluntary Insurance: What Can We Learn from the Experience of Lao Pdr? *BMC Health Services Research,* 13, 521-521.

Axelson, H., Bales, S., Minh, P. D., Ekman, B. & Gerdtham, U. G. 2009. Health Financing for the Poor Produces Promising Short-Term Effects on Utilization and out-of-Pocket Expenditure: Evidence from Vietnam. *Int J Equity Health,* 8, 20.

Babiarz, K. S., Miller, G., Yi, H., Zhang, L. & Rozelle, S. 2010. New Evidence on the Impact of China's New Rural Cooperative Medical Scheme and Its Implications for Rural Primary Healthcare: Multivariate Difference-in-Difference Analysis. *BMJ,* 341.

Babiarz, K. S., Miller, G., Yi, H., Zhang, L. & Rozelle, S. 2012. China's New Cooperative Medical Scheme Improved Finances of Township Health Centers but Not the Number of Patients Served. *Health Affairs,* 31(5), 1065-1074.

Bai, C.-E. & Wu, B. 2014. Health Insurance and Consumption: Evidence from China's New Cooperative Medical Scheme. *Journal of Comparative Economics,* 42(2), 450-469.

Barber, L. & Yao, L. 2010. Health Insurance Systems in China: A Briefing Note. *World health report*.

Blundell, R. & Dias, M. C. 2002. Alternative Approaches to Evaluation in Empirical Microeconomics. *Portuguese Economic Journal,* 1(2), 91-115.

Caliendo, M. & Kopeinig, S. 2008. Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys,* 22(1), 31-72.

Cameron, A. C. & Miller, D. L. 2015. A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources,* 50(2), 317-372.

Central Committee of the Communist Party & State Council 2002. Decisions on Further Strengthening Rural Health Work. Beijing.

Chen, M. S., Fang, G. X., Wang, L. D., Wang, Z. H., Zhao, Y. X. & Si, L. 2015. Who Benefits from Government Healthcare Subsidies? An Assessment of the Equity of Healthcare Benefits Distribution in China. *Plos One,* 10(3), 15.

Chen, Y. & Jin, G. Z. 2012. Does Health Insurance Coverage Lead to Better Health and Educational Outcomes? Evidence from Rural China. *Journal of Health Economics,* 31(1), 1-14.

Cheng, L. G., Liu, H., Zhang, Y., Shen, K. & Zeng, Y. 2015. The Impact of Health Insurance on Health Outcomes and Spending of the Elderly: Evidence from China's New Cooperative Medical Scheme. *Health Economics,* 24(6), 672-691.

Doiron, D., Jones, G. & Savage, E. 2008. Healthy, Wealthy and Insured? The Role of Self‐Assessed Health in the Demand for Private Health Insurance. *Health Economics,* 17(3), 317-334.

Dong, K. 2009. Medical Insurance System Evolution in China. *China Economic Review,* 20(4)**,** 591-597.

Dow, W. H. & Schmeer, K. K. 2003. Health Insurance and Child Mortality in Costa Rica. *Social Science & Medicine,* 57(6)**,** 975-986.

D'uva, T. B., Jones, A. M. & Van Doorslaer, E. 2009. Measurement of Horizontal Inequity in Health Care Utilisation Using European Panel Data. *Journal of Health Economics,* 28(2)**,** 280-289.

Eggleston, K. 2012. Health Care for 1.3 Billion: An Overview of China's Health System. *Asian Health Policy Program Working Paper 28.* Stanford University.

Elwell-Sutton, T. M., Jiang, C. Q., Zhang, W. S., Cheng, K. K., Lam, T. H., Leung, G. M. & Schooling, C. M. 2013. Inequality and Inequity in Access to Health Care and Treatment for Chronic Conditions in China: The Guangzhou Biobank Cohort Study. *Health Policy and Planning,* 28(5)**,** 467-479.

Erreygers, G. 2009. Correcting the Concentration Index. *Journal of Health Economics,* 28(2)**,** 504-515.

Gao, J., Qian, J., Tang, S., Eriksson, B. O. & Blas, E. 2002. Health Equity in Transition from Planned to Market Economy in China. *Health Policy and Planning,* 17(suppl 1)**,** 20-29.

Grosh, M. & Glewwe, P. 2000. Designing Household Survey Questionnaires for Developing Countries: Lessons from 15 Years of the Living Standards Measurement Study, Volume 2. Washington, DC: World Bank.

Heckman, J. J., Ichimura, H. & Todd, P. 1998. Matching as an Econometric Evaluation Estimator. *The Review of Economic Studies,* 65(2)**,** 261-294.

Heckman, J. J., Ichimura, H. & Todd, P. E. 1997. Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. *The review of economic studies,* 64(4)**,** 605-654.

Ho, D. E., Imai, K., King, G. & Stuart, E. A. 2007. Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference. *Political Analysis,* 15(3)**,** 199-236.

Hou, Z. Y., Van De Poel, E., Van Doorslaer, E., Yu, B. R. & Meng, Q. Y. 2014. Effects of New Cooperative Medical Scheme on Access to Care and Financial Protection in China. *Health Economics,* 23(8)**,** 917-934.

Jones-Smith, J. C. & Popkin, B. M. 2010. Understanding Community Context and Adult Health Changes in China: Development of an Urbanicity Scale. *Social Science & Medicine,* 71(8)**,** 1436-1446.

Kakwani, N., Wagstaff, A. & Van Doorslaer, E. 1997. Socioeconomic Inequalities in Health: Measurement, Computation, and Statistical Inference. *Journal of Econometrics,* 77(1)**,** 87-103.

Lei, X. & Lin, W. 2009. The New Cooperative Medical Scheme in Rural China: Does More Coverage Mean More Service and Better Health? *Health Economics,* 18(S2)**,** S25-S46.

Li, C., Zeng, L., Dibley, M. J., Wang, D., Pei, L. & Yan, H. 2015. Evaluation of Socio-Economic Inequalities in the Use of Maternal Health Services in Rural Western China. *Public Health,* 129(9)**,** 1251-1257.

Liang, L. & Langenbrunner, J. C. 2013. The Long March to Universal Coverage: Lessons from China. Washington DC: World Bank.

Liu, D. & Tsegai, D. 2011. The New Cooperative Medical Scheme and Its Implications for Access to Health Care and Medical Expenditure: Evidence from Rural China. *ZEF Discussion Papers on Development Policy.* Bonn: Center for Deveopment Research.

Liu, H., Sun, Q. & Zhao, Z. 2014. Social Learning and Health Insurance Enrolment: Evidence from China's New Cooperative Medical Scheme. *Journal of Economic Behavior & Organization,* 97**,** 84-102.

Liu, Q., Wang, B., Kong, Y. & Cheng, K. 2011. China's Primary Health-Care Reform. *The Lancet,* 377(9783)**,** 2064-2066.

Liu, X. & Cao, H. 1992. China's Cooperative Medical System: Its Historical Transformations and the Trend of Development. *Journal of Public Health Policy***,** 501-511.

Liu, Y., Hsiao, W. C. & Eggleston, K. 1999. Equity in Health and Health Care: The Chinese Experience. *Social Science & Medicine,* 49(10)**,** 1349-1356.

Mao, Z. 2005. Pilot Program of Ncms in China: System Design and Progress. *World Bank Report on China Rural Health Study*.

Mensah, J., Oppong, J. R. & Schmidt, C. M. 2010. Ghana's National Health Insurance Scheme in the Context of the Health Millennium Development Goals: An Empirical Evaluation Using Propensity Score Matching. *Health Economics,* 19(S1)**,** 95-106.

Miller, G., Pinto, D. M. & Vera-Hernández, M. 2009. High-Powered Incentives in Developing Country Health Insurance: Evidence from Colombia's Regimen Subsidiado. National Bureau of Economic Research.

Ministry of Health 2008. Annual Report on the Health Reform and Development in China

Ministry of Health 2009. Announcement of Establishing New Rural Cooperative Medical Scheme in Second Half of 2009. *In:* NATIONAL HEALTH AND FAMILY PLANNING COMMISSION OF PEOPLE'S REPUBLIC OF CHINA (ed.). Beijing.

Ministry of Health 2012. Statistical Digest of Chinese Health Development. *In:* NATIONAL HEALTH AND FAMILY PLANNING COMMISSION OF PEOPLE'S REPUBLIC OF CHINA (ed.). Beijing.

Ministry of Health, Ministry of Finance & Ministry of Agriculture 2003. The Advices for Establishment of New Cooperative Medical Scheme. China: Ministry of Health.

Ministry of Health, Ministry of Finance & Ministry of Civil Affairs 2011. Announcement of the Development of New Rural Cooperative Medical Shceme in 2011. Beijing.

Ministry of Health, Ministry of Finance & Ministry of Civil Affairs 2012. Announcement of the Development of New Rural Cooperative Medical Scheme in 2012. Beijing.

Ministry of Health, Ministry of Finance & State Administration of Traditional Chinese Medicine 2007. Advices on Developing Reimbursement Rules of New Rural Cooperative Medical Scheme. Beijing.

Ministry of Health, National Development Reform Commission, Ministry of Civil Affairs, Ministry of Finance, China Food and Drug Administration & State Administration of Traditional Chinese Medicine 2006. Announcement for Accelerating the Establishment of Pilots for the New Cooperative Medical Scheme. Beijing.

Nguyen, H. & Knowles, J. 2010. Demand for Voluntary Health Insurance in Developing Countries: The Case of Vietnam's School-Age Children and Adolescent Student Health Insurance Program. *Social Science & Medicine,* 71(12)**,** 2074-2082.

O'donnell, O. & Propper, C. 1991. Equity and the Distribution of United Kingdom National Health Service Resources. *Journal of Health Economics,* 10(1)**,** 1-19.

O'donnell, O., Van Doorsslaer, E., Wagstaff, A. & Lindelöw, M. 2008. *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*: World Bank Publications.

Popkin, B. M., Du, S., Zhai, F. & Zhang, B. 2010. Cohort Profile: The China Health and Nutrition Survey—Monitoring and Understanding Socio-Economic and Health Change in China, 1989–2011. *International Journal of Epidemiology,* 39(6)**,** 1435-1440.

Rosenbaum, P. R. & Rubin, D. B. 1983. The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika,* 70(1)**,** 41-55.

Rosenbaum, P. R. & Rubin, D. B. 1984. Reducing Bias in Observational Studies Using Subclassification on the Propensity Score. *Journal of the American Statistical Association,* 79(387)**,** 516-524.

Sepehri, A., Sarma, S. & Serieux, J. 2009. Who Is Giving up the Free Lunch? The Insured Patients' Decision to Access Health Insurance Benefits and Its Determinants: Evidence from a Low-Income Country. *Health Policy,* 92(2–3)**,** 250-258.

Shen, T., Habicht, J. P. & Chang, Y. 1996. Effect of Economic Reforms on Child Growth in Urban and Rural Areas of China. *New England Journal of Medicine,* 335(6)**,** 400-406.

Shen, Y., Yan, H., Reija, K., Li, Q., Xiao, S., Gao, J. & Zhou, Z. 2014. Equity in Use of Maternal Health Services in Western Rural China: A Survey from Shaanxi Province. *BMC Health Services Research,* 14(1)**,** 155.

Sparrow, R., Suryahadi, A. & Widyanti, W. 2013. Social Health Insurance for the Poor: Targeting and Impact of Indonesia's Askeskin Programme. *Social Science & Medicine,* 96(0)**,** 264-271.

Sun, X., Jackson, S., Carmichael, G. & Sleigh, A. C. 2009. Catastrophic Medical Payment and Financial Protection in Rural China: Evidence from the New Cooperative Medical Scheme in Shandong Province. *Health Economics,* 18(1)**,** 103-119.

Sun, X., Sleigh, A. C., Carmichael, G. A. & Jackson, S. 2010. Health Payment-Induced Poverty under China's New Cooperative Medical Scheme in Rural Shandong. *Health Policy and Planning,* 25(5)**,** 419-426.

Thornton, R. L., Hatt, L. E., Field, E. M., Islam, M., Solís Diaz, F. & González, M. A. 2010. Social Security Health Insurance for the Informal Sector in Nicaragua: A Randomized Evaluation. *Health Economics,* 19(S1)**,** 181-206.

Trujillo, A. J., Portillo, J. E. & Vernon, J. A. 2005. The Impact of Subsidized Health Insurance for the Poor: Evaluating the Colombian Experience Using Propensity Score Matching. *International Journal of Health Care Finance and Economics,* 5(3)**,** 211-239.

Van De Poel, E., Van Doorslaer, E. & O'donnell, O. 2012. Measurement of Inequity in Health Care with Heterogeneous Response of Use to Need. *Journal of Health Economics,* 31(4)**,** 676-689.

Van Doorslaer, E. & Koolman, X. 2004. Explaining the Differences in Income-Related Health Inequalities across European Countries. *Health Economics,* 13(7)**,** 609-628.

Van Doorslaer, E., Koolman, X. & Jones, A. M. 2004. Explaining Income‐Related Inequalities in Doctor Utilisation in Europe. *Health Economics,* 13(7)**,** 629-647.

Van Doorslaer, E., Koolman, X. & Puffer, F. 2002. Equity in the Use of Physician Visits In organisation for Economic Cooperation and Development countries: Has Equal Treatment for Equal Need Been Achieved. *Measuring Up: Improving Health Systems*.

Van Doorslaer, E. & Masseria, C. 2004. *Income-Related Inequality in the Use of Medical Care in 21 Organisation for Economic Cooperation and Development Countries*: OECD Paris.

Van Doorslaer, E., Masseria, C. & Koolman, X. 2006. Inequalities in Access to Medical Care by Income in Developed Countries. *Canadian Medical Association Journal,* 174(2)**,** 177-183.

Van Doorslaer, E., Wagstaff, A. & Rutten, F. 1992. *Equity in the Finance and Delivery of Health Care: An International Perspective*: Oxford University Press.

Van Doorslaer, E., Wagstaff, A., Van Der Burg, H., Christiansen, T., De Graeve, D., Duchesne, I., Gerdtham, U.-G., Gerfin, M., Geurts, J. & Gross, L. 2000. Equity in the Delivery of Health Care in Europe and the Us. *Journal of Health Economics,* 19(5)**,** 553-583.

Wagstaff, A. 2005. The Bounds of the Concentration Index When the Variable of Interest Is Binary, with an Application to Immunization Inequality. *Health Economics,* 14(4)**,** 429-432.

Wagstaff, A. 2009. *Reforming China's Rural Health System*: The World Bank.

Wagstaff, A., Lindelow, M., Jun, G., Ling, X. & Juncheng, Q. 2009a. Extending Health Insurance to the Rural Population: An Impact Evaluation of China's New Cooperative Medical Scheme. *Journal of Health Economics,* 28(1)**,** 1-19.

Wagstaff, A. & Van Doorslaer, E. 2000. Measuring and Testing for Inequity in the Delivery of Health Care. *Journal of Human Resources***,** 716-733.

Wagstaff, A., Van Doorslaer, E. & Watanabe, N. 2003. On Decomposing the Causes of Health Sector Inequalities with an Application to Malnutrition Inequalities in Vietnam. *Journal of Econometrics,* 112(1)**,** 207-223.

Wagstaff, A., Yip, W., Lindelow, M. & Hsiao, W. C. 2009b. China's Health System and Its Reform: A Review of Recent Studies. *Health Economics,* 18(S2)**,** S7-S23.

Wang, H., Zhang, L., Yip, W. & Hsiao, W. 2006. Adverse Selection in a Voluntary Rural Mutual Health Care Health Insurance Scheme in China. *Social Science & Medicine,* 63(5)**,** 1236-1245.

Wang, Y., Wang, J., Maitland, E., Zhao, Y., Nicholas, S. & Lu, M. 2012. Growing Old before Growing Rich: Inequality in Health Service Utilization among the Mid-Aged and Elderly in Gansu and Zhejiang Provinces, China. *BMC Health Services Research,* 12(1)**,** 302.

Xie, E. 2011. Income-Related Inequalities of Health and Health Care Utilization. *Frontiers of Economics in China,* 6(1)**,** 131-156.

Xie, X., Wu, Q., Hao, Y., Yin, H., Fu, W., Ning, N., Xu, L., Liu, C., Li, Y., Kang, Z., He, C. & Liu, G. 2014. Identifying Determinants of Socioeconomic Inequality in Health Service Utilization among Patients with Chronic Non-Communicable Diseases in China. *PLoS ONE,* 9(6)**,** e100231.

Yang, W. 2013. China's New Cooperative Medical Scheme and Equity in Access to Health Care: Evidence from a Longitudinal Household Survey. *International Journal for Equity in Health,* 12**,** 20.

Yang, W. 2015. Catastrophic Outpatient Health Payments and Health Payment-Induced Poverty under China's New Rural Cooperative Medical Scheme. *Applied Economic Perspectives and Policy,* 37(1)**,** 64-85.

Yip, W. & Hsiao, W. 2009a. China's Health Care Reform: A Tentative Assessment. *China Economic Review,* 20(4), 613-619.

Yip, W. & Hsiao, W. 2014. Harnessing the Privatisation of China's Fragmented Health-Care Delivery. *The Lancet,* 384(9945), 805-818.

Yip, W. & Hsiao, W. C. 2008. The Chinese Health System at a Crossroads. *Health Affairs,* 27(2), 460-468.

Yip, W. & Hsiao, W. C. 2009b. Non-Evidence-Based Policy: How Effective Is China's New Cooperative Medical Scheme in Reducing Medical Impoverishment? *Social Science & Medicine,* 68(2), 201-209.

Yip, W., Wagstaff, A. & Hsiao, W. C. 2009. Economic Analysis of China's Health Care System: Turning a New Page. *Health Economics,* 18(S2), S3-S6.

Yip, W. C., Wang, H. & Liu, Y. 1998. Determinants of Patient Choice of Medical Provider: A Case Study in Rural China. *Health Policy and Planning,* 13(3), 311-322.

Yip, W. C. M., Hsiao, W. C., Chen, W., Hu, S., Ma, J. & Maynard, A. 2012. Early Appraisal of China's Huge and Complex Health-Care Reforms. *The Lancet,* 379(9818), 833-842.

You, X. & Kobayashi, Y. 2009. The New Cooperative Medical Scheme in China. *Health Policy,* 91(1), 1-9.

Zhang, L. & Wang, H. 2008. Dynamic Process of Adverse Selection: Evidence from a Subsidized Community-Based Health Insurance in Rural China. *Social Science & Medicine,* 67(7), 1173-1182.

Zhang, X. & Kanbur, R. 2005. Spatial Inequality in Education and Health Care in China. *China Economic Review,* 16(2), 189-204.

Zhang, X., Wu, Q., Shao, Y., Fu, W., Liu, G. & Coyte, P. C. 2015. Socioeconomic Inequities in Health Care Utilization in China. *Asia-Pacific Journal of Public Health,* 27(4), 429-438.

Zhou, Z., Gao, J., Fox, A., Rao, K., Xu, K., Xu, L. & Zhang, Y. 2011. Measuring the Equity of Inpatient Utilization in Chinese Rural Areas. *BMC Health Services Research,* 11(1), 201.

APPENDIX A

Table A 2.1: Number of observations

Data	Number of observations	Number remaining
CHNS 2004~2006		23,862
Restrict to observations living in rural areas	7,945	15,917
Exclude if counties not covered by the NRCMS	5,762	10,155
Exclude if counties covered by urban social health insurance programs	939	9,216
Exclude if counties covered by other social health insurance before the NRCMS	718	8,498
Exclude if households missing in one wave	2,604	5,894
Exclude if households are insured before 2006	455	5,439
Exclude if households covered by any other health insurance programs except the NRCMS	247	5,192

Table A 2.2: The demand for the NRCMS in 2006 (logit marginal effects)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Village clinics	0.15***	0.14***	0.14***	0.12***	0.13***	0.12***	0.12***	0.12***	0.10***	0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Town hospitals	0.12***	0.09**	0.09***	0.08**	0.08**	0.09**	0.09**	0.10***	0.12***	0.14***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
County hospitals	-0.08**	-0.10***	-0.11***	-0.10***	-0.09**	-0.09**	-0.09**	-0.07*	-0.05	-0.02
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
City hospitals	-0.12**	-0.15***	-0.16***	-0.18***	-0.17***	-0.17***	-0.17***	-0.15**	-0.17***	-0.09
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
Other facilities	-0.07	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.09	-0.14
	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.10)
Female household head		-0.11***	-0.10***	-0.09***	-0.10***	-0.08**	-0.08**	-0.14***	-0.10**	-0.06
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Household size		0.04***	0.05***	0.04***	0.05***	0.05***	0.05***	0.06***	0.06***	0.05***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Minority ethnicity		0.15***	0.16***	0.16***	0.16***	0.17***	0.17***	0.14***	0.12**	0.12**
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
Married		0.01	-0.01	-0.01	-0.01	0.01	0.01	-0.02	-0.04	-0.03
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
East provinces		0.30***	0.30***	0.30***	0.30***	0.31***	0.30***	0.27***	0.30***	---
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(---)
Middle provinces		0.25***	0.25***	0.25***	0.26***	0.27***	0.27***	0.23***	0.28***	---
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(---)
Age of household head			-0.00**	-0.00***	-0.00**	-0.00**	-0.00**	-0.00**	-0.00	-0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fraction age<18			-0.00	0.00	-0.01	0.03	0.03	0.06	-0.03	-0.11
			(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.13)	(0.14)	(0.14)
Fraction age>55			0.13**	0.12**	0.12*	0.11*	0.11*	0.13**	0.09	0.07
			(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Household income				0.01	0.01	0.01	0.01	0.02	0.02	0.02
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Asset index				-0.06**	-0.05*	-0.06**	-0.06**	-0.08**	-0.08**	-0.07*
				(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Primary school					-0.04	-0.03	-0.04	-0.06	-0.03	0.00
					(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
Junior high school					-0.01	-0.01	-0.01	-0.02	0.01	0.04
					(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Senior high school and above					-0.07	-0.05	-0.06	-0.05	-0.01	0.00
					(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
Household head is a farmer						-0.02	-0.02	-0.02	-0.00	0.01
						(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Ratio of working people in household						0.10*	0.10*	0.12**	0.12*	0.10

						(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
SAH fair or poor							-0.03	-0.01	-0.02	-0.06*
							(0.03)	(0.03)	(0.04)	(0.04)
Household head has chronic disease							0.00	0.03	0.01	0.02
							(0.06)	(0.06)	(0.07)	(0.07)
Household chronic disease ratio							0.04	-0.02	0.05	0.07
							(0.12)	(0.12)	(0.13)	(0.13)
Household head is overweight								0.05	0.04	0.01
								(0.04)	(0.04)	(0.04)
Household head is abdominal obesity								0.03	0.03	0.03
								(0.04)	(0.04)	(0.04)
Household head is smoker								-0.04	-0.04	-0.04
								(0.03)	(0.04)	(0.04)
Household head is daily drinker								-0.02	-0.01	0.01
								(0.04)	(0.04)	(0.04)
Travel cost to the nearest health facility									0.01	0.01
									(0.01)	(0.01)
Waiting time									-0.00	-0.00
									(0.00)	(0.00)
Drug availability									-0.18	-0.10
									(0.13)	(0.14)
Treatment cost of a common cold									-0.00	---
									(0.00)	(---)
County dummies	No	No	No	No	No	No	No	No	No	Yes
N	2398	2234	2227	2227	2227	1989	1985	1798	1606	1571

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table A 2.3: The demand for the NRCMS in 2009 (logit marginal effects)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Village clinics	0.02	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.00
	(0.02)	(---)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.00)
Town hospitals	-0.01	-0.02	-0.02*	-0.02*	-0.02*	-0.02*	-0.01*	-0.03*	-0.02	-0.00
	(0.02)	(---)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.00)
County hospitals	0.01	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03***	-0.04	-0.00	0.00
	(0.04)	(---)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)
City hospitals	-0.04	-0.02	-0.03*	-0.02	-0.03*	-0.03	-0.02**	-0.04	-0.04*	-0.01
	(0.03)	(---)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Other facilities	---	---	---	---	---	---	---	---	---	---
	(---)	(---)	(---)	(---)	(---)	(---)	(---)	(---)	(---)	(---)
Female household head		-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.03	-0.03*	-0.00
		(---)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Household size		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		(---)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Minority ethnicity		0.02	0.02	0.02	0.02	0.02	0.02	---	---	---
		(---)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(---)	(---)	(---)
Married		-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.03*	-0.00
		(---)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.02)	(0.01)
East provinces		-0.34	-0.26***	-0.25**	-0.25***	-0.25***	-0.14**	0.10***	0.03	---
		(---)	(0.10)	(0.10)	(0.09)	(0.10)	(0.07)	(0.04)	(0.03)	(---)
Middle provinces		-0.39	-0.31***	-0.30***	-0.29***	-0.29***	-0.20***	---	---	---
		(---)	(0.10)	(0.11)	(0.10)	(0.10)	(0.07)	(---)	(---)	(---)
Age of household head			-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fraction age<18			0.11	0.09	0.09	0.10	0.06	0.15	0.05	0.00
			(0.10)	(0.09)	(0.09)	(0.09)	(0.06)	(0.13)	(0.06)	(0.01)
Fraction age>55			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00
			(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.00)
Household income				0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Asset index				-0.00	-0.00	0.00	-0.00	0.00	0.00	0.00
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Primary school					-0.00	0.00	0.00	0.00	0.02	0.00
					(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)
Junior high school					-0.00	0.00	0.00	0.00	0.01	0.00
					(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.00)
Senior high school and above					0.01	0.01	0.01	0.03	0.03	0.00
					(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.01)
Household head is a farmer						-0.00	-0.00	0.00	0.01	0.00
						(0.02)	(0.01)	(0.02)	(0.01)	(0.00)
Ratio of working people in household						0.01	0.01	0.03	0.01	0.00

						(0.02)	(0.01)	(0.03)	(0.02)	(0.00)
SAH fair or poor							0.01*	0.02*	0.01	0.00
							(0.01)	(0.01)	(0.01)	(0.00)
Household head has chronic disease							0.01	0.02	---	---
							(0.03)	(0.06)	(---)	(---)
Household chronic disease ratio							0.01	0.01	-0.04	-0.00
							(0.04)	(0.07)	(0.03)	(0.00)
Household head is overweight								0.02	0.00	-0.00
								(0.02)	(0.01)	(0.00)
Household head is abdominal obesity								-0.00	0.00	0.00
								(0.01)	(0.01)	(0.00)
Household head is smoker								-0.01	-0.01	-0.00
								(0.01)	(0.01)	(0.00)
Household head is daily drinker								0.01	-0.02	-0.00
								(0.02)	(0.02)	(0.00)
Travel cost to the nearest health facility									0.02*	0.00
									(0.01)	(0.00)
Waiting time									-0.00	-0.00
									(0.00)	(0.00)
Drug availability									---	---
									(---)	(---)
Treatment cost of a common cold									-0.00	-0.00
									(0.00)	(0.00)
County dummies	No	No	No	No	No	No	No	No	No	Yes
N	924	850	848	848	848	769	764	603	454	454

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Table A 2.4: Robustness check based on the sample of Model 10: the demand for the NRCMS in 2006 (logit marginal effects)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Village clinics	0.12***	0.12***	0.12***	0.10***	0.10***	0.09**	0.09**	0.10**	0.09**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Town hospitals	0.15***	0.12***	0.13***	0.11***	0.11***	0.12***	0.11***	0.12***	0.12***	0.14***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
County hospitals	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.04	-0.04	-0.02
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
City hospitals	-0.17***	-0.21***	-0.21***	-0.23***	-0.22***	-0.21***	-0.21***	-0.19***	-0.18***	-0.09
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Other facilities	-0.06	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.09	-0.14
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.07)	(0.07)	(0.10)
Female household head		-0.10***	-0.10**	-0.09**	-0.10**	-0.09**	-0.08*	-0.10**	-0.10**	-0.06
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Household size		0.04***	0.05***	0.05***	0.05***	0.06***	0.06***	0.06***	0.06***	0.05***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Minority ethnicity		0.12**	0.13**	0.13**	0.13**	0.13**	0.13**	0.13**	0.12**	0.12**
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
Married		0.00	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.03
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
East provinces		0.30***	0.30***	0.29***	0.30***	0.30***	0.29***	0.28***	0.29***	---
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(---)
Middle provinces		0.29***	0.29***	0.29***	0.30***	0.30***	0.30***	0.29***	0.30***	---
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(---)
Age of household head			-0.00**	-0.00**	-0.00**	-0.00*	-0.00*	-0.00*	-0.00*	-0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fraction age<18			-0.02	-0.04	-0.05	-0.03	-0.04	-0.03	-0.02	-0.11
			(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Fraction age>55			0.12*	0.11	0.10	0.10	0.10	0.10	0.10	0.07
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Household income				0.02**	0.03**	0.02*	0.02	0.02	0.02	0.02
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Asset index				-0.07**	-0.07**	-0.07**	-0.07**	-0.08**	-0.08**	-0.07*
				(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Primary school					-0.05	-0.04	-0.05	-0.05	-0.04	0.00
					(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)
Junior high school					-0.02	-0.01	-0.01	-0.01	-0.00	0.04
					(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Senior high school and above					-0.06	-0.04	-0.04	-0.04	-0.02	0.00
					(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Household head is a farmer						-0.00	-0.00	0.00	0.01	0.01
						(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Ratio of working people in household						0.12*	0.13**	0.13*	0.13*	0.10

						(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
SAH fair or poor							-0.03	-0.03	-0.03	-0.06*
							(0.04)	(0.04)	(0.04)	(0.04)
Household head has chronic disease							0.01	0.02	0.02	0.02
							(0.07)	(0.07)	(0.07)	(0.07)
Household chronic disease ratio							0.08	0.06	0.07	0.07
							(0.13)	(0.13)	(0.13)	(0.13)
Household head is overweight								0.04	0.04	0.01
								(0.04)	(0.04)	(0.04)
Household head is abdominal obesity								0.03	0.03	0.03
								(0.04)	(0.04)	(0.04)
Household head is smoker								-0.04	-0.04	-0.04
								(0.04)	(0.04)	(0.04)
Household head is daily drinker								-0.01	-0.01	0.01
								(0.04)	(0.04)	(0.04)
Travel cost to the nearest health facility									0.01	0.01
									(0.01)	(0.01)
Waiting time									-0.00	-0.00
									(0.00)	(0.00)
Drug availability									-0.18	-0.10
									(0.13)	(0.14)
Treatment cost of a common cold									-0.00*	-0.00
									(0.00)	(0.00)
County dummies	No	No	No	No	No	No	No	No	No	Yes
N	1571	1571	1571	1571	1571	1571	1571	1571	1571	1571

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Figure A 3.1: The survey regions of the CHNS

Table A 3.1: Number of observations

Data	Number of observations	Number remaining
CHNS 1991~2006		81,815
Restrict to observations living in rural areas	37,867	43,948
Exclude if covered by any other health insurance except NRCMS	12,258	31,690
Exclude if insurance status is one or missing before 2006	2874	28,816

Table A 3.2: Estimation results of the propensity score

Age of household head	-0.007**
	(0.003)
Fraction age <18	0.707***
	(0.187)
Fraction age >55	-0.343***
	(0.118)
Female household head	-0.152*
	(0.085)
Household size	-0.029
	(0.020)
Minority ethnicity	-0.169**
	(0.069)
Household head married	-0.000
	(0.091)
Eastern provinces	1.039***
	(0.089)
Middle provinces	0.107
	(0.074)
Household income	0.099***
	(0.019)
Asset index	-0.365***
	(0.052)
Household head completed primary school	0.152*
	(0.082)
Household head completed junior high school	0.032
	(0.088)
Household head completed senior high school or above	0.047
	(0.110)
Working ratio	0.661***
	(0.106)
Household head is a farmer	-0.433***
	(0.061)
Household head has chronic disease	-0.183*
	(0.104)
Chronic disease ratio	1.049***
	(0.222)
Household head is overweight	-0.389***
	(0.059)
Household head is smoker	-0.048
	(0.058)
Household head is daily drinker	0.216***
	(0.064)
Travel time to nearest health facility	-0.001
	(0.001)
Travel cost to nearest health facility	-0.004
	(0.018)
Waiting time	-0.016***
	(0.003)
Treatment cost of a common cold	0.004***
	(0.001)
Presence of public health facilities in the community	-0.347***
	(0.068)
N	2764

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level.

Figure A 3.2: Propensity score histograms

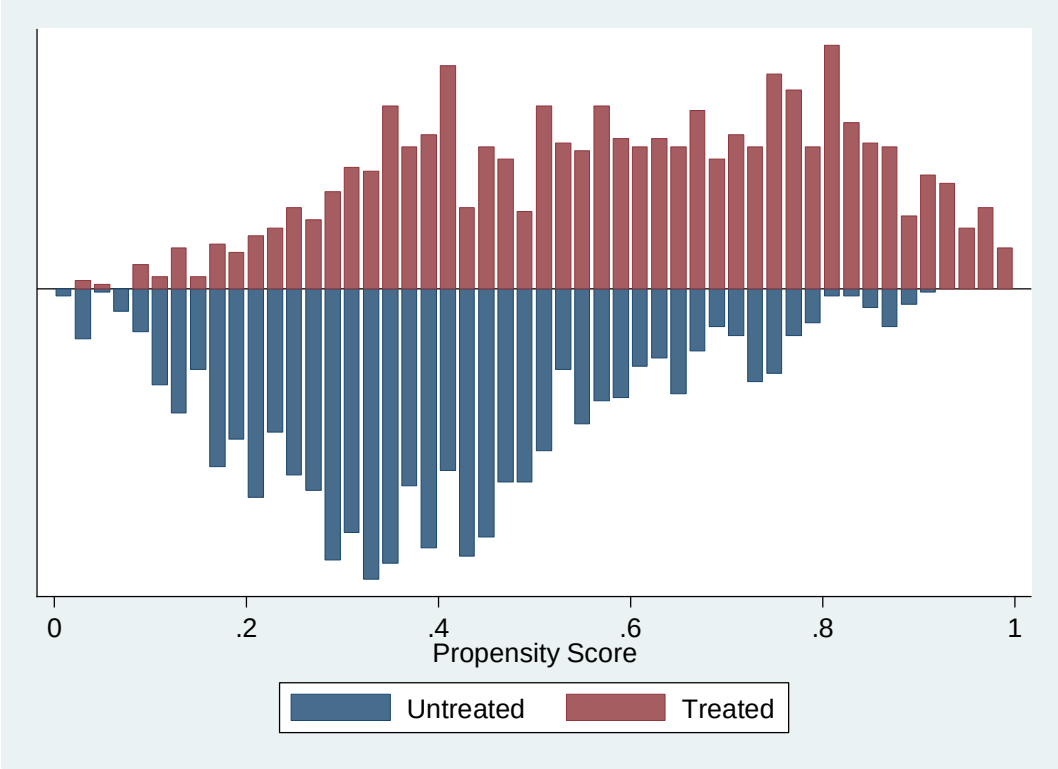


Table A 3.3: Sensitivity of results of choice of caliper and order for NN matching with DID (logit marginal effects)

	Formal care	Preventive care	Folk doctor use	Inpatient care	Village clinics	Town hospitals	County hospitals	City hospitals	Private clinics
Difference-in-difference estimation weighted by nearest neighbour matching (caliper 0.005)									
NRCMS treatment effect	0.001	0.004*	-0.033**	---	0.075	-0.170***	0.124**	-0.018	-0.004
	(0.006)	(0.002)	(0.013)	(---)	(0.056)	(0.050)	(0.054)	(0.012)	(0.033)
NRCMS treatment group	0.002	-0.001	-0.001	---	0.222***	0.015	-0.097***	-0.017***	-0.106***
	(0.003)	(0.001)	(0.008)	(---)	(0.031)	(0.029)	(0.023)	(0.006)	(0.016)
After policy period 2006	-0.004	-0.003*	0.015	---	-0.054	0.022	-0.149***	0.009	-0.061***
	(0.005)	(0.002)	(0.011)	(---)	(0.042)	(0.036)	(0.041)	(0.007)	(0.019)
N	1767	4286	2211	---	7848	7848	7848	7848	7848
Difference-in-difference estimation weighted by nearest neighbour matching (caliper 0.0025)									
NRCMS Treatment effect	0.000	0.002	-0.026**	0.000	0.103*	-0.175***	0.105*	---	0.007
	(0.006)	(0.001)	(0.013)	(---)	(0.058)	(0.052)	(0.057)	(---)	(0.034)
Treatment group	0.002	-0.000	-0.001	-0.018	0.193***	0.030	-0.099***	---	-0.109***
	(0.003)	(0.001)	(0.008)	(0.014)	(0.032)	(0.030)	(0.022)	(---)	(0.017)
Policy period	-0.004	-0.002*	0.017	0.000	-0.052	0.033	-0.154***	---	-0.063***
	(0.005)	(0.001)	(0.013)	(---)	(0.044)	(0.037)	(0.041)	(---)	(0.020)
N	1601	3943	2040	115	7425	7425	7425	---	7425
Difference-in-difference estimation weighted by nearest neighbour matching (caliper 0.00125)									
NRCMS treatment effect	-0.000	0.001	-0.027**	---	0.088	-0.189***	0.155***	-0.021*	0.012
	(0.005)	(0.001)	(0.013)	(---)	(0.059)	(0.055)	(0.058)	(0.012)	(0.035)
NRCMS treatment group	0.003	0.000	-0.003	---	0.176***	0.031	-0.108***	-0.015**	-0.107***
	(0.003)	(0.000)	(0.008)	(---)	(0.034)	(0.032)	(0.025)	(0.006)	(0.018)
After policy period 2006	-0.001	-0.001	0.015	---	-0.060	0.040	-0.157***	0.012	-0.073***
	(0.004)	(0.001)	(0.011)	(---)	(0.045)	(0.040)	(0.045)	(0.007)	(0.021)
N	1344	3368	1739	---	6601	6601	6601	6601	6601
Difference-in-difference estimation weighted by nearest neighbour matching (descending order)									
NRCMS treatment effect	-0.002	0.002	-0.021**	---	0.076	-0.150***	0.166***	-0.010	-0.003
	(0.007)	(0.002)	(0.011)	(---)	(0.055)	(0.048)	(0.053)	(0.011)	(0.033)
NRCMS treatment group	0.002	0.000	-0.004	---	0.197***	0.005	-0.104***	-0.016***	-0.102***
	(0.004)	(0.001)	(0.007)	(---)	(0.029)	(0.028)	(0.022)	(0.005)	(0.016)
After policy period 2006	0.001	-0.002	0.014	---	-0.004	-0.002	-0.183***	-0.005	-0.074***
	(0.005)	(0.002)	(0.010)	(---)	(0.041)	(0.035)	(0.042)	(0.007)	(0.019)
N	1843	4562	2364	---	8225	8225	8225	8225	8225

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level. Control variables for DID models that are used in the model but not reported include: age, gender, household size, ethnicity, marital status, household income, asset index, education levels, occupation, chronic disease, community health facility characteristics and geographical dummies. [b] Since the question 'Any formal medical care in last four weeks' is only asked in survey waves 2004 and 2006, samples used for formal care are only from these two waves. [c] The matching algorithm used here is nearest neighbour matching without replacement.

Table A 3.4: Robustness check of the impact of the NRCMS on use of folk doctors using DID estimation weighted by NN matching from 1991 to 2006 based on sample of Model 7 (logit marginal effects)

Folk doctors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.034**	-0.033**	-0.033**	-0.033**	-0.033**	-0.033**	-0.029**
	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.012)
NRCMS	-0.004	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)
2006	0.020	0.019	0.017	0.017	0.017	0.017	0.014
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Time trends	0.010*	0.010*	0.010*	0.010*	0.010*	0.010*	0.009*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Age	0.001***	0.001***	0.001***	0.001**	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.004	0.004	0.003	0.002	0.002	0.001	0.001
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.007)	(0.006)
Household size	0.002	0.001	0.001	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Minority ethnicity	0.006	0.007	0.007	0.006	0.006	0.006	0.005
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Married	0.013	0.009	0.010	0.010	0.010	0.011	0.010
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Eastern provinces	0.020**	0.016*	0.015	0.013	0.013	0.014	0.014
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Middle provinces	0.001	0.001	0.001	0.000	-0.000	0.000	0.001
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Household income		0.006**	0.005**	0.006**	0.006**	0.006**	0.005**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Asset index		-0.012**	-0.011**	-0.012**	-0.012**	-0.012**	-0.008
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Primary school			-0.017**	-0.016**	-0.017**	-0.016**	-0.014**
			(0.008)	(0.008)	(0.008)	(0.008)	(0.006)
Junior high school			-0.000	-0.001	-0.001	-0.001	-0.001
			(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
Senior high school or above			0.005	0.004	0.004	0.004	0.003
			(0.013)	(0.013)	(0.013)	(0.013)	(0.010)
Working				-0.007	-0.007	-0.007	-0.005
				(0.011)	(0.011)	(0.011)	(0.010)
Farmer				0.003	0.003	0.003	0.001
				(0.011)	(0.011)	(0.010)	(0.009)
Chronic diseases					0.005	0.005	0.005
					(0.009)	(0.009)	(0.008)
Overweight						-0.003	-0.004

						(0.005)	(0.005)
Smoker						-0.001	-0.000
						(0.007)	(0.006)
Daily alcohol drinker						-0.005	-0.004
						(0.011)	(0.009)
Travel time to nearest health facility							0.000**
							(0.000)
Travel cost to nearest health facility							-0.010*
							(0.005)
Waiting time							-0.001
							(0.001)
Treatment cost of a common cold							-0.000
							(0.000)
Presence of public health facilities in the community							-0.001
							(0.007)
N	2268	2268	2268	2268	2268	2268	2268

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.5: Robustness check of the impact of the NRCMS on the stated preference of village clinics using DID estimation weighted by NN matching from 1991 to 2006 based on sample of Model 7 (logit marginal effects)

Village clinics	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	0.063	0.075	0.075	0.077	0.080	0.071	0.113**
	(0.050)	(0.051)	(0.051)	(0.052)	(0.052)	(0.052)	(0.055)
NRCMS	0.176***	0.177***	0.178***	0.170***	0.169***	0.178***	0.192***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
2006	-0.075**	-0.087**	-0.093**	-0.091**	-0.093**	-0.088**	-0.060
	(0.036)	(0.037)	(0.037)	(0.038)	(0.038)	(0.038)	(0.041)
Time trends	0.006	0.029***	0.030***	0.036***	0.036***	0.034***	0.040***
	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)
Age of household head	0.001	0.000	0.000	0.000	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	-0.096	-0.111*	-0.113*	-0.062	-0.062	-0.050	-0.050
	(0.062)	(0.063)	(0.063)	(0.068)	(0.068)	(0.067)	(0.068)
Fraction age >55	-0.026	-0.055	-0.060	-0.036	-0.029	-0.020	-0.028
	(0.053)	(0.053)	(0.053)	(0.055)	(0.056)	(0.055)	(0.054)
Female household head	-0.074**	-0.038	-0.045	-0.023	-0.023	-0.022	-0.012
	(0.034)	(0.033)	(0.034)	(0.034)	(0.034)	(0.036)	(0.037)
Household size	0.011	0.015*	0.015*	0.019**	0.019**	0.017*	0.012
	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
Minority ethnicity	-0.215***	-0.221***	-0.223***	-0.227***	-0.226***	-0.229***	-0.238***
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Household head married	-0.043	-0.037	-0.031	-0.044	-0.044	-0.049	-0.048
	(0.038)	(0.038)	(0.039)	(0.039)	(0.039)	(0.040)	(0.040)
Eastern provinces	0.075	0.057	0.055	0.063	0.065	0.030	-0.084*
	(0.046)	(0.044)	(0.043)	(0.043)	(0.043)	(0.045)	(0.047)
Middle provinces	0.102***	0.097***	0.100***	0.108***	0.109***	0.092**	0.065*
	(0.036)	(0.036)	(0.037)	(0.037)	(0.037)	(0.038)	(0.038)
Household income		0.003	0.003	0.000	0.000	-0.001	-0.006
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Asset index		-0.206***	-0.204***	-0.180***	-0.178***	-0.186***	-0.171***
		(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.030)
Household head completed primary school			-0.048	-0.048	-0.046	-0.050	-0.061*
			(0.035)	(0.035)	(0.036)	(0.035)	(0.036)
Household head completed junior high school			-0.023	-0.016	-0.014	-0.014	-0.007
			(0.039)	(0.038)	(0.038)	(0.039)	(0.039)
Household head completed senior high school or above			-0.041	-0.030	-0.028	-0.023	-0.024
			(0.053)	(0.054)	(0.054)	(0.053)	(0.055)
Working ratio				0.163***	0.160***	0.148***	0.150***
				(0.053)	(0.054)	(0.054)	(0.056)
Household head is a farmer				0.052*	0.051*	0.062**	0.056*

				(0.029)	(0.029)	(0.029)	(0.030)
Household head has chronic disease					-0.017	-0.013	-0.000
					(0.055)	(0.056)	(0.058)
Chronic disease ratio					-0.056	-0.087	-0.058
					(0.114)	(0.114)	(0.117)
Household head is overweight						0.086***	0.117***
						(0.026)	(0.027)
Household head is smoker						-0.022	-0.028
						(0.025)	(0.026)
Household head is daily drinker						0.020	0.006
						(0.031)	(0.032)
Travel time to nearest health facility							-0.008***
							(0.002)
Travel cost to nearest health facility							-0.039*
							(0.024)
Waiting time							-0.000
							(0.001)
Treatment cost of a common cold							-0.006***
							(0.001)
Presence of public health facilities in the community							0.243***
							(0.029)
N	7984	7984	7984	7984	7984	7984	7984

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.6: ITT analysis of the NRCMS on use of folk doctors using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Folk doctors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.018	-0.018	-0.016	-0.017	-0.016	-0.015	-0.026**
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
NRCMS	-0.006	-0.006	-0.006	-0.005	-0.006	-0.006	-0.004
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.006)
2006	0.029***	0.028***	0.025***	0.024***	0.023***	0.024***	0.018**
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)
Time trends	0.002	0.003	0.004	0.004	0.004	0.005*	0.005
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Age	0.001***	0.001***	0.001**	0.000**	0.000*	0.000**	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.008**	0.008**	0.002	0.001	0.001	0.004	0.002
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Household size	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Minority ethnicity	-0.017**	-0.017**	-0.019***	-0.019***	-0.019***	-0.017**	-0.004
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Married	0.009	0.008	0.008	0.008	0.008	0.008	0.006
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Eastern provinces	0.008	0.002	0.001	-0.001	-0.001	0.000	0.005
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Middle provinces	-0.014**	-0.017***	-0.016***	-0.016***	-0.016***	-0.014**	0.001
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Household income		0.001	0.002	0.002	0.002	0.002	0.003**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset index		-0.015***	-0.011**	-0.010**	-0.011**	-0.010*	-0.012***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Primary school			-0.017***	-0.017***	-0.018***	-0.018**	-0.014**
			(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Junior high school			-0.019**	-0.018**	-0.019**	-0.017**	-0.009
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Senior high school or above			-0.029***	-0.027***	-0.027***	-0.030***	-0.020*
			(0.011)	(0.010)	(0.010)	(0.011)	(0.011)
Working				-0.012	-0.012	-0.013	-0.010
				(0.008)	(0.008)	(0.009)	(0.009)
Farmer				0.010	0.010	0.011	0.007
				(0.008)	(0.009)	(0.009)	(0.008)
Chronic diseases					0.006	0.008	0.005
					(0.006)	(0.007)	(0.006)
Overweight						-0.002	-0.004
						(0.004)	(0.004)
Smoker						0.009	0.005

						(0.007)	(0.005)
Daily alcohol drinker						-0.007	-0.003
						(0.009)	(0.008)
Travel time to nearest health facility							0.000
							(0.000)
Travel cost to nearest health facility							0.001**
							(0.000)
Waiting time							-0.000
							(0.000)
Treatment cost of a common cold							-0.000
							(0.000)
Presence of public health facilities in the community							0.002
							(0.005)
N	4351	4351	4343	4331	4309	3988	3517

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.7: ITT analysis of the NRCMS on stated household preference of village clinics using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Village clinics	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	0.006	0.000	0.001	-0.008	-0.008	-0.004	0.125***
	(0.038)	(0.039)	(0.039)	(0.039)	(0.038)	(0.039)	(0.048)
NRCMS	0.137***	0.140***	0.141***	0.129***	0.132***	0.129***	0.147***
	(0.023)	(0.024)	(0.024)	(0.023)	(0.024)	(0.023)	(0.026)
2006	-0.015	-0.018	-0.018	-0.011	-0.008	-0.007	-0.040
	(0.028)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.038)
Time trends	0.007*	0.028***	0.028***	0.036***	0.036***	0.034***	0.039***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Age of household head	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	0.033	0.004	0.003	0.067	0.060	0.066	0.058
	(0.048)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)	(0.058)
Fraction age >55	-0.040	-0.066	-0.067	-0.032	-0.043	-0.037	-0.032
	(0.041)	(0.041)	(0.041)	(0.040)	(0.041)	(0.041)	(0.044)
Female household head	-0.113***	-0.075***	-0.075***	-0.052*	-0.061**	-0.066**	-0.052*
	(0.026)	(0.026)	(0.027)	(0.028)	(0.028)	(0.029)	(0.031)
Household size	0.009	0.010	0.009	0.015**	0.016**	0.015**	0.014*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Minority ethnicity	-0.163***	-0.178***	-0.178***	-0.187***	-0.181***	-0.180***	-0.166***
	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)
Household head married	-0.013	-0.011	-0.009	-0.032	-0.043	-0.049*	-0.047
	(0.028)	(0.028)	(0.029)	(0.030)	(0.029)	(0.029)	(0.033)
Eastern provinces	0.121***	0.086**	0.087**	0.104***	0.096***	0.068*	-0.028
	(0.037)	(0.035)	(0.035)	(0.035)	(0.035)	(0.036)	(0.040)
Middle provinces	0.126***	0.106***	0.106***	0.116***	0.111***	0.097***	0.125***
	(0.027)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.030)
Household income		0.000	0.000	-0.003	-0.001	-0.000	-0.007
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Asset index		-0.198***	-0.196***	-0.181***	-0.182***	-0.188***	-0.176***
		(0.020)	(0.021)	(0.021)	(0.021)	(0.021)	(0.023)
Household head completed primary school			0.001	0.006	0.009	0.009	-0.006
			(0.027)	(0.027)	(0.027)	(0.027)	(0.030)
Household head completed junior high school			0.003	0.008	0.011	0.012	0.024
			(0.031)	(0.031)	(0.031)	(0.031)	(0.034)
Household head completed senior high school or above			-0.017	-0.004	0.004	0.006	0.019
			(0.040)	(0.041)	(0.041)	(0.041)	(0.043)
Working ratio				0.158***	0.159***	0.152***	0.205***
				(0.037)	(0.037)	(0.038)	(0.043)
Household head is a farmer				0.070***	0.065***	0.073***	0.078***

				(0.023)	(0.023)	(0.023)	(0.026)
Household head has chronic disease					-0.094**	-0.091**	-0.098**
					(0.042)	(0.042)	(0.048)
Chronic disease ratio					0.123	0.094	0.079
					(0.087)	(0.089)	(0.098)
Household head is overweight						0.060***	0.071***
						(0.020)	(0.023)
Household head is smoker						-0.008	-0.017
						(0.019)	(0.022)
Household head is daily drinker						-0.008	0.005
						(0.024)	(0.027)
Travel time to nearest health facility							-0.007***
							(0.002)
Travel cost to nearest health facility							-0.059***
							(0.021)
Waiting time							-0.001
							(0.001)
Treatment cost of a common cold							-0.005***
							(0.001)
Presence of public health facilities in the community							0.210***
							(0.024)
N	17938	17938	17907	14054	13671	13518	11063

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.8: ITT analysis of the NRCMS on stated household preference of town hospitals using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

Town hospitals	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.063*	-0.069*	-0.068*	-0.084**	-0.078**	-0.083**	-0.121***
	(0.036)	(0.038)	(0.037)	(0.036)	(0.036)	(0.037)	(0.042)
NRCMS	0.025	0.025	0.027	0.016	0.015	0.011	0.029
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)
2006	0.023	0.021	0.012	0.012	0.008	0.012	-0.005
	(0.027)	(0.028)	(0.028)	(0.027)	(0.027)	(0.028)	(0.032)
Time trends	-0.029***	-0.016***	-0.013***	-0.012**	-0.012**	-0.010*	-0.006
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Age of household head	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	0.051	0.036	0.037	0.040	0.046	0.040	0.065
	(0.048)	(0.048)	(0.048)	(0.049)	(0.049)	(0.050)	(0.052)
Fraction age >55	-0.080**	-0.092**	-0.094**	-0.089**	-0.081*	-0.091**	-0.093**
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.042)	(0.045)
Female household head	-0.059**	-0.033	-0.047*	-0.036	-0.033	-0.040	-0.021
	(0.027)	(0.026)	(0.026)	(0.025)	(0.025)	(0.027)	(0.029)
Household size	0.008	0.007	0.008	0.003	0.003	0.008	-0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Minority ethnicity	-0.093***	-0.102***	-0.105***	-0.103***	-0.106***	-0.109***	-0.084**
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.035)	(0.035)
Household head married	-0.006	-0.006	0.006	0.001	0.005	0.009	0.010
	(0.030)	(0.030)	(0.031)	(0.029)	(0.029)	(0.030)	(0.032)
Eastern provinces	0.209***	0.187***	0.189***	0.199***	0.204***	0.250***	0.211***
	(0.038)	(0.039)	(0.039)	(0.039)	(0.039)	(0.041)	(0.043)
Middle provinces	0.142***	0.130***	0.131***	0.120***	0.120***	0.141***	0.145***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.031)	(0.031)
Household income		0.008	0.008	0.009	0.009	0.008	0.011*
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Asset index		-0.131***	-0.129***	-0.069***	-0.064***	-0.058***	-0.039*
		(0.019)	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)
Household head completed primary school			-0.066**	-0.083***	-0.084***	-0.084***	-0.106***
			(0.029)	(0.028)	(0.028)	(0.028)	(0.030)
Household head completed junior high school			-0.090***	-0.093***	-0.099***	-0.100***	-0.127***
			(0.032)	(0.032)	(0.032)	(0.032)	(0.033)
Household head completed senior high school or above			-0.031	-0.045	-0.049	-0.045	-0.074*
			(0.043)	(0.043)	(0.042)	(0.043)	(0.042)
Working ratio				-0.009	-0.018	-0.007	-0.020
				(0.036)	(0.037)	(0.037)	(0.041)
Household head is a farmer				0.147***	0.152***	0.140***	0.150***

				(0.023)	(0.024)	(0.024)	(0.025)
Household head has chronic disease					-0.008	-0.009	-0.021
					(0.045)	(0.046)	(0.049)
Chronic disease ratio					-0.117	-0.082	-0.027
					(0.090)	(0.091)	(0.098)
Household head is overweight						-0.090***	-0.081***
						(0.021)	(0.023)
Household head is smoker						-0.025	0.000
						(0.019)	(0.021)
Household head is daily drinker						0.029	0.008
						(0.024)	(0.025)
Travel time to nearest health facility							0.002
							(0.002)
Travel cost to nearest health facility							-0.018
							(0.014)
Waiting time							0.001
							(0.001)
Treatment cost of a common cold							0.000
							(0.000)
Presence of public health facilities in the community							0.088***
							(0.023)
N	17938	17938	17907	14054	13671	13518	11063

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.9: ITT analysis of the NRCMS on stated household preference of county hospitals using DID estimation weighted by NN matching from 1991 to 2006 (logit marginal effects)

County hospitals	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	0.151***	0.160***	0.159***	0.165***	0.156***	0.162***	0.113**
	(0.038)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.046)
NRCMS	-0.102***	-0.103***	-0.104***	-0.085***	-0.081***	-0.082***	-0.079***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)
2006	-0.159***	-0.158***	-0.154***	-0.155***	-0.151***	-0.152***	-0.112***
	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.037)
Time trends	-0.012***	-0.035***	-0.037***	-0.041***	-0.039***	-0.039***	-0.044***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Age of household head	-0.001	-0.000	0.001	0.000	0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	-0.124***	-0.096**	-0.099**	-0.113**	-0.107**	-0.104**	-0.123**
	(0.043)	(0.044)	(0.044)	(0.045)	(0.046)	(0.046)	(0.053)
Fraction age >55	0.042	0.073**	0.070**	0.068*	0.060*	0.061*	0.085**
	(0.034)	(0.035)	(0.035)	(0.035)	(0.035)	(0.036)	(0.040)
Female household head	0.101***	0.061***	0.068***	0.047**	0.048**	0.061***	0.065***
	(0.021)	(0.020)	(0.020)	(0.019)	(0.020)	(0.021)	(0.023)
Household size	0.000	-0.003	-0.003	0.001	0.003	0.001	0.002
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Minority ethnicity	0.087***	0.111***	0.114***	0.123***	0.127***	0.128***	0.124***
	(0.025)	(0.024)	(0.024)	(0.023)	(0.023)	(0.023)	(0.024)
Household head married	-0.006	-0.012	-0.017	-0.011	-0.009	-0.011	-0.017
	(0.024)	(0.023)	(0.023)	(0.022)	(0.023)	(0.023)	(0.026)
Eastern provinces	0.205***	0.249***	0.248***	0.251***	0.244***	0.242***	0.246***
	(0.025)	(0.026)	(0.026)	(0.027)	(0.027)	(0.028)	(0.032)
Middle provinces	-0.079***	-0.053**	-0.056**	-0.056***	-0.061***	-0.063***	-0.090***
	(0.024)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.024)
Household income		0.018***	0.017***	0.016***	0.016***	0.016***	0.022***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)
Asset index		0.184***	0.179***	0.135***	0.134***	0.129***	0.132***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.019)
Household head completed primary school			0.027	0.037	0.036	0.034	0.046*
			(0.023)	(0.023)	(0.023)	(0.023)	(0.025)
Household head completed junior high school			0.054**	0.061**	0.059**	0.060**	0.064**
			(0.025)	(0.025)	(0.026)	(0.026)	(0.029)
Household head completed senior high school or above			0.055*	0.050	0.049	0.054*	0.101***
			(0.033)	(0.032)	(0.031)	(0.031)	(0.036)
Working ratio				-0.014	-0.013	-0.027	-0.031
				(0.031)	(0.031)	(0.032)	(0.036)
Household head is a farmer				-0.135***	-0.136***	-0.134***	-0.132***

				(0.021)	(0.021)	(0.021)	(0.023)
Household head has chronic disease					-0.022	-0.020	-0.028
					(0.038)	(0.038)	(0.042)
Chronic disease ratio					0.152**	0.145*	0.127
					(0.076)	(0.077)	(0.081)
Household head is overweight						0.006	0.003
						(0.017)	(0.019)
Household head is smoker						0.039**	0.039**
						(0.017)	(0.020)
Household head is daily drinker						0.010	0.001
						(0.021)	(0.023)
Travel time to nearest health facility							0.002***
							(0.001)
Travel cost to nearest health facility							0.003
							(0.004)
Waiting time							0.001
							(0.001)
Treatment cost of a common cold							0.000
							(0.001)
Presence of public health facilities in the community							0.063***
							(0.021)
N	17938	17938	17907	14054	13671	13518	11063

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.10: Robustness check of the ITT analysis of the NRCMS on use of folk doctors using DID estimation weighted by NN matching from 1991 to 2006 based on sample of Model 7 (logit marginal effects)

Folk doctors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	-0.032***	-0.028**	-0.026**	-0.026**	-0.026**	-0.026**	-0.026**
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
NRCMS	-0.006	-0.005	-0.004	-0.004	-0.004	-0.004	-0.004
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
2006	0.023**	0.020**	0.018**	0.017**	0.017**	0.017**	0.018**
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Time trends	0.003	0.005	0.005	0.005	0.005	0.005*	0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.001***	0.001***	0.001***	0.001***	0.001***	0.000**	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.004	0.004	-0.000	-0.001	-0.001	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Household size	0.002	0.002	0.002	0.002	0.002	0.002	0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Minority ethnicity	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003	-0.004
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Married	0.008	0.006	0.006	0.006	0.006	0.006	0.006
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Eastern provinces	0.015**	0.007	0.007	0.006	0.006	0.007	0.005
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Middle provinces	0.003	-0.001	0.001	0.001	0.001	0.001	0.001
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Household income		0.003*	0.003*	0.003*	0.003*	0.003**	0.003**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset index		-0.017***	-0.014***	-0.013***	-0.013***	-0.013***	-0.012***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
Primary school			-0.015**	-0.015**	-0.015**	-0.015**	-0.014**
			(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Junior high school			-0.010	-0.010	-0.010	-0.010	-0.009
			(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Senior high school or above			-0.023**	-0.022**	-0.023**	-0.022**	-0.020*
			(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Working				-0.010	-0.010	-0.010	-0.010
				(0.009)	(0.009)	(0.009)	(0.009)
Farmer				0.008	0.008	0.008	0.007
				(0.009)	(0.009)	(0.009)	(0.008)
Chronic diseases					0.003	0.004	0.005
					(0.007)	(0.007)	(0.006)
Overweight						-0.004	-0.004

						(0.004)	(0.004)
Smoker						0.005	0.005
						(0.006)	(0.005)
Daily alcohol drinker						-0.003	-0.003
						(0.008)	(0.008)
Travel time to nearest health facility							0.000
							(0.000)
Travel cost to nearest health facility							0.001**
							(0.000)
Waiting time							-0.000
							(0.000)
Treatment cost of a common cold							-0.000
							(0.000)
Presence of public health facilities in the community							0.002
							(0.005)
N	3517	3517	3517	3517	3517	3517	3517

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.11: Robustness check of the ITT analysis of the NRCMS on the stated preference of village clinics using DID estimation weighted by NN matching from 1991 to 2006 based on sample of Model 7 (logit marginal effects)

Village clinics	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
NRCMS*2006	0.074*	0.080*	0.080*	0.078*	0.085*	0.082*	0.125***
	(0.043)	(0.044)	(0.044)	(0.046)	(0.046)	(0.046)	(0.048)
NRCMS	0.146***	0.154***	0.154***	0.144***	0.144***	0.147***	0.147***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)
2006	-0.051	-0.066*	-0.066*	-0.059	-0.064*	-0.061*	-0.040
	(0.033)	(0.034)	(0.034)	(0.036)	(0.036)	(0.036)	(0.038)
Time trends	0.002	0.026***	0.026***	0.033***	0.033***	0.032***	0.039***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Age of household head	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fraction age <18	0.008	-0.027	-0.028	0.059	0.060	0.063	0.058
	(0.054)	(0.056)	(0.056)	(0.057)	(0.057)	(0.058)	(0.058)
Fraction age >55	-0.028	-0.068	-0.069	-0.033	-0.036	-0.032	-0.032
	(0.043)	(0.043)	(0.043)	(0.044)	(0.044)	(0.044)	(0.044)
Female household head	-0.124***	-0.081***	-0.079***	-0.049*	-0.047	-0.046	-0.052*
	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)	(0.031)
Household size	0.013*	0.014*	0.014*	0.018**	0.018**	0.017**	0.014*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Minority ethnicity	-0.153***	-0.168***	-0.167***	-0.174***	-0.175***	-0.174***	-0.166***
	(0.030)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)
Household head married	-0.049	-0.037	-0.038	-0.050	-0.050	-0.055*	-0.047
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.033)
Eastern provinces	0.102**	0.065*	0.064*	0.072*	0.074**	0.051	-0.028
	(0.040)	(0.037)	(0.038)	(0.037)	(0.037)	(0.039)	(0.040)
Middle provinces	0.141***	0.122***	0.123***	0.134***	0.135***	0.124***	0.125***
	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)	(0.031)	(0.030)
Household income		0.000	0.000	-0.004	-0.004	-0.005	-0.007
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Asset index		-0.226***	-0.226***	-0.186***	-0.185***	-0.192***	-0.176***
		(0.021)	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)
Household head completed primary school			0.003	0.006	0.008	0.008	-0.006
			(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Household head completed junior high school			0.013	0.027	0.031	0.032	0.024
			(0.034)	(0.034)	(0.033)	(0.034)	(0.034)
Household head completed senior high school or above			-0.007	0.018	0.021	0.023	0.019
			(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Working ratio				0.199***	0.197***	0.189***	0.205***
				(0.041)	(0.041)	(0.041)	(0.043)
Household head is a farmer				0.074***	0.071***	0.078***	0.078***
				(0.026)	(0.025)	(0.025)	(0.026)
Household head has chronic disease					-0.099**	-0.097**	-0.098**
					(0.046)	(0.046)	(0.048)
Chronic disease ratio					0.057	0.036	0.079
					(0.092)	(0.092)	(0.098)

Household head is overweight						0.055**	0.071***
						(0.022)	(0.023)
Household head is smoker						-0.008	-0.017
						(0.021)	(0.022)
Household head is daily drinker						0.016	0.005
						(0.026)	(0.027)
Travel time to nearest health facility							-0.007***
							(0.002)
Travel cost to nearest health facility							-0.059***
							(0.021)
Waiting time							-0.001
							(0.001)
Treatment cost of a common cold							-0.005***
							(0.001)
Presence of public health facilities in the community							0.210***
							(0.024)
N	11063	11063	11063	11063	11063	11063	11063

Notes: [a] Robust standard errors clustered at household level in brackets. * indicates statistical significant at 10% level. ** indicates statistical significant at 5% level. *** indicates statistical significant at 1% level. [b] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 3.12: Impact of the NRCMS on medical care utilization and stated preference of different levels of health facilities using DID and NN matching with DID (logit marginal effects)

	Formal care	Preventive care	Folk doctor use	Inpatient care	Village clinics	Town hospitals	County hospitals	City hospitals	Private clinics
Difference-in-difference estimation									
NRCMS treatment effect	-0.001	0.001	-0.020*	0.043	0.117	-0.160*	0.097	0.009	-0.000
	(0.005)	(0.002)	(0.011)	(0.035)	(0.082)	(0.087)	(0.073)	(0.017)	(0.042)
NRCMS treatment group	0.003	0.000	-0.009	0.008	0.154**	-0.020	-0.110***	-0.021**	-0.084**
	(0.003)	(0.001)	(0.009)	(0.023)	(0.060)	(0.067)	(0.041)	(0.010)	(0.036)
After policy period 2006	-0.003	-0.001	0.009	0.012	-0.063	-0.028	-0.119**	-0.009	-0.048*
	(0.004)	(0.002)	(0.010)	(0.032)	(0.058)	(0.058)	(0.054)	(0.014)	(0.026)
N	3952	9480	4740	714	14793	14793	14793	14793	14793
Difference-in-difference estimation weighted by nearest neighbour matching									
NRCMS Treatment effect	0.005	0.004*	-0.030**	0.000	0.113	-0.195*	0.102	---	0.002
	(0.007)	(0.002)	(0.013)	(---)	(0.097)	(0.102)	(0.102)	(---)	(0.049)
Treatment group	0.002	-0.001	-0.001	-0.003	0.192***	0.022	-0.090*	---	-0.101***
	(0.003)	(0.001)	(0.008)	(0.005)	(0.064)	(0.070)	(0.046)	(---)	(0.035)
Policy period	-0.006	-0.003	0.013	---	-0.060	0.019	-0.139**	---	-0.060**
	(0.005)	(0.002)	(0.016)	(---)	(0.061)	(0.061)	(0.065)	(---)	(0.029)
N	1635	4394	2286	109	7984	7984	7984	---	7984

Notes: [a] Robust standard error clustered at community level in brackets. * indicates statistical significant at the 10% level. ** indicates statistical significant at the 5% level. *** indicates statistical significant at the 1% level. Control variables for DID models that are used in the model but not reported include: age, gender, household size, ethnicity, marital status, household income, asset index, education levels, occupation, chronic disease, community health facility characteristics and geographical dummies. [b] Since the question 'Any formal medical care in last four weeks' is only asked in survey waves 2004 and 2006, samples used for formal care are only from these two waves. [c] The matching algorithm used here is nearest neighbour matching with caliper 0.01 without replacement.

Table A 4.1: Number of observations

Data	Number of observations	Number remaining
CHNS 2000~2006		50,944
Restrict to observations living in rural areas	16,471	34,473
Exclude if age younger than 18	5,341	29,132
Exclude if covered by urban social health insurance	1,640	27,492

Figure A 4.1: Concentration curves of formal medical care use

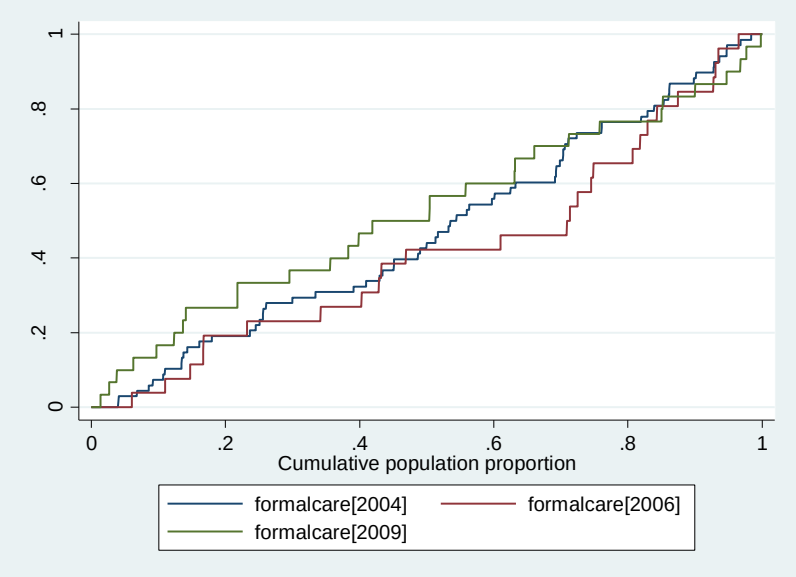


Figure A 4.2: Concentration curves of preventive care use

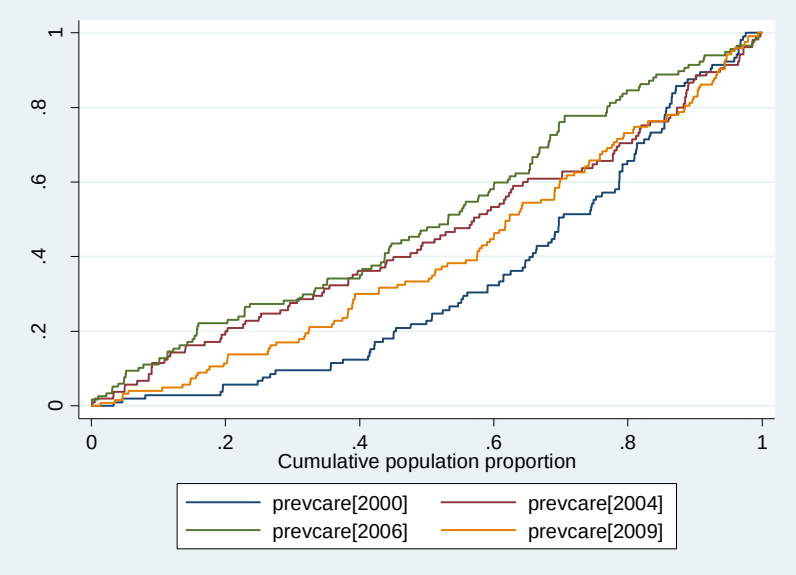


Figure A 4.3: Concentration curves of folk doctors use

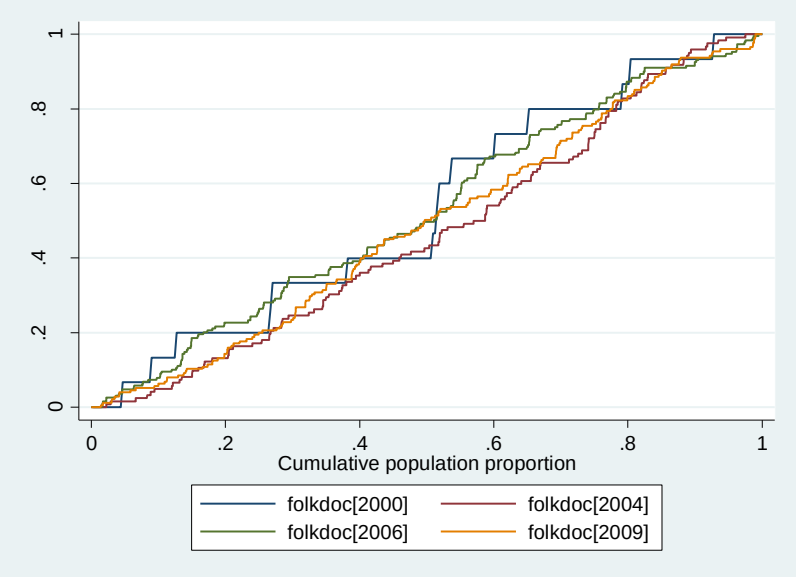


Figure A 4.4: Concentration curves of inpatient care use

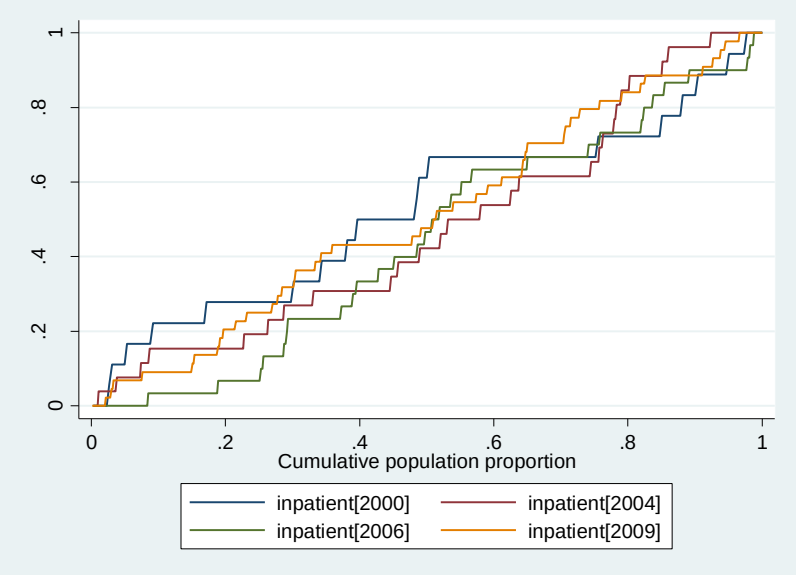


Figure A 4.5: Concentration curves of the use of village clinics

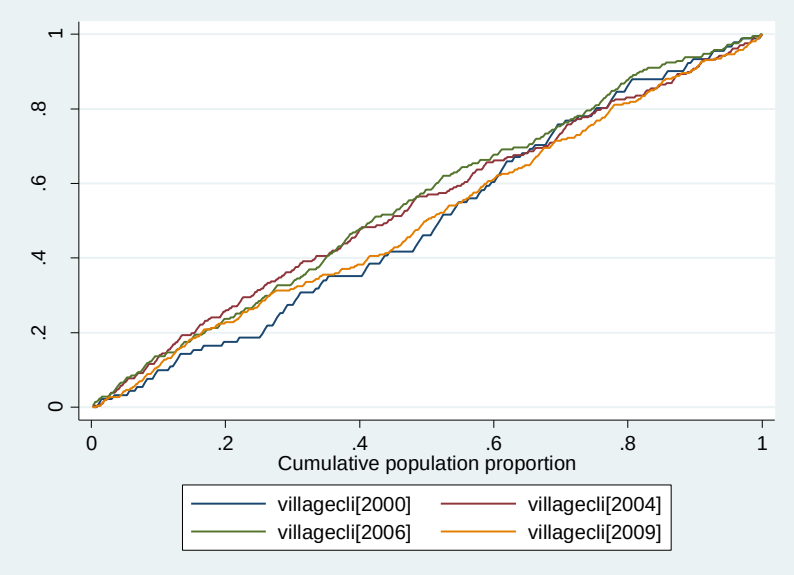


Figure A 4.6: Concentration curves of the use of town hospitals

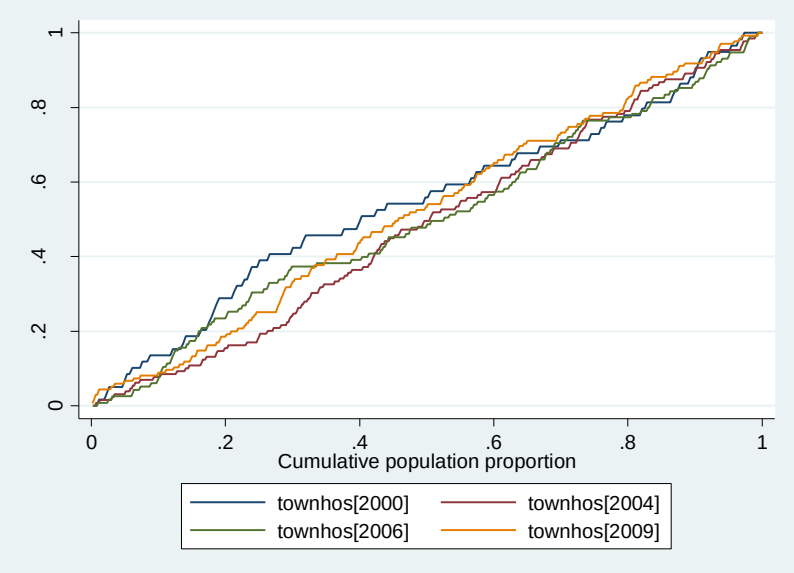


Figure A 4.7: Concentration curves of the use of county hospitals

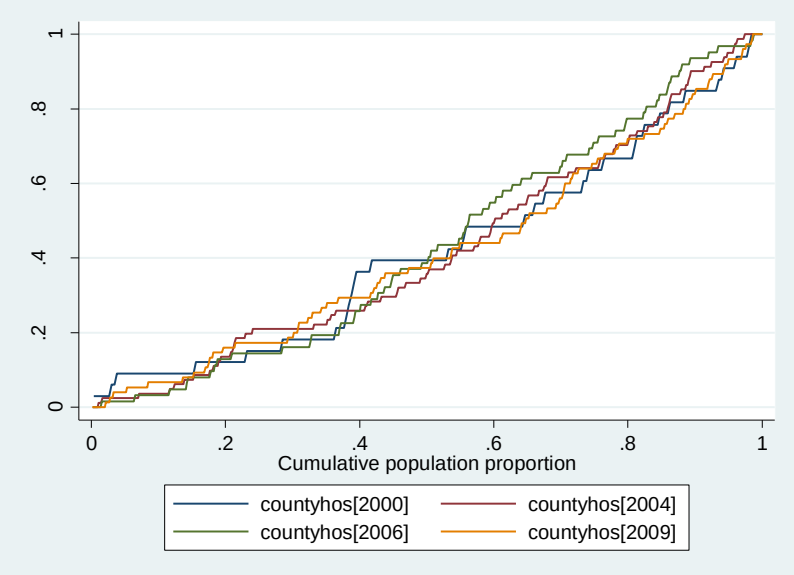


Figure A 4.8: Concentration curves of the use of private clinics