

Department of Public Health, Hjelt Institute, Faculty of Medicine,  
University of Helsinki, Helsinki, Finland  
and  
National Institute for Health and Welfare, Helsinki, Finland

# **Utilisation of maternity care in rural China: Affordability and Quality**

Qian Long

ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Medicine of the University of Helsinki, for public examination in Lecturehall 2, Biomedicum, Haartmaninkatu 8, Helsinki, on 17 August 2012, at 12 o'clock.

ISBN 978-952-10-8062-3 (paperback)

ISBN 978-952-10-8063-0 (PDF)

Helsinki University Print

Helsinki, Finland 2012

### *Supervisors*

Research Professor Elina Hemminki, MD, Dr.PH.  
National Institute for Health and Welfare, Helsinki, Finland

Professor Tuohong Zhang, MD, Ph.D.  
School of Public Health, Peking University, Beijing, China

### *Reviewers*

Professor Päivi Rautava, MD, Ph.D.  
Department of Public Health, University of Turku, Turku, Finland  
Turku University Hospital, Turku, Finland

Adjunct Professor Juha Teperi, MD, Ph.D.  
School of Health Sciences, University of Tampere, Tampere, Finland

### *Opponent*

Adjunct Professor Reijo Salmela, MD, Ph.D.  
Faculty of Health Sciences, University of Eastern Finland, Kuopio, Finland

## CONTENTS

LIST OF ORIGINAL PUBLICATIONS .....	5
ABBREVIATIONS .....	6
ABSTRACT .....	7
TIIVISTELMÄ .....	9
1. INTRODUCTION .....	11
2. CONTEXT .....	13
2.1 People's Republic of China .....	13
2.2 China's economic transition .....	13
2.3 Health care system in China.....	13
2.3.1 A centrally directed China's health care system in 1949-1978 .....	13
2.3.2 China's health care system reform in 1979-2002 .....	14
2.3.3 China's rural health care system reform initiatives since 2003 .....	15
2.4 Maternity care in rural China .....	16
2.5 Family planning policy in China .....	16
3. CONCEPTUAL BACKGROUND .....	18
3.1 Equity in health care .....	18
3.2 Equity analysis .....	19
4. LITERATURE REVIEW .....	21
4.1 Objectives and methods of literature review.....	21
4.2 Use of maternity care and affordability in other developing countries.....	21
4.3 Use of maternity care and affordability in China.....	28
4.4 Relation between maternity care and health insurance in developing countries .....	33
5. AIM OF THE STUDY.....	37
6. DATA AND METHODS.....	38
6.1 Data sources .....	40
6.2 Data analysis .....	41
7. RESULTS .....	43
7.1 Changes in utilisation of maternity care in western rural China (Paper I).....	43
7.2 Changes in expenditure for facility-based delivery in rural China (Paper III) .....	44
7.3 Maternity package of the NCMS in the five rural counties (Paper II and IV).....	46
7.4 Utilisation, contents and costs of prenatal care in relation to the NCMS (Paper II).....	46
7.5 Relation between caesarean section and NCMS coverage (Paper IV) .....	48
8. DISCUSSIONS .....	50
8.1 Main findings .....	50
8.2 Public health implications.....	54
8.3 Methodological considerations .....	55
9. CONCLUSIONS.....	57
10. POLICY RECOMMENDATIONS AND FURTHER STUDIES .....	58
ACKNOWLEDGEMENTS .....	59
REFERENCES.....	61
APPENDIX: Geographic distribution of data collections .....	68
ORIGINAL PUBLICATIONS .....	69

## LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following articles:

- I. Long Q, Zhang T, Xu L, Tang S, Hemminki E. Utilisation of maternal health care in western rural China under a new rural health insurance system (New Co-operative Medical System). *Trop Med Int Health* 2010; 15(10):1210-1217.
- II. Long Q, Zhang T, Hemminki E, Tang X, Huang K, Xiao S, Tolhurst R. Utilisation, contents and costs of prenatal care under a rural health insurance (New Co-operative Medical System) in rural China: lessons from implementation. *BMC Health Serv Res* 2010; 10:301.
- III. Long Q, Zhang Y, Raven J, Wu Z, Bogg L, Tang S, Hemminki E. Giving birth at a health-care facility in rural China: is it affordable for the poor? *Bull World Health Organ* 2011; 89(2):144-152.
- IV. Long Q, Klemetti R, Wang Y, Tao FB, Yan H, Hemminki E. High Caesarean section rate in rural China: Is it related to health insurance (New Co-operative Medical Scheme)? *Soc Sci Med* 2012; 75:733-737.

All papers are reprinted with permission of the respective copyright holders.

## ABBREVIATIONS

CHIMACA	The project "Structural hindrances to, and promoters of, good maternal care in rural China" funded by European Commission
CHI	Compulsory Health Insurance
CBHI	Community-Based Health Insurance
CI	Confidence Interval
CMS	Co-operative Medical Scheme
CS	Caesarean Section
DHS	Demographic and Health Survey
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
GIS	Government Insurance Scheme
HIP	Health Insurance for the Poor
LIS	Labour Insurance Scheme
MMR	Maternal Mortality Ratio
NCMS	New Co-operative Medical Scheme
NHHS	National Household Health Services (survey)
NHI	National Health Insurance
OR	Odds Ratio
RMB	Renminbi (Chinese yuan)
RR	Relative Risk
TB	Tuberculosis
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
US\$	United States Dollar
VNHS	Vietnam National Household Survey
WHO	World Health Organisation

## ABSTRACT

**Background** China, like other transitional countries, is encountering socioeconomic-related inequality in maternal and child health. Lack of access to high quality maternity care by rural and poor women has been considered the main obstacle to improve maternal health. Since 2003, a rural health insurance, New Co-operative Medical Scheme (NCMS) has expanded nationwide. The NCMS includes a maternity care benefit package usually providing reimbursement for facility-based delivery (both vaginal delivery and Caesarean section (CS)). In a few counties, the scheme has included part of prenatal care.

**Objectives** The principal aim of this study was to investigate the utilisation, contents, and costs of maternity care and its related financial burden on households in rural China, particularly in relation to rural health insurance (NCMS).

**Materials and methods** Several approaches and data sources were applied in this study, including: 1) cross-sectional data on rural women who gave birth between 1998 and 2007 obtained from the National Household Health Services (NHHS) surveys; 2) additional western survey in ten western provinces in NHHS for women giving birth in 2002 and 2007; 3) a population-based survey data on women giving birth in 2008–2009 in five rural counties in three central and western provinces, which was conducted in the context of the project "Structural hindrances to, and promoters of, good maternal care in rural China-CHIMACA (015396)"; 4) qualitative interview data obtained from one of the five survey counties which included part of prenatal care in the NCMS.

For the cross-sectional survey data, logistic regressions were used to study factors related to having prenatal care, facility-based delivery, and CS. Out-of-pocket expenditure for facility-based delivery as a proportion of annual household income was used to measure financial burden on households. Furthermore, linear regressions were used to study factors associated with out-of-pocket expenditure by taking the natural logarithm of the observed expenditure. For the qualitative data, "frame-work approach" for data analysis was used to identify common or divergent perceptions of stakeholders on the impact of including prenatal care in the NCMS on care use and provision.

**Results** Between 2002 and 2007, a decrease, from 25% to 12%, in pregnant mothers without a prenatal visit was seen, while facility-based delivery increased from 45% to 80% in less developed western rural China; the difference in the use of prenatal and delivery care between income groups became smaller. Factors related to having prenatal care were: enrolment in the NCMS, higher income and education, lower parity, and not being in a minority group. Women aged over 30 years, having higher education and lower parity, and having prenatal visits, were more likely to give birth at health facilities (Paper I).

In the 2002-2007 periods, the total medical expenditure on facility-based delivery for rural households almost doubled. The out-of-pocket expenditure increased too, but less substantially. In 2007, out-of-pocket expenditure on facility-based delivery was 13% of annual household income for the low-income households. This proportion had decreased from 18% in 2002 and differences between income groups had narrowed. After adjusting for maternal age, education, household income, number of children, and type of birth health facility, the NCMS was associated with reduced out-of-pocket expenditure for CS, but not for vaginal delivery (Paper III).

The use of prenatal care was studied in three of the five counties without CHIMACA financial intervention that covered part of women's costs for prenatal and postnatal care. Regardless of whether the county included prenatal care in the NCMS (one county) or not (two counties), over 70% of women had a first prenatal visit within twelve gestational weeks, and over 60% of women had five or more visits. In all three counties, the proportions of women having the number of haemoglobin and urine tests recommended by the national guidelines were low, but 90% of women received two or more ultrasound examinations. Out-of-pocket expenditure on prenatal care varied from 8% to 17% of women's annual income across counties, which was much higher among the low-income women than middle- and high-income women in all three counties. A qualitative study in the county, which included prenatal care in the NCMS, found the reimbursement for prenatal care was not well understood by women, and had little influence on women's decisions to make prenatal visits. Several women reported that doctors suggested them to take expensive examinations (Paper II).

In the five rural counties studied here, almost half (46%) of all births were by CS with 13% occurring as an (self-reported) emergency CS and 33% a non-emergency CS. Women reported that half of the non-emergency CSs were recommended by a doctor and half were requested by themselves. In the counties with mid-range CS rate (28%-63%), having reimbursement from the NCMS was associated with having CS, in particular having non-emergency CS after adjusting for maternal age, education and occupation, household income, previous abortion and births, and type of birth health facility; while no statistically significant association was found in the counties with the highest (82%) and lowest (13%) CS rate (Paper IV).

**Conclusions** In rural China, the use of maternity care has greatly improved between 2002 and 2007. Nevertheless, practice variations demonstrate widespread non-adherence to the national guidelines. More expensive examinations or procedures were often recommended by doctors. The financial burden relating to the use of prenatal care and facility-based delivery for the rural poor remained high. The current NCMS scheme lacks the tools required to control costs and to encourage good quality of care.

## TIIVISTELMÄ

**Tausta:** Kiinassa, kuten muissakin siirtymäkauden maissa, eriarvoisuus äitien ja lasten terveydessä sosioekonomisen taustan mukaan on suuri. Suurimpana esteenä parantaa äitien terveyttä pidetään laadukkaiden äitiyshuoltopalveluiden puuttumista köyhiltä ja maaseudun naisilta. Vuonna 2003 maaseudun sairausvakuutus, New Co-operative Medical Scheme (NCMS), laajentui valtakunnalliseksi. Sairausvakuutukseen kuuluu äitiyshuollon etuuspaketti joka yleensä kattaa sairaalasyntytykset (sekä alatiesynnytykset että keisarisleikkaukset (sektiot)). Muutamissa lääneissä järjestelmään kuuluu raskaudenaikainen hoito.

**Tavoitteet:** Tämän tutkimuksen päätavoitteena oli selvittää äitiyshuoltopalveluiden käyttöä, sisältöä ja kustannuksia. Kustannuksissa selvitettiin myös taloudellista taakkaa kotitalouksille Kiinan maaseudulla, erityisesti suhteessa sairausvakuutukseen (NCMS).

**Aineisto ja menetelmät:** Tutkimuksessa käytettiin useita lähestymistapoja ja tietolähteitä: 1) poikkileikkausaineisto vuosina 1998 ja 2007 synnyttäneistä maaseudun naisista (kansalliset haastattelututkimukset, National Household Health Services (NHHS surveys), 2) NHHS:n erityiskyselyt Länsi-Kiinan 10 maakunnassa vuosina 2002 ja 2007 synnyttäneille naisille, 3) väestöpohjainen kyselytutkimus vuosina 2008–2009 synnyttäneille maaseudun naisille viidessä läänissä kolmessa Keski- ja Länsi-Kiinan maakunnassa (CHIMACA-hanke: "Hyvän äitiyshuollon rakenteelliset esteet ja edistäjät Kiinan maaseudulla" 4) laadullinen aineisto (haastattelututkimus) yhdessä CHIMACA-tutkimuksen läänissä, jossa sairausvakuutukseen kuului osa raskaudenaikaisesta hoidosta.

Kyselytutkimusten analyyseissa käytettiin logistista regressiota. Sillä selvitettiin mitkä tekijät olivat yhteydessä raskaudenaikaisten palveluiden käyttöön, sairaalasyntytykseen ja sektioihin. Kotitalouksille koituvaa taloudellista taakkaa mitattiin suhteuttamalla itse maksetut sairaalasyntytysten kustannukset kotitalouden vuosituloihin. Lineaarista regressiota käytettiin selvittämään tekijöitä, jotka vaikuttavat itse maksettuihin kustannuksiin. Analyysissä itse maksetuista kustannuksista otettiin luonnollinen logaritmi. Laadullisen aineiston analyyseissa käytettiin "frame-work approach" -menetelmää. Sen avulla yksilöitiin eri eturyhmien käsityksiä siitä, minkälaisia vaikutuksia raskaudenaikaisen hoidon sisällyttämisellä sairausvakuutukseen oli palvelujen käyttöön ja järjestämiseen.

**Tulokset:** Vuosien 2002 ja 2007 välillä Länsi-Kiinan vähän kehittyneellä maaseudulla havaittiin raskaudenaikaisia palveluja käyttämättömien naisten lasku 25 %:sta 12 %:iin. Samana ajanjaksona sairaalasyntytysten osuus kasvoi 45 %:sta 80 %:iin. Erot eri tuloryhmien välillä kapenivat. Raskauden aikaisen hoidon käyttöön vaikuttavia tekijöitä olivat: sairausvakuutuksen otto, korkea tulotaso ja koulutus, ensimmäinen lapsi ja valtaväestöön kuuluminen (Han-etnisyys). Sairaalasyntytysten käyttöön vaikuttavia tekijöitä olivat: yli 30-vuoden ikä, korkea koulutus, ensimmäinen lapsi ja raskaudenaikaisen ehkäisevien palvelujen käyttö (Artikkeli I).

Vuosien 2002–2007 aikana laitossyntytysten kustannukset maaseudun kotitalouksille lähes kaksinkertaistuivat. Itse maksetut kustannukset kasvoivat myös joskin vähemmän. Vuonna 2007 pienituloisten itse maksetut kustannukset sairaalasyntytyksissä olivat 13 % pienituloisten kotitalouksien vuosituloista. Osuus oli vähentynyt vuodesta 2002, jolloin se oli 18 %. Samalla erot eri tuloryhmien välillä kaventuivat. Kun äidin ikä, koulutus, kotitalouden tulot, lasten lukumäärä ja

synnytyssairaalan taso vakioitiin, sairausvakuutus (NCMS) oli yhteydessä vähentyneeseen omaan kustannusosuuteen sektioissa, mutta ei alatiesynnytyksissä (Artikkeli III).

Kahdessa läänissä viidestä CHIMACA-projekti rahoitti pienen osan naisten raskaudenaikaisesta ja synnytyksen jälkeisestä hoidosta. Äitiyshuollon palvelujen käyttöä tutkittiin niissä kolmessa läänissä viidestä, joissa äitiyshuollon palveluja ei rahoitettu CHIMACA-projektista. Riippumatta siitä sisältyikö raskausajan hoito läänin sairausvakuutukseen (yksi lääni) vai ei (kaksi lääniä) yli 70 % naisista kävi neuvolassa kahdentoista raskausviikon kuluessa ja yli 60 %:lla naisista oli vähintään viisi käyntiä. Kaikissa kolmessa läänissä suositusten mukaiset hemoglobiinin ja virtsan tutkimukset otettiin harvoin, mutta 90 % naisista kävi vähintään kaksi kertaa ultraäänitutkimuksissa. Kaikissa kolmessa läänissä äitiyshuollon itse maksetut menot vaihtelivat 8 %:sta 17 %:iin naisten vuosituloista. Menot olivat paljon suuremmat pienituloisilla kuin keski- ja suurituloisilla naisilla. Laadullisen tutkimuksen mukaan läänissä, jossa äitiyshuolto kuului sairausvakuutukseen, naiset eivät ymmärtäneet hyvin äitiyshuollon korvausta ja korvauksella oli vain vähän vaikutusta naisten päätöksiin käyttää äitiyshuollon palveluja raskausaikana. Useat naiset raportoivat lääkäreiden ehdottaneen heille kalliita tutkimuksia (Artikkeli II).

Viidessä maaseutumaisessa läänissä lähes puolet (46 %) kaikista lapsista syntyi sektorin avulla. Naiset ilmoittivat, että 13 % sektioista oli ollut hätäsektioita ja 33 % suunniteltuja. Naiset raportoivat, että puolet suunnitelluista sektioista oli lääkäreiden suosittelemia ja puolet heidän itsensä pyytämiä. Lääneissä, joissa sektioiden määrä oli keskitasoa (28 % - 63 %), vakuutuksesta saatu korvaus oli yhteydessä sektioiden määrään, etenkin suunniteltujen sektioiden määrään, kun otettiin huomioon äidin ikä, koulutus ja ammatti, kotitalouden tulot, aikaisemmat abortit ja synnytykset sekä synnytyspaikan taso. Tilastollisesti merkitsevää yhteyttä ei löytynyt lääneissä, joissa sektioiden määrä oli korkein (82 %) ja pienin (13 %) (Artikkeli IV).

**Päätelmät:** Kiinan maaseudun äitiyshuoltopalveluiden käyttö on huomattavasti parantunut vuosien 2002 ja 2007 välillä. Käytäntöjen suuret vaihtelut kuitenkin osoittavat, että kansallisten ohjeiden noudattamista laiminlyödään. Kalliit tutkimukset ja hoitotoimet ovat usein lääkäreiden suosittelemia. Äitiyshuoltoon ja synnytykseen liittyvä taloudellinen taakka maaseudun köyhien keskuudessa pysyi korkeana. Nykyisessä vakuutusjärjestelmässä ei ole välineitä, joilla voidaan hallita kustannuksia ja edistää laadukasta hoitoa.

## 1. INTRODUCTION

Maternal health has received a great deal of international attention in relation to global health development and poverty reduction. Mothers that are alive and healthy are good for their whole family and equally important to society. They facilitate improved childhood survival in the first several years and later positively impact on their child's productive life, as well as contribute to labour supply and economic well-being of communities (Lule et al., 2005). Maternal survival and health is also a human right, particularly related to gender equality.

From 1990 to 2008, the maternal mortality ratio (MMR) worldwide declined by 34%; although this progress is encouraging, developing countries continued to account for 99% (355 000) of global maternal deaths in 2008 (World Health Organization [WHO], United Nations Children's Fund [UNICEF], United Nations Population Fund [UNFPA] and The World Bank, 2010). Yet the deaths are only the tip of the iceberg, and many more women are estimated to suffer various short- or long-term pregnancy related illnesses and problems (Ashford, 2002).

In many developing countries, lack of access to quality and affordable maternity care are the two main barriers to improve maternal health (Ronsmans et al., 2006a). These have triggered debates on the performances of health care systems, government policies, and actions. In the 1980s, the World Bank introduced the market-oriented health services financing strategy to improve the "efficiency" of the health sector (Akin et al., 1987). The suggestions included: charging user fees at government health facilities, promotion of health insurance, decentralisation of government health services, and promotion of the private health sector. This strategy has influenced health policy in many developing countries. The World Bank policy had little concern on the health services for the poor, however. At the end of the 1990s, "Health for All" strategies have started to tackle health inequity (World Health Assembly, 1998). Many approaches to reduce financial barriers to maternity care have been discussed. They include: demand-side financing, for example providing cash or monetary form to individuals or households to encourage care use (Lim et al., 2010; Ir et al., 2010; Ekirapa-Kiracho et al., 2011), fee exemption to women by the government funding (Daponte et al., 2000; Kruk et al., 2008a), and pre-payment mechanism (e.g. health insurance) (Sepegri et al., 2008; Smith & Sulzbach, 2008; Kozhimannil et al., 2009). Although health care system reform has emerged globally, "no single resolution is likely to work everywhere", as formulated by Klein (1993).

China, like other transitional countries, is encountering socioeconomic-related inequality in maternal health. Between 1996 and 2006, the MMR was persistently high in poor rural areas (147 per 100 000): it was almost five times that of urban areas and twice that of average rural areas (Feng et al., 2010). The utilisation of maternity care has also varied by women's socioeconomic status and regions (Jing & Kaufman, 2008; Wu et al., 2012). In addition, factors related to socioeconomic status interact in different ways to influence care use. These factors include maternal age, education, occupation and ethnicity, cultural beliefs, and family support (Kaufman & Jing, 2002; Short & Zhang, 2004; Li, 2004).

Rising social inequality in health has been partly attributed to China's market-oriented economic and health care system reform in the 1980s. In the collective economy era, a prepaid health security programme, Co-operative Medical Scheme (CMS), financed and organized basic health services for all rural people (Feng et al., 1995). With the marketization of the rural economy, this system collapsed. At the same time, the contribution of the central government to health care dropped to

10% of total health care expenditure (Yip & Hsiao, 2008). The financial responsibility for health care was decentralized to provincial and local authorities through local taxation. Thereafter, the health care system became heavily dependent on fee-for-services financing. Health care was less affordable for rural population.

The Chinese government has recognized the failure of previous health care system reform and has lifted "equity in health and health care" in the health policy agenda (Tang et al., 2008). In 2003, the New Co-operative Medical Scheme (NCMS), a government subsidised voluntary health insurance, was introduced aiming to provide financial risk protection for the rural population in regard to catastrophic diseases (You & Kobayashi, 2008). Its introduction has been considered a milestone of the new rural health reform. The impact of the NCMS on the health of the rural population has attracted widespread national and international interest.

This study was made within the project "Structural hindrances to, and promoters of, good maternal care in rural China-CHIMACA (015396)" funded by the European Commission. The principal focus is to investigate the utilisation, contents, and costs of maternity care in the context of rural China, with a specific interest in its relation to the NCMS. Data was mainly obtained from cross-sectional surveys and qualitative interviews in 2008-2009. The reform of the health care system in China moves quickly, in particular since 2009 when the Chinese government committed to increasing investment in health care. Nevertheless, the results of this study are still valuable for policy development to continue improving maternal health in rural China. It also contributes to debate on financing maternity care in other developing countries, using the Chinese health care system as an example.

## **2. CONTEXT**

### **2.1 People's Republic of China**

The People's Republic of China had a population of over 1.3 billion in 2009. Its area is 9.6 million square kilometres, of which half is arid or mountainous in the north and the west and a densely populated area is in the east along the shore.

China is a single-party state, governed by the Communist Party of China, administratively divided into 23 provinces (including Taiwan), five autonomous regions, four municipalities directly governed by the central government (Beijing, Tianjing, Shanghai and Chongqing), and two special administrative regions (Hongkong and Macau). The provinces have a high degree of fiscal independence and are further divided into three levels: County, Township and Village.

Contemporary China has the typical structure of rural-urban dualism. This divide stems from the official household registration system ("Hukou") introduced in 1955, and has permeated all aspects of Chinese society, including public policy development (Liu, 2005). China is urbanizing rapidly. Out of the 900 million rural people in 2010, 720 million people lived in the countryside and 180 million rural residents ("rural Hukou") had left their hometown and lived in a city for over a half year (Han, 2010).

### **2.2 China's economic transition**

Since the economic transition from a centrally planned to a market-oriented economy was launched in 1978, China has made a rapid and sustained economic growth. Its annual growth rate per capita income was 8.5% during 1980-2007 (Wagstaff et al., 2009a). Growth has correlated with average poverty reduction and human development, such as increase in life expectancy, educational attainments, and improvement of living standards.

This economic liberalisation, accepting inequality in order to stimulate rapid economic growth, however, has negatively affected the distribution of income and social benefits of economic progress. The Gini index is often used to measure income inequality ranging from 0.23 (Sweden) to 0.71 (Namibia) worldwide (United Nations Development Programme [UNDP], 2009). In China, it was 0.47 in 2009 beyond acknowledged "security line" of 0.4 since 2000 (Liu, 2010). Income gaps between east coastal and west interior regions have been widening with over two times of per capita gross domestic product (GDP) in eastern regions than in western regions. In urban areas, per capita income in 2009 was United States Dollar (US\$) 2500, compared to US\$ 755 in rural areas. The real urban-rural income ratio was 2.6 in 2008 (Liu, 2010). Social inequality in health is increasing, and public dissatisfaction is mounting.

### **2.3 Health care system in China**

#### **2.3.1 A centrally directed China's health care system in 1949-1978**

In the Mao Tse-tung era (1949-1978), the Chinese health care system was centrally directed, and made great efforts to meet the needs of its huge peasant population. The government owned, funded, and ran all hospitals, clinics, and specialized care centres for maternal and child health, family planning, and some infectious diseases. The delivery of services was organized by a three-level network: in rural areas, it was composed of county-township-village health units; in urban areas, it was referred to city-district-street health units. This was designed as a referral chain from primary to

secondary care and a line management of technical assistance from county health units to village level. Provincial and central hospitals provided high-level referral. There was another horizontal control by the government units, ministry/bureau of health at the central, provincial, and county level (Hillier & Shen, 1996). In addition, the army and large state-owned industries ran their own hospitals under the control of their respective ministries and were also involved in services delivery.

During this period, the Chinese government controlled budgets and provided funding to cover the running costs of health sectors. Physicians were employees of the state and were paid a fixed salary. The price of medication and services were set at a low level and periodically adjusted by the central government to ensure affordable health care for all. Most of the urban population was covered by the Labour Insurance Scheme (LIS), targeting employees (and their dependents) at state-owned factories or by the Government Insurance Scheme (GIS), targeting officials and staff at government agencies (Ma et al., 2008). In the rural sector, the welfare fund of the communes based on collective farming financed the CMS. The CMS paid barefoot doctors (now called village doctors) who had basic health care training. They provided many preventive services, and both western and traditional Chinese medical care. The CMS also partially reimbursed patients for services received at township and county level health facilities. At its peak, 90% of the rural population had CMS coverage in 1978 (Hsiao, 1995).

Between the 1960s and 1970s, health gains were impressive. Maternal and child mortality fell faster than would be expected of a country with low per capita income and a low rate of economic growth. Life expectancy increased from about 35 to 68 years (WHO, 2005). These improvements could be a credit to the universal coverage of basic health care, and investment in preventive services including improved immunization, sanitation, and hygiene.

### **2.3.2 China's health care system reform in 1979-2002**

China's health care system reform was launched in the early 1980s, following macro-economic reform. The basic structure of delivering services remained; however, the way of financing health had changed, putting an emphasis on "cost recovery" for health care. First, the central government reduced investment in health care and transferred the financial responsibility for funding health care to provincial and local authorities through local taxation (Blumenthal & Hsiao, 2005). At the same time, health facilities gained increasing financial autonomy to generate revenues and manage surpluses. The government maintained price control for basic health care, but to ensure financial survival of health facilities, it permitted prices for high technology medical services and new drugs with profit margins of 15% or more (Yip & Hsiao, 2008). Furthermore, a bonus system was introduced to bind healthcare provider's salary to the revenue generation of facilities. Privatization of enterprises and the disappearance of rural communes led to a dramatic decrease in health insurance coverage, leaving over half of the urban population and 90% of the rural population uninsured (Yip & Hsiao, 2008). In 2002, the out-of-pocket payment, as a share of total health care spending, was around 60% (Hu et al., 2008).

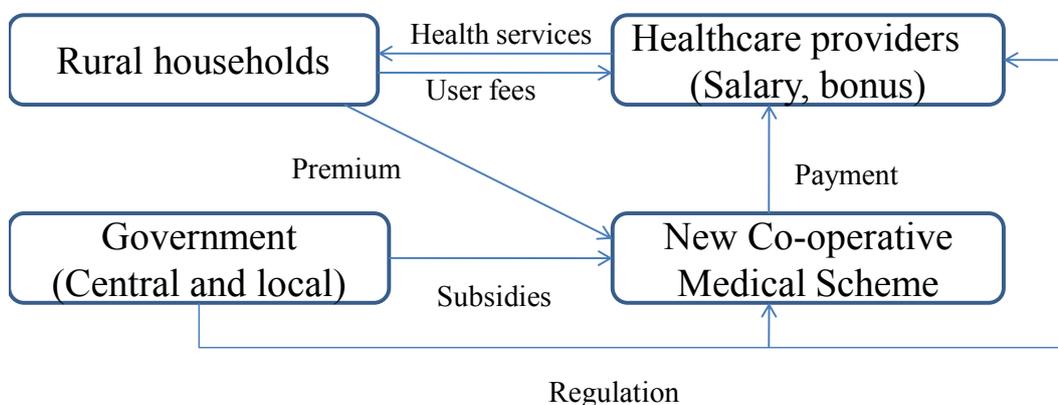
Yip and Hsiao (2008) have commented on China's health care system: "it was transformed from one that provided preventive and affordable basic health care to all people to one in which people cannot afford basic care and many families are driven into poverty because of large medical expenses." After communes dismantled, rural barefoot doctors were unemployed and became private healthcare practitioners. The fee-for-service payment mechanism has given a strong incentive to healthcare providers to offer many or expensive services. Freestanding hospitals, clinics, and even preventive institutions compete for patients. The referral system has broken down and gradually become patient self-referring to anywhere they can afford (Eggleston et al., 2008).

According to the 2003 Third National Household Health Service survey, 30% of the people who should have been hospitalized were not. Three-quarters of them were from rural areas and 85% from the poorest fifth of the households. The main reason for not seeking care was financial difficulty (Ministry of Health of China, 2004). In the national free tuberculosis (TB) treatment programme, patients were charged for longer treatment periods than recommended, and drugs and tests were administered beyond the standard treatment regimen (Xu et al., 2006; Liu et al., 2010). As a result, many patients have ended up paying considerably for TB treatment or have dropped out because of difficulties in paying for care (Long et al., 2011).

### 2.3.3 China's rural health care system reform initiatives since 2003

Health inequality and medical impoverishment, especially among many rural families, require the new reform. In 2003, the Chinese government instituted a voluntary health insurance programme, the NCMS, for rural residents not employed in the formal sector. The NCMS has joint financing by the central and local government and enrollees pay a flat rate of premium (Figure 1). It mainly shares the financial risk of inpatient care. The county (typical population: 0.5-1 million) forms the administrative unit of the scheme and the risks associated with illness are shared across the unit. The county government can decide the contents, coverage and reimbursement model most appropriate for local conditions, although the Chinese Ministry of Health is responsible for developing overall strategies and policies (Wang, 2007). At the same time, another safety net scheme, the Medical Assistance programme, has been established in both rural and urban counties. In rural areas, this programme has assisted the most vulnerable groups, such as the "extremely poor" or household eligible for China's new safety net programme with the NCMS contributions and co-payment (Wagstaff et al., 2009a).

Figure 1: New Co-operative Medical Scheme in rural China



In the initial stage of the NCMS, rural residents had little willingness to participate in the schemes. Participation was associated with higher education, household income, number of sick family members, potential benefits from premium, and co-payment costs (Zhang et al., 2006; Wang et al., 2008). The participation rate has consistently increased, however, reaching 92% in 2008 (Ministry of Health of China, 2009). In general, the scheme has been found to increase the utilisation of outpatient and inpatient care, but not to reduce out-of-pocket payment per case (Wagstaff et al., 2009b).

The NCMS includes a maternity benefit package, which differs in design and implementation across counties. Usually this package provides reimbursement for delivery at a health facility, either

as a fixed proportion of expenditure or a fixed payment. Reimbursement may be the same or different for vaginal delivery and Caesarean section (CS). The costs of prenatal and postnatal care are not often covered by the scheme.

The Chinese government has boosted public health spending in the early 2000s, particularly to strengthen the public health system in the central and western rural provinces. The funding has been directed to construction, qualified staffing, and the services revenues of preventive institutions (Wang et al., 2007). In 2009, China announced the plan for "Deepening the reform of the health care system", which emphasized the role of government in funding and supervision. This plan carried out five reform programmes as priorities during 2009-2011. They are: accelerating the establishment of the basic medical security system, setting up the national essential medicines system, strengthening the grass-root health care services, piloting public hospital reform, and promoting gradual equalization of basic public health services, with maternity care as one of the targets (National Development and Reform Commission, 2009).

## **2.4 Maternity care in rural China**

A guideline of systematic maternity care issued by the Chinese Ministry of Health in the 1980s recommends starting prenatal visits within the first trimester of pregnancy ( $\leq 12$  gestational weeks), having at least five prenatal visits by rural women and eight visits by urban women, giving birth at a health facility, and having at least three postnatal visits. Those are often used as progress indicators to measure improvement in maternal health in China.

Currently, maternity care in rural areas is primarily delivered at the township (township health centre) and county level (county general hospital or county maternal and child hospital). At the village level, village doctors and family planning workers (typically with six months medical education) provide health education and encourage pregnant women to seek care in health facilities; they also inform the township health centre of pregnancies in their villages. In the township health centre, caregivers are usually health care professionals with three years of specialized education (with direct entry into maternal and child health care). In the county hospital, the caregivers are health care professionals with either three years or five years of medical education. Referrals and self-referrals from township to county hospitals are not systematic, and the rules and recommendations for the appropriate level of care vary. Maternity care is charged like other health care, however, there are no the recent estimates available for public contributions to, and out-of-pocket payment for, maternity care in rural areas. In 2002, fee-for-services income accounted for 82% of the total revenue of maternity care institutes in rural China (Guo et al., 2008).

## **2.5 Family planning policy in China**

The Chinese family planning policy, known as "one-child policy", was officially introduced in 1979 aiming to encourage population containment, in considerations for economic development and improvement in living standards (Zhu, 2003). The policy consisted of a set of regulations including number of children permitted, spacing of children, and benefits to authorised birth (e.g. subsidised medical care for the birth, monthly stipend, and other social benefits to child) in addition to the financial penalty imposed for unauthorised birth (Klemetti et al., 2011). It was estimated that the fine could be at 10%-20% of household annual income or even higher than the average local annual income (Doherty et al., 2001). The interpretation and implementation of the policy varied over time across China. In most rural areas, a second child was generally allowed after three to five years (Hesketh et al., 2005).

In the early 1980s, the government subsidised a family planning programme, withdrew from the health care system, and established family planning service stations affiliated with the National Family Planning Commission (Short & Zhang, 2004). It mainly provided family planning services to married couples and placed childbearing under administrative control. Since 1994, the orientation of Chinese family planning has shifted from a focus on birth control to an integration of birth planning with quality and safety in reproductive health care, poverty alleviation, and economic development (Peng, 1998). Family planning stations started providing routine maternity care (Winckler, 2002).

### 3. CONCEPTUAL BACKGROUND

#### 3.1 Equity in health care

This chapter reviews the theoretical structure used to assess a health care system with the perspective of equity in health care, in order to set the context for this thesis.

There is an extensive body of literature that defines and measures equity in health care, where the concept has been generally considered to be "*equal access for equal need*" (Whitehead & Dahlgren, 2006; Oliver & Mossialos, 2004; Goddard & Smith, 2001; Ward, 2009). This means matching health services to the level of need across different socioeconomic groups. Often, *utilisation of health care* was used as indirect indicator of the wider notion of *access*. Therefore, a greater use of health care by socially vulnerable groups, who tend to have a greater need for health care, would be expected.

Dahlgren and Whitehead (2007) developed a systematic framework –the Affordability Ladder Programme– by applying an analysis of utilisation and quality of care, as well as the related health, economic, and social consequences.

##### *Utilisation of health care*

According to Dahlgren and Whitehead (2007), equity in the utilisation of health care needs to take type and level of care into account, regardless of a patient's ability to pay. The indicators of utilisation often include number of visits for outpatient services, number of days for hospitalization, or completed episodes of treatment.

From a health user's perspective, utilisation of health care starts with perceived need for care. The perception of need varies across social classes, influenced by age, sex, educational achievement, household wealth, common knowledge in the community, as well as availability of care (Sen, 2002). Sen's study illustrated that people in the low-income quintile were less likely to report health problems than the rich people, even though clinical measures showed worse health condition in the poor people. There is a growing body of evidence showing underuse of needed care in the poorer group due to economic constraints and overuse of high technology medical services which might not be necessary in the richer group (Hanratty et al., 2007).

##### *Quality of care*

Quality of care is an intrinsic element in the utilisation of health care. In many developing countries, community perceptions of high quality of care are related to knowing healthcare providers, comprehensive diagnostic and treatment equipments, and drugs (Gilson & McIntyre, 2007; Ma et al., 2008). Access to such services is often costly. Difficulty in affording desired care, and perceived poor quality at the primary level, have resulted in people not seeking care at all, having informal care, or delays and discontinuation of seeking care (McIntyre et al., 2007).

Supplies and equipment can be a precondition to delivering health care, while practice variations are widespread, depending on patient's social and economic background. In addition, healthcare provider's moral and attitude toward patients influences the patient's acceptance of professional care. Dissatisfaction or perceived stigma among patients, particularly the poor, women, and other

disempowered social groups, has led to deter compliance and use of health services (McIntyre et al., 2007).

Concerns of equity in quality of care include adequate, appropriate, and effective treatment for the same health problem for different social groups. Quality of care is typically gauged by patient's satisfaction, time spent with patients, adherence to practical guideline, and clinical outcomes (Goddard & Smith, 2001).

#### *Affordability of care*

The cost of health care is another critical factor influencing care utilisation, and it can also have economic consequences on the households. In many developing countries, private financing by user fees has been introduced in public health services to avoid overuse of services and improve quality of care (Russell, 1996). Over the past two decades, however, the out-of-pocket payments have become a major barrier for access to health care (Ensor & Cooper, 2004; James et al., 2006). Other than medical costs, the costs of transportation, food, and lodging, in addition to the cost of lost time for both the patients and the people that accompany them, often family members, can also be considerable.

The concept of affordability of health care implies the ability to cope with costs related to care use. It can rely on available income after meeting basic subsistence needs or third-party payment (e.g. health insurance coverage), but should not impose an "unreasonable burden on households" (Niens et al., 2012). Affordability of health care is a concern in low- and middle-income countries due to the payment for health care becoming a cause of poverty, particularly among vulnerable or near poor households (Whitehead et al., 2001). They are forced to sell productive assets or borrow money to cover health care costs, resulting in reduced living conditions and negative social effects, such as removing children from school (Russell, 2004).

Catastrophic payment is used to measure affordability for hospital care. It means the ratio of the health care expenditure to the total household resources. The assessment of household resources is difficult. Two indicators are usually used as proxy measures: household income or consumption in a certain periods (e.g. within one year). The household consumption is considered a more accurate reflection of purchasing power than the household income. The threshold of catastrophic spending on health care has been defined as 10% of total household income, or 40% of non-food spending (Xu et al., 2003; Ranson, 2002).

### **3.2 Equity analysis**

Most empirical studies are based on the assumption that an individual's or household's financial background is a key predictor of utilisation of health care, as well as care use related health, economic, and social consequences. Although the impact of other social characteristics, such as age, gender, educational achievement, and occupation on care use have been acknowledged, those are considered to associate with economic status and ability of using available resources (Caldwell, 1993; Habicht & Kunst, 2005). In the analysis, they are either stratified or adjusted as confounding factors.

#### *Income and wealth*

Income, as a proxy indicator of socioeconomic status, is commonly used in the studies on access or utilisations of health care (Bogg, 2002). Income data is usually collected at the household level and

standardized by family size, however, intra-family differences may be overlooked related to age, gender, or occupation status.

In developing countries, another measure of socioeconomic status is wealth index. It is based on household ownership of durable consumer goods, housing quality and water, and sanitation facilities. It uses principal components-derived weights and ranks wealth groups, consisted of e.g. 20% of population each (Gwatkin, 2005).

### *Health insurance*

Health insurance is an important financial variable directly associated with using health care and providing financial protection related to care use. Health insurance requires a fixed prepayment and can be categorized to mandatory and voluntary health insurance.

Mandatory health insurance is based on the principle of social solidarity, known as social health insurance covering a certain segment of the population or national health insurance aimed at universal coverage (Hacker, 1998). The scheme can cover a range of health care. In low-income countries, the financial capacity and sustainability is the main challenge to develop compulsory health insurance. Instead, voluntary health insurance, for instance community-based health insurance, is developed in small scale and requires a flat-rate premium to enrol in the scheme on a voluntary basis. There are risks of financial pooling across rich and poor population and sustainability of schemes in a small-scale (Ekman, 2004).

The introduction and expansion of health insurance has been suggested as a key of the strategy of "the Health for All" in developing countries. The debate over health insurance related effect on access to appropriate health care, cost of care, and resources allocation continues (World Health Assembly, 2005).

## **4. LITERATURE REVIEW**

### **4.1 Objectives and methods of literature review**

This literature review focuses on: a) the use of maternity care in developing countries, in particular in China, with a focus on its relation to women's socioeconomic status, costs of care use, and economic burden on women and their households; and b) the impact of health insurance on the use of maternity care and affordability in developing countries.

This review included population-based or facility-based cross-sectional, case control or cohort studies in developing countries published in English between 2000 and 2011. In the 1990s, there was a rapid development of maternity care in most developing countries (including China). Hence, studies published in the most recent ten years were considered more relevant. For reviewing the use of maternity care in developing countries, multicountry-based studies which are eligible to compare care use by women's socioeconomic status were included so as to provide a better understanding of the extent of the problem. Studies on maternity-care costs in developing countries were included. The same inclusion criteria were also applied to review the use and cost of maternity care in China. For reviewing the impact of health insurance on maternity care, studies that are eligible to compare care use and cost before and after the introduction of health insurance, or between insurance members and non-members, were included. In addition, two systematic reviews relating to study topics that add values by providing important evidence were reported in the text. Studies in which there was no information on the study design, study population, and how data were collected were excluded.

The databases MEDLINE, PUBMED, and Science Direct were searched using the following terms in different combinations: maternity care, maternal health services, prenatal care, obstetrics, postnatal care; utilisation, equity, inequality, socioeconomics, income, cost, expenditure, financial burden; health financing, user fees, health insurance; developing countries; China. Google search and web pages of the WHO and the World Bank related to reproductive health, and reference lists of retrieved articles were screened for further relevant papers. Studies were identified through examining titles, and then abstracts. Full texts of relevance abstracts were retrieved for further assessment.

There were two main outcome measures: the first was the relative difference in the use of maternity care by women's socioeconomic status or health insurance coverage. Rate ratio or odds ratio was extracted, or rate ratio was calculated from proportions for each comparison group; the second was out-of-pocket expenditure on maternity care, and the expenditure as a proportion of household income or expenditure. Data for outcome measures were summarised as a brief narrative.

### **4.2 Use of maternity care and affordability in other developing countries**

The search yielded a great number of studies on the use of maternity care in developing countries. In terms of specified criteria, six comparative studies based on a multi-country analysis were included. Data of all six studies were mainly obtained from nationally representative Demographic and Health Surveys (DHS) between 1990 and 2008 in countries in sub-Saharan Africa, south and southeast Asia, Latin America, and the Caribbean. China is not included. These studies used wealth index to measure women's socioeconomic status, and applied appropriate equity analyses. Other

contextual factors relating to care use were little investigated by these studies, however. The descriptions of these studies presented in Table 1 (page 24).

#### *Poor-Rich inequality in the use of maternity care*

In the six studies included, three studies investigated prenatal visits and skilled birth attendants (Houweling et al., 2007; Kruk et al., 2008b; Ahmed et al., 2010), two studies analyzed place of birth (Montagu et al., 2011; Limwattananon et al., 2011) and one focused on the use of CS (Ronsman et al., 2006b). All six studies highlighted poor-rich inequality in the use of professional prenatal and delivery care in the survey countries, although there was a substantial variation in care use across those countries. Houweling's (2007) and Ahmed's (2010) studies reported that inequality in skilled birth attendants was larger than those in prenatal care. In addition, Houweling (2007) and Kruk (2008b) assessed the relationship between the extent of inequality in maternity care use and overall health care use or health expenditure. Houweling found poor-rich inequalities in having prenatal care and skilled birth attendants were likely larger in countries with lower overall health care use. Kruk suggested that higher health expenditure should be accompanied by more equal education distribution to reduce inequality in skilled birth attendants.

For studying the place of delivery, Montagu (2011) found that most poor women gave birth at home compared to one fifth of women in the richest wealth quintile. The most common reason for home birth reported by poor women was that they perceived a facility-based delivery to be unnecessary, followed by a lack of access and high costs for facility-based delivery. Limwattananon (2011) reported an absolute difference in facility-based delivery between the poor and the rich ranging from 29% to 69% across countries in 2001-2006. In addition, this study described changes in facility-based delivery over time (between 1995 and 2006). It found a 10-20% increase in facility-based delivery occurred in all five studied Asia countries (except Bangladesh), but a less than 10% increase in 19 Sub-Saharan Africa countries.

For studying the use of CS, Ronsman (2006b) found that it was extremely low among the very poor, less than 1% in most low- and low-middle income countries. Greater difference in having CS between the poor and the rich occurred in countries with rate of CS over 5%. In addition, unexpected overall high CS rates were found in some middle-income countries, mostly in Latin America. The study concluded that in the poor countries, access to life-saving caesareans was not enough, while in the countries with high CS rates, CSs performed might not be all based on medical indications.

#### *Other factors related to care use*

Three of the six studies (Houweling et al., 2007; Limwattananon et al., 2011; Ronsman et al., 2006b) reported a difference in receiving professional delivery care, in favour of urban women, although the rural-urban difference in care use was smaller than the poor-rich difference in the most countries. Only one study (Ahmed et al., 2010) examined factors other than maternal economic status in relation to care use. After adjusting for maternal age and place of residence (urban/rural), the completion of primary education and higher empowerment score (ranked based on a set of answers of women's autonomy) were positively associated with having both four or more prenatal visits and skilled birth attendants.

Say & Raine (2007) have systematically reviewed the use of maternity care from 30 eligible studies in 23 developing countries, and also demonstrated economic inequality in care use. Disparities in maternity care were associated with factors at the individual level (e.g. place of residence, maternal age, education, medical insurance, and clinical risk factors) or at the health services level (e.g. clinic availability, distance to facility) and their interactions (e.g. perceived quality of care). Variations

were furthermore interpreted by contextual issues relating to funding and organization of health care or social and cultural issues. Another systematic review of factors affecting the use of prenatal care in developing countries that included 28 both quantitative and qualitative studies reported similar findings (Simkhada et al., 2008).

#### *Economic implications of facility-based delivery*

Of 19 identified studies on the cost of maternity care in developing countries, 14 were excluded. Seven did not have cost data at the household level, two studies were unable to locate, two were qualitative studies, and three by the author of this thesis. Overall five, four cross-sectional surveys and one cohort study conducted at four time points, were included. Studies were located to African (n=4) and Asian (n=1) countries. Response rates of these studies were high. Out-of-pocket payment for care use and financial burden on households were measured in different ways in each study (Table 2, page 26).

All five studies reported out-of-pocket payment for facility-based delivery. One study reported the average cost of delivery (Kruk et al., 2008a), and another four studies reported the cost of normal and complicated delivery respectively (Borghgi et al., 2003; Borghgi et al., 2006a; Storeng et al., 2008; Perkins et al., 2009). In general, the cost for a complicated delivery was more expensive than a normal delivery. Perkins (2009) studied changes in medical cost for facility-based delivery using two cross-sectional surveys in 2003 and 2006. The study reported between 2003 and 2006 average medical cost for facility-based delivery decreased in Kenya after officially eliminating user fees. The costs increased over time in Tanzania, and in Burkina Faso the increase occurred in complicated delivery. Financial burden on households in those studies was measured by out-of-pocket payment as a percentage of annual or monthly household income or expenditure. Although the measures were not consistent in each study, the costs of a complicated delivery often consumed a big proportion of household income (Storeng et al., 2008; Perkins et al., 2009; Borghgi et al., 2003; Borghgi et al., 2006a). For the poor, it was likely to be less affordable, potentially reaching catastrophic.

Three of the five studies (Borghgi et al., 2003; Borghgi et al., 2006a; Kruk et al., 2008a) reported a cost component of facility-based delivery. An investigation in Benin and Ghana reported that medical costs were the main component of facility-based delivery (Borghgi et al., 2003), however, transportation costs accounted for half of the total costs for a normal delivery in Nepal (Borghgi et al., 2006a) and over half of the average cost of a facility-based delivery in Tanzania (Kruk et al., 2008a).

Storeng (2008) and Kruk (2008a) further investigated women on how they managed high expenditure for facility-based delivery. Both studies found that over 40% of women cut down, borrow, or sell assets to cover delivery cost. Most of those households had suffered from short- or long-term socioeconomic consequences (Storeng et al., 2008).

Table 1: Description of studies on poor-rich inequality in the use of maternity care in multi-developing countries, 2006-2011

Study	Methods	Sample	Country	Outcome measures	Rich vs. Poor Rate ratio (%)	Comments	Observations
Houweling, 2007	DHS, 1990-1998	Births in the 3 or 5 years prior to the survey	45	Prenatal visits 2+	>1.5 (>90%, <60%)	Larger poor-rich inequalities in countries with lower overall levels of health care use.	Exponential curves were fitted through the scatter plots for the rate ratio against the overall level of health care use.
				Skilled birth attendants	>2.7 (>80%, <30%)		
Kruk, 2008b	DHS, 1990-2001 World Bank data, 1990 WHO data, 1998-2004	Births in the 3 years prior to the survey	45	Skilled birth attendants	2.6 (83%, 32%)	Smaller poor-rich inequalities with higher health expenditure accompanied by more equal education distribution.	Linear regression model included variables: total health expenditure per capita, maternal education and their interactions, and rate of poverty.
Ahmed, 2010	DHS, 1998-2006	Births in the 5 years prior to the survey	31	Prenatal visits 4+	6.3 <sup>a</sup> (4.76-7.69)	Care use was related to higher economic status, education and empowerment score.	Logistic regression models included variables maternal age, residence (urban/rural), education, economic status and empowerment score. Meta-analysis was used to summarize the results from multiple countries.
				Skilled birth attendants	16.7 <sup>a</sup> (11.1-20.0)		
Montagu, 2011	DHS, 2003-2008	Births in 2001 to survey year	48	Home birth	0.3 (in SSA, 22%, 78%); 0.2 (in SA, 21%, 89%); 0.2 (in SEA, 20%, 90%)	Reasons for home birth reported by poor women was perceived unnecessary for facility-based birth, a lack of access and high costs for facility-based	Descriptive analysis

Limwattananon, 2011	DHS, 1995-2001 2001-2006	Births (up to 4-6 by a woman) in each round of survey	25	Facility-based delivery	29-69% in 2001-2006 <sup>b</sup>	birth. Time trend: between 1995 and 2006, five Asian countries studied had an increase of 10-20% in facility-based delivery, but there was less than 10% increase in 19 SSA countries.	Descriptive analysis
Ronsmans, 2006b	DHS, 1990-2004	Births in the 3 years prior to the survey	42	Caesarean section	1 (2-2%)-122 (18-0.15%) <sup>c</sup>	Greater difference between the poor and the rich occurred in countries with caesarean rates >5%.	Descriptive analysis

Rate ratio: ratio of use of maternity care among the richest 20% wealth quintile to the poorest 20% wealth quintile

DHS: the Demographic and Health Surveys;

SSA: Sub Saharan Africa; SA: South Asia; SEA: South East Asia

<sup>a</sup> Pooled odds ratio (95% confidence interval)

<sup>b</sup> Range of absolute difference in the percentage across countries in 2001-2006

<sup>c</sup> Range of rate ratio across countries

Table 2: Description of studies on out-of-pocket payment on facility-based delivery in several developing countries, 2003-2009

Study	Methods (response rate)	Sample (n)	Country	Out-of-pocket cost (US\$)		% of household income/expenditure		Comments
				Normal delivery	Complicated delivery	Normal delivery	Complicated delivery	
Storeng 2008	Prospective cohort in 2004- 2006 (follow-up rate 87%)	Pregnancies ended in normal or "near-miss" obstetric events (1014)	Burkina Faso	23.5	58.5	5.1% <sup>a</sup>	12.7% <sup>a</sup>	1) Out-of-pocket payment was medical cost. 2) 41% of women who had a near-miss event reported to borrowing and selling assets compared to 10% of women having normal birth.
Perkins, 2009	Cross-sectional surveys in 2003 and 2006 (93-97%)	Births in the 2 years prior to each survey (6345 in 2003 8302 in 2006)	Tanzania	4.5 <sup>b</sup>	7.7 <sup>b</sup>	6% <sup>c</sup>	10% <sup>c</sup>	1) Out-of-pocket payment was medical cost. 2) Time trend: Between 2003 and 2006, average medical cost for facility-based delivery decreased in Kenya after officially eliminating user fees. The costs increased in Tanzania, and in Burkina Faso the increase occurred in complicated delivery.
			Burkina Faso	6.6 <sup>b</sup>	13.2 <sup>b</sup>	8% <sup>c</sup>	16% <sup>c</sup>	
			Kenya	14.2 <sup>b</sup>	30.4 <sup>b</sup>	17% <sup>c</sup>	35% <sup>c</sup>	
Borghi, 2003	Cross-sectional survey in 1999- 2000 (convenience sampling)	Pregnancies ended in normal or "near-miss" obstetric events (541)	Benin	36-15 <sup>d</sup>	160-104 <sup>d</sup>	5-2% <sup>e</sup>	20-13% <sup>e</sup>	1) Out-of-pocket payment included medical and non- medical cost (e.g. food, lodging, transportation, and others). 2) Medical cost was 79% of total cost in Ghana and 64% in Benin.
			Ghana	19-23 <sup>d</sup>	110-79 <sup>d</sup>	1-1% <sup>e</sup>	8-5% <sup>e</sup>	
Borghi, 2006a	Cross-sectional survey in 2003 (N-A)	Birth in the previous year of the survey (720)	Nepal	70.6	151.4	113- 366% <sup>f</sup>	N-A	1) Out-of-pocket payment included facility-based medical and non-medical cost, medicine or other items bought by patients

---

Kruk, 2008a	Cross-sectional survey in 2007 (91%)	Births in the 5 years prior to the survey (1205)	Tanzania	5.0 <sup>g</sup>	N-A	<p>outside facility, transportation and opportunity cost of time.</p> <p>2) Transportation cost was half of total cost for a normal delivery and one quarter for caesarean section.</p> <p>1) Out-of-pocket payment included medical cost, non-medical supplies, transportation and other costs.</p> <p>2) Transportation cost was 54% of average cost of facility-based delivery.</p> <p>3) 48% of women reported cutting down, borrowing/selling to pay for delivery.</p>
-------------	--------------------------------------	--	----------	------------------	-----	---

---

N-A: not available

<sup>a</sup> Out-of-pocket cost as a percentage of annual gross domestic product (GDP) per capita;

<sup>b</sup> Out-of-pocket cost in 2006;

<sup>c</sup> Out-of-pocket as a percentage of monthly household income;

<sup>d</sup> Out-of-pocket cost for spontaneous vaginal delivery and a near-miss complication caused by haemorrhage ranged between teaching and non-teaching hospital;

<sup>e</sup> Out-of-pocket cost as a percentage of annual household cash expenditure ranged between teaching and non-teaching hospital;

<sup>f</sup> Out-of-pocket cost as a percentage of monthly cash income ranged between the wealthiest and the poorest group;

<sup>g</sup> 435 women reported total out-of-pocket cost for a facility-based delivery on average.

### 4.3 Use of maternity care and affordability in China

Of 37 studies judged to potentially meet inclusion criteria, 27 were excluded. Of those excluded, 18 did not compare care use by women's economic status, 6 studies were comments, reviews, or qualitative studies, and 3 by the author of this thesis. In total, ten studies were included. All ten studies used data obtained from cross-sectional surveys, either nationwide (n=4), in western areas (n=2), and in central and northern areas (n=4). Women's economic status was assessed by a household owned consumer durables in Ren's study (2011), by a wealth index in Liu's study (2011), and by income category in eight other studies (Bogg et al., 2002; Anson, 2004; Li, 2004; Tang et al., 2006; Klemetti et al., 2010; Nwaru et al., 2012; Feng et al., 2011; Feng et al., 2012). Outcome measures regarding the use of prenatal, delivery and postnatal care were not consistent in each study. Table 3 (page 30) shows descriptions of these studies.

#### *Poor-Rich inequality in the use of maternity care*

All ten studies reported that poor women were less likely to use maternity care than rich women (Table 3). The association between economic status and care use was statistically significant by adjusted analysis in seven of the ten studies (Bogg et al., 2002; Li, 2004; Klemetti et al., 2010; Nwaru et al., 2012; Feng et al., 2011; Feng et al., 2012), whilst no association was found in the other three (Anson, 2004; Tang et al., 2006; Ren, 2011).

The timing and frequency of prenatal care was examined in two studies (Nwaru et al., 2012; Ren, 2011). Nwaru (2012) defined inadequate prenatal care as not starting prenatal visits by the fifth month and having less than 80% of recommended visits. There was higher likelihood of inadequate care for low-income women adjusting for maternal age, occupation, parity, and study sites. Moreover, a higher proportion of women with low-income (56%) had insufficient routine tests (e.g. blood pressure measure, blood tests, and ultrasound examination), compared to 27% of women with high-income. When content of care and maternal characteristics were adjusted simultaneously, the value of low-income as the risk of estimating to inadequate care increased. In Ren's study (2011), adequate care was defined as having a first visit within the first trimester of gestation and having five or more visits overall. Owning a television, refrigerator, and telephone were used as a measure for women's living standard. No association between these measures and having adequate care was found.

Two studies (Bogg et al., 2002; Li, 2004) investigated having prenatal and delivery care. Both studies did not find statistically significant association between income and prenatal visits, but they reported that higher income was positively related to facility-based delivery or birth with a skilled attendant. Another two studies (Anson, 2004; Liu et al., 2011) examined the use of prenatal and postnatal care, and facility-based delivery. After adjusting for maternal and household characteristics in both studies, income was not associated with any of those care uses in Anson's study, while Liu's study (2011) observed that high wealth index was significantly associated with the use of all three cares.

Four studies based on national representative data reported changes in facility-based delivery rates (Feng et al., 2011) and CS rates (Tang et al., 2006; Klemetti et al., 2010; Feng et al., 2012) in China. Between 1988 and 2008, facility-based delivery increased from 44% to 95% nationally. Low-income women were less likely to give birth in a health facility, but differences in facility-based delivery across income groups became much smaller (Feng et al., 2011). In 1988-2008, CS rates increased greatly in both urban and rural areas. Income related difference in having CS was found in rural areas (Klemetti et al., 2010; Feng et al., 2012), but not in urban areas (Tang et al., 2006; Feng et al., 2012).

### *Other factors related to care use*

These ten studies also reported factors other than economic status relating to maternity care use. They were maternal age, ethnicity, education, parity, financing, structural, and policy factors.

In the studies on adequate prenatal care, older women were more likely to have inadequate care, but its effect was attenuated after adjusting for content of care (Nwaru et al., 2012). Ren's study (2011) found maternal ethnicity was significantly related to care use. Hui women were less likely to have adequate care compared to Han women.

Bogg (2002) reported that the amount of savings in the bank, and coverage by a maternal pre-payment scheme or health insurance, were positively associated with both prenatal and professional delivery care use. Li (2004) reported that cultural preferences for a son, and the regulated number of births due to family planning policy, were negatively related to care use. Anson's (2004) and Liu's (2011) studies had similar findings, that higher education and lower parity were associated with having prenatal and postnatal visits, and facility-based delivery. In addition, both studies investigated structural factors. Anson (2004) found availability of maternal health staff in the village was associated with increased probability of having prenatal and postnatal care, but decreased odds of giving birth in a health facility. Longer distances of a village to a county hospital correlated with fewer women giving birth in a health facility and having a postnatal visit. In Liu's study (2011), lower altitude of county was positively associated with prenatal, delivery, and postnatal care uses.

In the four studies based on the national data, higher education and health insurance coverage were associated with both facility-based delivery and CS adjusting for survey year. Greater differences in care use were found by socioeconomic regions (Tang et al., 2006; Klemetti et al, 2010; Feng et al., 2011; Feng et al., 2012). In addition, Klemetti (2010) reported that giving birth in a high-level hospital was associated with having a CS.

For the affordability of maternity care, no previous study on household expenditure on care use was found.

Table 3: Description of studies on poor-rich inequality in the use of maternity care in China, 2002-2011

Study	Methods	Sample (n)	Province	Outcome measures	Rich vs. Poor <sup>a</sup>	Other determinants	Observations
					OR / RR (%)		
Nwaru, 2012	Cross-sectional survey in 2001, 2002 and 2003	Births in the previous year of the survey (1479)	Anhui	Inadequate prenatal care <sup>b</sup>	*0.4 (27%, 23%)	The effect of older age in relation to inadequate care use was attenuated after adjusting for content of care.	Logistic regression adjusted for maternal age, occupation, parity, study sites (intervention/control town), and the content of care.
Ren, 2011	Cross-sectional survey in 2006	Births in the five years prior to the survey (554)	Ningxia	Adequate prenatal care <sup>c</sup>	NS (9%) <sup>d</sup>	Minority status was negatively associated with care use.	Logistic regression adjusted for maternal age, education, ethnicity and sex, age, and sibling of youngest child.
Bogg, 2002	Cross-sectional survey in 1995	Births in 1990-1995 (353)	3 central provinces	Prenatal visits 3+ Facility delivery	NS (71%, 32%) *1.07-1.99 <sup>e</sup> (78%, 18%)	Amount of savings in the bank, covered by a maternal pre-payment scheme or health insurance were associated with both care use.	Logistic regression adjusted for urban/rural residence, maternal education, occupation, health insurance, maternal pre-payment scheme, amount of savings in the bank, distance to secondary care, and parity.
Li, 2004	Cross-sectional survey in 1994	Births in 1991-1993 (1062)	Yunnan	Prenatal visits 1+ Skilled birth attendants	1.2 (33%) <sup>d</sup> *1.4 (17%) <sup>d</sup>	Son preference cultural and unauthorised birth were negatively related to care use.	Logistic regression adjusted for a set of variables in relation to women's status in the family, son preference, and family planning policy.

Anson, 2004	Cross-sectional survey (survey year not available)	Births in 1996-1999 (4273)	Hebei	Prenatal visits 1+ Facility delivery Postnatal visits 1+	1.0 (65%, 47%) 1.0 (34%, 24%) 1.0 (27%, 12%)	Younger age, higher education, and lower parity and structural factors were related to all care use.	Logistic regression adjusted for maternal age, education, occupation, living arrangements, and parity.
Liu, 2011	Cross-sectional survey in 2005	Births in the 3 years prior to the survey (14112)	10 western provinces	Prenatal visits 4+ Facility delivery Postnatal visits 1+	*1.5 (53%) <sup>d</sup> *1.7 (86%) <sup>d</sup> *1.4 (85%) <sup>d</sup>	Han ethnicity, higher education, lower parity, and lower altitude of county were related to all care use.	Multilevel logistic regression adjusted for maternal age, ethnicity, and education, husband education, parity, altitude of county, and region.
Feng, 2011	NHHS in 1993, 1998, 2003 and 2008	Births in 1988-2008 (34482)	National	Facility delivery	*1.1 (90%, 48%)	<u>Time trend:</u> Between 1988 and 2008, facility-based delivery increased from 44% to 95%. <u>Other factors:</u> Greater difference by socioeconomic regions, higher education and health insurance coverage.	Poisson regression adjusted for survey year, region, maternal age and education, health insurance, parity, and number of prenatal visits.
Tang, 2006	NHHS in 1993, 1998 and 2003	Primary births in 1990-2002 (3559)	National (urban)	Caesarean section	0.9 (50%, 34%) in 1998-2002	<u>Time trend:</u> Between 1990 and 2002, caesarean rate increased from 18% to 40% in urban China. <u>Other factors:</u> living in large cities, higher education, and health insurance coverage.	Logistic regression adjusted for time periods, city development level, maternal age and education, health insurance.

Klemetti, 2010	NHHS in 1993, 1998 and 2003	Primary births in 1991-2002 (10754)	National (rural)	Caesarean section	*2.6 (19%, 8%) in 1998-2002	<u>Time trend</u> : Between 1991 and 2002, caesarean rate increased from 1% to 17% in rural China. <u>Other factors</u> : higher education, living in eastern China, health insurance coverage, use of prenatal care, and birth at high-level hospital.	Logistic regression adjusted for maternal age.
Feng, 2012	NHHS in 1993, 1998, 2003 and 2008	Births in 1988-2008 (34482)	National	Caesarean section	1.2 (50%, 16%) in urban areas; *1.4 (23%, 2%) in rural areas	<u>Time trend</u> : Between 1988 and 2008, caesarean rate increased from 3% to 39% nationally. <u>Other factors</u> : Greater difference by socioeconomic regions, higher education, and health insurance coverage.	Poisson regression adjusted for survey year, maternal age, education, health insurance, parity, and number of prenatal visits in both urban and rural areas.

OR: odds ratio; RR: relative risk;

NS: not significant; \* statistically significant

NHHS: National Household Health Service surveys

<sup>a</sup> Economic status (rich and poor) was assessed by a household owned consumer durables in Ren's study (2011), by a wealth index in Liu's study (2011), and by high- and low-income category in other studies.

<sup>b</sup> Inadequate prenatal care was defined as not having a first prenatal visit by the fifth month and having less than 80% of recommended visits.

<sup>c</sup> Adequate prenatal care was defined as having a first prenatal visit within the first trimester of gestation and having five or more visits overall.

<sup>d</sup> The proportions are averages

<sup>e</sup> Odds ratio 95% confidence interval

#### 4.4 Relation between maternity care and health insurance in developing countries

Sixteen studies in relation to both maternal health and health insurance were identified. Of these studies, ten were excluded, five were comments or reviews, three measured the outcomes of infant and child health or the use of health care in general, one was a qualitative study, and one lacked a clear method of data collection. In total, six studies were included. Five of the six studies used data from cross-sectional surveys to study the impact of health insurance on the use and content of maternity care (Kozhimannil et al., 2009; Chen et al., 2001; Chen et al., 2008; Sepehri et al., 2008; Smith & Sulzbach, 2008). One study (Tsai & Hu, 2002) extracted data from facility birth records to study the relation between health insurance coverage and CS (Table 4, page 35).

##### *Use of maternity care*

Four studies (Kozhimannil et al., 2009; Chen et al., 2001; Tsai & Hu, 2002; Chen et al., 2008) investigated changes in the use of prenatal and delivery care before and after introducing national health insurance in the Philippines and Taiwan (Table 4). After adjusting for maternal socioeconomic and regional characteristics, the Philippine health insurance programme increased the likelihood of having a first prenatal visit within 16 gestational weeks, and having four or more visits overall. Facility-based delivery increased slightly and the association was not statistically significant (Kozhimannil et al., 2009). In Taiwan, the use of maternity care also increased after the establishment of a national insurance programme. Chen (2001) reported a notable increase in the use of complicated laboratory tests for prenatal and intrapartum care and having a CS after the implementation of the insurance programme. There was no change in consultation services and a decrease in the use of less costly laboratory tests. The study of Tsai and Hu (2002) also reported insurance-related increases in having a CS in Taiwan, adjusting for maternal and physician characteristics. In addition, Chen (2008) found rural women were more likely to seeking maternity care at a large hospital in post-insurance periods. But this was not found in non-rural areas.

One study in Vietnam (Sepehri et al., 2008) compared the use of prenatal and delivery care between uninsured members and those covered by social health insurance (e.g. employment-based population, veterans etc.), or those covered by a health insurance for the poor. After adjusting for women's socioeconomic and community characteristics, social health insurance coverage was associated with giving birth in a health facility for the middle- and high-income women, but not for the low-income women. There was no insurance-related association with having prenatal visits. The health insurance for the poor was found to increase the probability of having prenatal visits, but the association with facility-based delivery was not statistically significant.

One study (Smith & Sulzbach, 2008) investigated the impact of community-based health insurances on care use by insured or uninsured members in Senegal, Mali, and Ghana. The findings varied across countries: in Senegal, insured women were more likely to give birth at a facility than uninsured women, but there was no significant difference in having four or more prenatal visits between insured and uninsured women; in Mali, membership status was found to associate with the use of both prenatal and delivery care; while, in Ghana there was no association between health insurance coverage and having any care. The variations in care use were considered to depend on the context in terms of general care costs and utilisation rates.

### *Affordability of care*

Only one study (Smith & Sulzbach, 2008) examined the impact of community-based health insurances on out-of-pocket expenditure for facility-based delivery in Senegal, Ghana, and Mali. The study used a linear regression of a logarithmic scale of out-of-pocket expenditure, and found the insurance was related to the lower out-of-pocket expenditure for facility-based delivery in Senegal and Ghana, but not in Mali. The authors suggested further studying the ability of community-based health insurance to provide financial protection.

Table 4: Description of studies on relation between the use of maternity care and health insurance in developing countries, 2001-2009

Study	Methods (Response rate)	Sample (n)	Country	Type of insurance	Outcome measures	Comparison	Association (Odds ratio)	Observations
Kozhimannil, 2009	DHS in 1998 and 2003 (97%-98%)	Births in the five years prior to each survey (4968 in 1998 and 4802 in 2003)	Philippines	NHI	Prenatal visits 4+ Start visit ≤16 weeks Facility delivery	after, before	↑*1.04  ↑*1.03  ↑ 1.00	Logistic regression adjusted for maternal age, education, parity, age when first child was born, number of family members, urban/rural residence, religion, assets index, and regional development level
Chen, 2001	Cross-sectional surveys in 1989 and 1996 (90%)	Births in 1989 (1662) and in 1996 (3626)	Taiwan	NHI	Content of care	after, before	↑ Complicated laboratory tests for prenatal and intrapartum care, and caesarean sections ↔ No change in consultation services ↓ Less costly laboratory tests * 4.75	Stratification analysis by maternal age, education, and parity
Tsai, 2002	Facility birth records in 1994 (pre-NHI)-1996 (post-NHI)	Primary deliveries in 1994-1996 (11788)	Taiwan	NHI	Caesarean section	insured, uninsured		Logistic regressions adjusted for maternal age and education, physician gender, professional level, financial incentive, clinical indication, and convenience
Chen,	Cross-sectional	Births in 1990-	Taiwan	NHI	Place for	after, before	↑* 6.54 Seeking	Multivariate analysis

Year	Survey	Sample Size	Country	Insurance Type	Healthcare Service	Insurance Status	OR	Notes
2008	survey in 2000 (76%)	1999 (1575)			prenatal care			care at large hospital by rural women ↔ No change in non-rural areas adjusted for child gender, birth order, maternal age, ethnicity, education, marital status, household income, obstetric health problems, and parity
Sepehri 2008	VNHS in 2001-2002 (>98%)	Births in the five years prior to the survey (9400)	Vietnam	CHI	Prenatal care	insured, uninsured	1.02	Logistic regressions adjusted for a set of maternal characteristics, household characteristics, and commune characteristics
				HIP	Prenatal care	insured, uninsured	*2.8-4.2 for the middle- and high-income groups *1.19	
Smith, 2008	Cross-sectional survey in 2004 (N-A)	Births in the previous year of the survey or pregnancy over 5 months	Senegal (n=191)	CBHI	Prenatal visit 4+	insured, uninsured	1.17	Logistic regressions adjusted for maternal age, education, parity, history of stillbirth, and household socioeconomic status, education of household head, religion, ethnicity, and community variables
					Facility delivery		*4.74	
			Mali (n=775)	CBHI	Prenatal visit 4+	insured, uninsured	*2.41	
			Ghana (n=293)	CBHI	Facility delivery		*4.32	
					Prenatal visit 4+	insured, uninsured	1.44	
					Facility delivery		1.45	

↑ Increase in absolute percentage of the use of maternity care; \* Statistically significant; N-A: not available

DHS: Demographic and Health Surveys; VNHS: Vietnam National Household Survey

Type of health insurance:

NHI: National Health Insurance CHI: Compulsory health insurance

HIP: Health insurance for the poor CBHI: Community-based Health Insurance

## **5. AIM OF THE STUDY**

### *General objective*

The principle aim of this study was to investigate the utilisation, contents, and costs of maternity care and its related financial burden on households in the context of rural China, particularly in relation to rural health insurance (NCMS).

### *Specific objectives*

- 1) To investigate changes in the use of maternity care in western rural China and its relation to income before and after introducing the NCMS.
- 2) To investigate changes in the expenditure of facility-based delivery in rural China with the development of the NCMS, and examine the financial burden on households, particularly poor ones, and to identify factors associated with out-of-pocket expenditure.
- 3) To describe use, contents, and costs of prenatal care in one rural county where prenatal care is included in the NCMS and two counties where it is not, and furthermore explore the perceptions of stakeholders of including prenatal care in the NCMS.
- 4) To investigate the use of caesarean section in five rural counties and its related factors, with particular focus on the NCMS.

## 6. DATA AND METHODS

This study has utilised data from the 2003 and 2008 Chinese National Household Health Services (NHHS) surveys and NHHS additional western surveys in ten western provinces in both 2003 and 2008. The CHIMACA project has also provided survey, qualitative interviews, and other data over the years 2008-2009. The map of China in the Appendix shows the geographic distribution of data collections.

The CHIMACA project included one province in Central (Anhui) and two provinces in Western China (Chongqing and Shaanxi), all three representing relatively less developed areas of China. Two counties in Anhui (FC and XC County) and Shaanxi (LT and ZA County), and one county in Chongqing (RC County) were selected. The selection criteria for counties were a low to average socioeconomic level, and local health facilities that were willing to, and capable of, participating in the project.

The CHIMACA survey obtained the approval of the International Centre for Reproductive Health, Ghent University (2008/143). Ethical approval for the qualitative study was obtained from the Research Ethics Committee at the Liverpool School of Tropical Medicine (2008/63). Local approval was obtained from the ethical committee of Anhui Medical University, Chongqing Medical University, and Xi'an Jiaotong University in 2008. All data was collected based on voluntary participation.

A detailed description of each data source is given in the original papers. Characteristics of the data sources and study population are summarized in Table 5-6.

Table 5: Description of data sources used in the study

Data source	Year	Type of data	Province	Sampling	Target population	Response rate	In paper
NHHS survey	2003, 2008	Cross-sectional	Nationwide	Multistage random sampling	Rural households: 40,212 in 2003; 39,654 in 2008.	>95%	III
NHHS: additional western survey	2003, 2008	Cross-sectional	10 western provinces	Multistage random sampling	Rural households: 18,000 in 2003 and 2008.	>95%	I
CHIMACA survey	2008-2009	Cross-sectional	Anhui Chongqing Shaanxi	Cluster random sampling	Women giving birth in 2008-2009 (5049)	73%	II, IV
CHIMACA qualitative study	2009	a) Focus group discussions; b) Individual interviews	Chongqing	Purpose sampling	a) New mothers; b) Policy makers, and healthcare providers	N-A	II

Other	2009	Official documents and statistic data	Anhui Chongqing Shaanxi	N-A	N-A	N-A	II, IV
-------	------	---------------------------------------	-------------------------------	-----	-----	-----	--------

NHHS: National Household Health Service surveys  
 CHIMACA: "Structural hinders to, and promoters of, good maternal care in rural China" project funded by the European Commission  
 N-A: not applicable

Table 6 Description of study population in original papers

Paper	Data	Study population (n)	Characteristics
I	2003 and 2008 NHHS additional western surveys	Rural women who gave birth in 2002 (917) or 2007 (809)	<ul style="list-style-type: none"> <li>• In the both years, women were relatively similar in regard to age, ethnicity, and parity.</li> <li>• The significant changes over time were the increase in women's educational level and the proportion of women participating in the NCMS, from only a small percentage to almost everyone.</li> </ul>
II	CHIMACA	Rural women who gave birth in 2008-2009 in the three counties <sup>a</sup> (2,234)	<ul style="list-style-type: none"> <li>• Women had the highest annual income in XC county, followed by RC, and the lowest in LT county.</li> <li>• Over one third of women reporting the latest pregnancy were unauthorised in RC and LT counties, but it was a very small proportion in XC county.</li> </ul>
III	2003 and 2008 NHHS surveys	Rural women who gave birth in 1998-2007 (11,866)	<ul style="list-style-type: none"> <li>• The age and parity distribution were relatively similar over the study periods.</li> <li>• Women's educational level increased over time. NCMS participation had a substantial increase.</li> </ul>
IV	CHIMACA	Rural women who gave birth in 2008-2009 in the five counties <sup>b</sup> (3,550)	<ul style="list-style-type: none"> <li>• In FC and XC counties, women paying out-of-pocket for a delivery were younger, well educated, and had lower parity, compared to women who had received reimbursement from the NCMS.</li> <li>• In the other three counties, women paying out-of-pocket for a delivery were older, had lower education, and higher parity.</li> </ul>

NHHS: National Household Health Service surveys  
 CHIMACA: "Structural hinders to, and promoters of, good maternal care in rural China" project funded by the European Commission

<sup>a</sup> Three of the five counties without the CHIMACA financial intervention that covered part of women's costs for prenatal and postnatal care.

<sup>b</sup> Women with a missing value on health insurance and reimbursement were excluded, leaving 3550 women from the 3673 women interviewed.

## 6.1 Data sources

### *NHHS surveys (Paper III)*

The cross-sectional data were obtained from NHHS surveys conducted in 2003 and 2008 by the Centre of Statistics and Information, Ministry of Health of China. The 2003 and 2008 surveys used the same four-stage stratified random sampling procedure (counties, townships, villages and households). Ten indicators of socioeconomic development were used to classify each county's level of development as being in one of the four categories: developed, relatively developed, less developed, or poor. The probability proportional sampling method was used to randomly select counties for each development category; then, five townships were selected from each county and two villages from each township. Finally, 60 households were randomly selected from each village. In total, 40,212 rural households in 2003, and 39,654 in 2008, were surveyed. Interviews were carried out by trained township health workers using a structured questionnaire.

The questionnaires used in the two surveys had a similar structure and involved similar questions. The 2008 survey included questions about participation in the NCMS and any reimbursement received. The questionnaires were divided into several sections covering: the general demographic and socioeconomic background of the sampled households and family members; the perceived need and demand for health care; and the utilisation of, and expenditure on, health services. The questionnaire included a section on births that occurred within the five years before the survey. The rural component of the data set was applied, and births that took place between 1998 and 2007 were included in the analysis.

### *NHHS: additional western surveys (Paper I)*

As part of the NHHS surveys, regionally representative data was also collected in 2003 and 2008 from ten western provinces. In the two surveys, the same multistage sampling was used in each of the ten western provinces to randomly select thirty rural townships, two villages in each township and thirty households from each village, yielding 18,000 rural households. Trained township health workers interviewed people using the questionnaires of 2003 and 2008 national surveys. Data for rural women who gave birth in 2002 or 2007 was included in the analysis.

### *CHIMACA survey (Paper II and IV)*

A cross-sectional survey was carried out in the CHIMACA study counties between December 2008 and March 2009. The survey included a sample of villages in all townships in each county. The villages of each township were stratified by population size and distance to the township hospital; one third of the villages were then randomly selected from each of the stratifications, giving a total of 485 villages. In the FC and XC counties, women who gave birth between March and December 2008 were identified from the family planning register. In the RC and LT Counties, women who gave birth between April and December 2008 and in the ZA County between August 2008 and March 2009 were identified from the birth registers of hospitals. The both registers included births occurring at health facilities and those outside health facilities. Trained researchers and medical students interviewed the women at home or in a public place using a structured questionnaire. The questionnaire included women's demographic and socioeconomic background, history of pregnancy, utilisation of and expenditure on maternity care for the latest pregnancy.

In total, 5049 women (excluding women moving out of the area) were identified, and 73% of women (n=3673) completed the interview. In addition, 285 (of 5049, 6%) husbands or mothers of the survey participants were interviewed if the woman was not able to answer questions. The questionnaire used to interview those relatives did not contain detailed information on care use, and so these answers were not included in the analysis<sup>1</sup>. The most common reasons for non-response included: women were not at home at the time of the survey (10%, n=518); no or incomplete contact information (7%, n=376); or women refused to be interviewed (2%, n=83).

#### *CHIMACA qualitative interviews (Paper II)*

The qualitative investigations in RC County, which included part of the prenatal care in the NCMS, were conducted in 2009. The methods included: 1) Focus Group Discussions (FGDs) with two groups each of five women who had an authorised birth (one group before and another after including prenatal care in the NCMS); and 2) Semi-structured individual interviews with three key informants who were responsible for maternal health and the NCMS at the county level, and twelve healthcare providers including health managers, NCMS managers and obstetric doctors from township hospitals. The interviewers were researchers or medical students who were trained in the skills of data collection and ethical approaches.

The use of different data collection methods and involving in different participants were employed to data triangulation. Triangulation is a method of cross-checking or cross-referencing the data through combining different perceptions of the same event in order to provide more detailed and holistic understandings of the situation (O'Donoghue & Punch, 2003).

#### *Other data (Paper II and IV)*

In CHIMACA study counties, statistic data between 2001 and 2008 including demographics, provision of maternity care in health facilities at county and township level, and their patient fees were collected from the county Maternal and Child Health hospitals, the county statistics offices, and the county NCMS offices. The data collection forms were developed by a research team and completed by members of a local research group who received training on how to use the instruments. The 2008 data was used in the study. In addition, policy documents were reviewed regarding the implementation of the NCMS issued by the county Health Bureaus.

## **6.2 Data analysis**

Utilisation of maternity care was measured by the use of any prenatal care, the initiation of a prenatal visit within 12 gestational weeks, having five or more prenatal visits, and facility-based delivery, defined as giving birth at a township or higher level health facility. Contents of prenatal care were compared to the national guidelines including advice on health behaviour and nutrition, and some basic examinations and tests. Caesarean section (CS) was divided into emergency CS (self-reported child's or woman's own condition in danger) and non-emergency (not in danger). Out-of-pocket expenditure on prenatal care or facility-based delivery was calculated as the total medical expenditure minus any reimbursement reported by the women. Out-of-pocket expenditure as a percentage of annual women's or household income was used as an indicator to evaluate the financial burden.

---

<sup>1</sup> Questionnaire used in the CHIMACA survey are available at [<http://groups.stakes.fi/NR/rdonlyres/E4C55881-5B94-4962-A428-74E6D3C6D671/0/RAP0232010.pdf>].

The explanatory variables related to use, contents, and costs of maternity care were maternal socioeconomic characteristics (e.g. age, education, occupation and ethnicity, household income, and NCMS participation or NCMS coverage defined as having or not receiving reimbursement) and other characteristics (e.g. previous abortions and births, distance to the nearest health facility, and type of health facility for a birth). The outcome measures and explanatory variables used in original papers are summarised in Table 7.

Table 7 Outcome measures and explanatory variables used in original papers

Paper	Outcome measure	Socioeconomic explanatory variable	Other explanatory variable
I	a) Use of any prenatal care; b) Initiation of a prenatal visit within 12 gestational weeks; c) Having five or more visits; d) Facility-based delivery	Maternal age, education, and ethnicity, household income, and NCMS participation	Parity, previous abortions, and distance to the nearest health facility
II	a) Initiation of a prenatal visit within 12 gestational weeks; b) Having five or more visits; c) Contents of prenatal care d) Out-of-pocket expenditure on prenatal care	Women's income	Parity, inclusion of prenatal care in the NCMS
III	Out-of-pocket expenditure on facility-based delivery	Maternal age, education, household income, and NCMS participation	Parity and type of health facility for birth
IV	Caesarean section (divided into emergency and non-emergency)	Maternal age, education, occupation, household income, and NCMS coverage	Parity, previous abortions, and type of health facility for birth

Proportions and means were used to describe use, contents, and costs of maternity care over study periods and by women's income category. The differences were tested by Chi-square, t-test, and Chi-square trend test. Logistic regressions were used to study factors related to maternity care use (Paper I), and the association between birth by CS and NCMS coverage adjusting for co-variables (Paper IV). Odds ratios (OR) and 95% confidence interval (CI) were calculated. For studying factors related to out-of-pocket expenditure on facility-based delivery, regression coefficients were calculated from the linear regressions of the logarithm of the observed expenditure (Paper III). In studying the impact of the NCMS on prenatal care use and provision, descriptive statistics and qualitative interviews were used (Paper II). The qualitative data was analyzed using the "framework approach" (Ritchie et al., 2003). An analytical framework was developed based on the topic guide and categories emerging from the transcripts. All qualitative data were coded, sorted and classified using Maxqda2 software based on the framework. Chartings were used to identify common or divergent perceptions and explanations were developed.

## 7. RESULTS

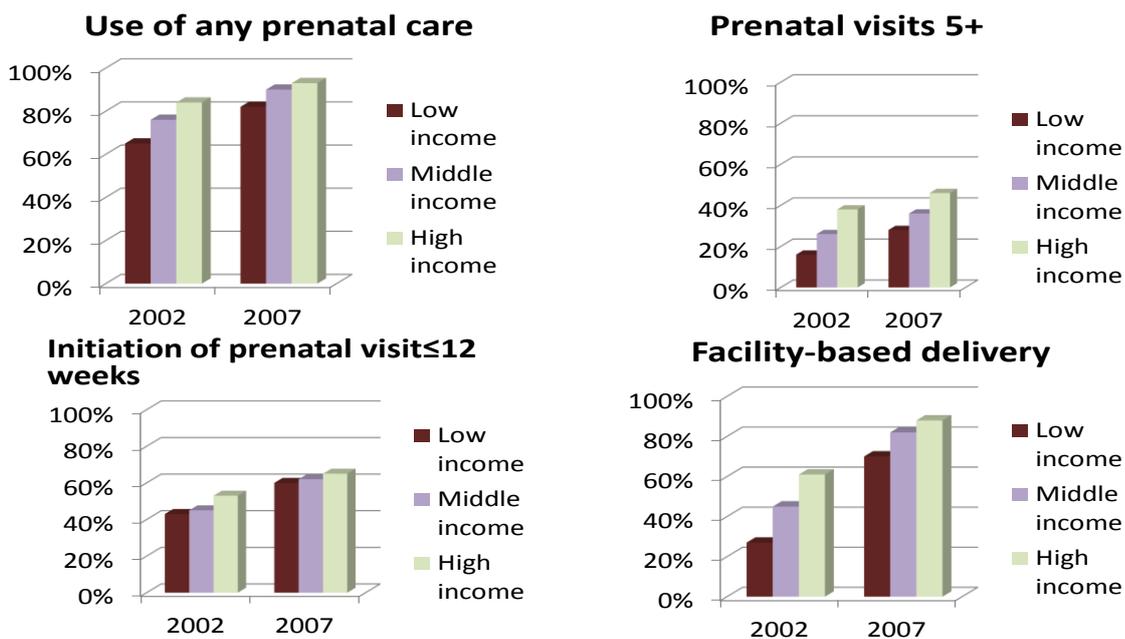
### 7.1 Changes in utilisation of maternity care in western rural China (Paper I)

#### *Utilisation of maternity care*

In western rural China, between 2002 and 2007 the proportion of women having no prenatal visit decreased from 25% to 12%, and the proportion of women having five or more visits increased from 27% to 36%, with over half of the women's starting visits within the first trimester of pregnancy. Facility-based delivery increased greatly from 45% in 2002, to 80% in 2007, with 46% of births occurring at county or higher level health facilities. CS rate increased from 6% in 2002, to 17% in 2007.

In both study years, women with higher income had more prenatal care and gave birth more often at a health facility compared to women with lower income (Figure 2). The differences in having prenatal care and facility-based delivery between the high- and low-income groups were smaller in 2007 than in 2002. The differences by income groups, however, were statistically significant even in 2007, with the exception of the starting time for prenatal visit.

Figure 2: Utilisation of maternity care in western rural China, by income group in 2002 and 2007



#### *Factors related to care use*

In 2007, NCMS participation was associated with having any prenatal care (OR 2.94, 95%CI 1.35-6.25) after adjusting for maternal age, education and ethnicity, household income, parity, previous abortions, and distance to health facility. NCMS participation was also related to making early (OR 1.67, 95%CI 0.88-3.23) or many prenatal visits (OR 1.67, 95%CI 0.87-3.12), or giving birth at a health facility (OR 1.45, 95%CI 0.69-3.03), but the odds ratios were not statistically significant.

Other factors that were associated with the use of prenatal care and facility-based delivery were maternal age, education and ethnicity, parity, and household income. Young women at 15-24 years of age, women with lower education, from minority groups, or higher parity were less likely to use

prenatal and delivery care. High income was positively associated with having prenatal care, but the association between income and facility-based delivery was not statistically significant. In addition, the number of prenatal visits was positively associated with giving birth at a health facility.

## 7.2 Changes in expenditure for facility-based delivery in rural China (Paper III)

### *Expenditure for facility-based delivery*

In rural areas, between 1998 and 2007, total medical expenditure for facility-based delivery increased by 152%, from renminbi (RMB) 758 to RMB 1912 (RMB 1= US\$ 0.14 in 2007). Expenditure on a vaginal delivery increased by 226%, from RMB 333 in 1998 to RMB 1084 in 2007, and on a CS by 58%, from RMB 2415 in 1998 to RMB 3815 in 2007. The greatest increase of expenditure on facility-based delivery, and on both vaginal delivery and CS, was seen from 2002 onwards.

For all facility-based deliveries, both total and out-of-pocket expenditure in 2002 and 2007 were higher for middle- and high-income groups than for the low-income group. The increase in the total expenditure on facility-based delivery between 2002 and 2007 was around 100% in middle- and high-income groups and 84% in the low-income group. Out-of-pocket expenditure on delivery increased too, but less substantially. In 2007, out-of-pocket expenditure on delivery was 13% of annual household income in the low-income group, compared with 9% and 6% in middle- and high-income groups, respectively. Out-of-pocket expenditure, as a percentage of annual household income, decreased since 2002 on average, and differences between the income groups became smaller (Table 8).

For vaginal deliveries alone, the greatest increases in total and out-of-pocket expenditure between 2002 and 2007 occurred in the low-income group: 184% for total and 115% for out-of-pocket, despite the fact that women in middle- and high-income groups spent more than women in the low-income group in these two years. Out-of-pocket expenditure on vaginal delivery, as a percentage of annual household income, did not change greatly in any income group. The highest percentage was 7% in the low-income group in 2007.

For deliveries by CS alone, the highest total and out-of-pocket expenditures were in the high-income group in both 2002 and 2007. The increase in expenditures between 2002 and 2007 was also greatest in the high-income group: 63% for total expenditure and 40% for out-of-pocket expenditure. In both 2002 and 2007 and in all income groups, out-of-pocket expenditure on CS consumed a high percentage of annual household income; the percentage was particularly high in the low-income group, at 32% in 2007. The percentage declined between 2002 and 2007 and differences between the income groups narrowed.

Table 8: Out-of-pocket expenditure on facility-based delivery as a percentage of annual household income in rural China in 2002 and 2007 (%), by income group

Income	Facility-based deliveries			Vaginal deliveries			Caesarean sections		
	2002	2007	Difference	2002	2007	Difference	2002	2007	Difference
Low	18.2	13.1	-5.1	6.9	7.4	+0.5	51.0	31.8	-19.2
Middle	10.8	9.0	-1.8	5.4	5.1	-0.3	26.6	17.9	-8.7
High	6.3	5.6	-0.7	3.3	3.3	0	13.7	10.0	-3.7

### *Factors related to out-of-pocket expenditure*

After adjusting for maternal age and education, household income, parity, type of birth health facility, and mode of delivery, in 2007 NCMS participation was associated with lower out-of-pocket expenditure on facility-based delivery. In addition, out-of-pocket expenditure on delivery was significantly higher in women who were over 30 years and well educated, had high income, and only one child, who gave birth at a county- or higher-level health facility, and received a CS (Table 9).

The same analysis was made for out-of-pocket expenditure on vaginal delivery and CS separately. NCMS participation was associated with lower out-of-pocket expenditure for CS, but not for vaginal delivery. The effects of age, household income, parity, and the location of the health facility were similar to those found in the analysis of out-of-pocket expenditure on overall facility-based deliveries.

Table 9: Regression coefficients obtained from the linear regression model of the logarithm of out-of-pocket expenditure on facility-based delivery in rural China, 2007

	All deliveries (n=1333)	Vaginal deliveries (n=955)	Caesarean sections (n=378)
<b>Age</b>			
15–24 <sup>a</sup>	--	--	--
25–29	-0.02	0.04	0.13
30–49	0.26**	0.29**	0.18
<b>Education</b>			
Illiterate/primary school <sup>a</sup>	--	--	--
Secondary school	0.08	0.08	0.02
High school or higher	0.18*	0.14	0.15
<b>Income</b>			
Low income <sup>a</sup>	--	--	--
Middle income	0.25**	0.28**	0.08
High income	0.45**	0.55**	0.16*
<b>Parity</b>			
1 child <sup>a</sup>	--	--	--
2+ children	-0.24**	-0.33**	-0.05
<b>Level of health facility</b>			
Township level <sup>a</sup>	--	--	--
County or higher level	0.10**	0.08*	0.10*
<b>NCMS participation</b>			
No <sup>a</sup>	--	--	--
Yes	-0.16**	-0.05	-0.35**
<b>Mode of delivery</b>			
Vaginal delivery <sup>a</sup>	--	--	--
Caesarean section	1.32**	--	--

\* P<0.05 \*\* P<0.01 (two-tailed test of significance)

<sup>a</sup> Reference group

### 7.3 Maternity package of the NCMS in the five rural counties (Paper II and IV)

In the five CHIMACA study counties, the maternity benefit package of the NCMS varied by county in terms of services covered and the level of reimbursement. In 2008, in all five rural counties, families pay a flat annual premium to enrol in the NCMS at their registered hometown. Women having an authorised birth can claim reimbursement for the services included in the maternity package (Table 10). In terms of the interpretation and implementation of the family planning policy, in FC, XC, LT and ZA Counties, the first birth, or the second birth if the first child was daughter, is defined as authorised; in RC, only the first birth is authorised. Care for complications was covered by other parts of the NCMS, both for authorised and unauthorised births.

Table 10: Characteristics of maternity benefit package of the New Co-operative Medical Scheme (NCMS) in five counties, 2008

	Anhui		Chongqing	Shaanxi	
	FC	XC	RC	LT	ZA
Year of the introduction	2004	2007	2005	2007	2003
Enrolling in the NCMS	Household	Household	Household	Household	Household
Annual premium per person (RMB)	20	20	20	10	10
Authorised health facilities (including public and private facility)	within province	within province	within province	within county	within county
Available reimbursement for maternity care					
a) Prenatal care	No	No	Fixed payment	No	No
b) Facility-based delivery	Fixed payment	Fixed payment	Fixed payment	Fixed payment	Fixed payment
--Vaginal delivery (RMB)	150	300	400	350	400
--Caesarean section (RMB)	600	300	400	1150	1200

Source: unpublished data from the county NCMS offices and the county statistics offices  
RMB 1=US\$ 0.14

Of the five counties, the NCMS covered part of the prenatal care only in RC County, providing a fixed amount of reimbursement for a number of tests recommended by the national guidelines, up to a maximum of RMB 100 since 2007 ( Paper II). Women were charged for pregnancy related treatment and drugs. In the other four counties, prenatal care was not included in the NCMS. Women had to pay out-of-pocket for prenatal care (e.g. physical check-ups, tests and examinations, treatment, and drugs).

In all five counties, the NCMS provided a fixed payment for facility-based delivery in 2008 (Paper IV). In the XC and RC Counties, the amount of reimbursements for vaginal delivery and CS was the same, while in the three other counties, the amount of reimbursement for CS was higher than vaginal delivery and higher also compared to the XC and RC Counties. The reimbursement as a percentage of mean charge for both vaginal delivery and CS were relative high in the LT and ZA Counties, around 50% of expenditures. In the other three counties, available reimbursement for deliveries was 14%-34% of average expenditures.

### 7.4 Utilisation, contents and costs of prenatal care in relation to the NCMS (Paper II)

#### *Utilisation of prenatal care*

Whether in one county (RC) where prenatal care was included in the NCMS or two counties (XC and LT) where it was not, over 70% of women started prenatal visits within 12 gestational weeks

and over 60% had five or more visits. In all three counties, over one third of women had previously given birth, which associated with relatively late and fewer overall prenatal visits compared to women having their first child ( $p<0.05$ ).

Qualitative interviews with new mothers in RC County demonstrated that most women knew that they could claim up to RMB 100 in reimbursement for prenatal care expenditure, but they were unaware of which services were covered by the NCMS, and furthermore showed distrust in doctor's decisions regarding the amount of reimbursement. Almost all of them said that the reimbursement for prenatal care was better than nothing, but it did not influence their decision to make prenatal visits.

Of the county policy makers, township health managers, NCMS managers, and obstetric doctors interviewed, most of them believed that the NCMS reimbursement for prenatal care would encourage prenatal care use. In addition, one leader at the county level explained that the implementation of the NCMS had to follow the national policy (e.g. family planning policy); hence, it was reasonable that unauthorised pregnancies could not benefit from the package. On the other hand, other leaders at the county level perceived a problem with excluding unauthorised pregnancies who were less likely to use prenatal care. This divergence in opinion was also found among the township health managers, NCMS managers, and obstetric doctors.

#### *Contents of care*

In the three counties, there were overall high proportions of women having received advice for health behaviour and nutrition, and having three or more blood pressure measurements and fetal heart monitoring. In RC County, the proportion of women having neither haemoglobin (32%) nor urine tests (20%) was higher; and having the number of tests recommended (three haemoglobin tests and two urine tests) was lower than the other two counties, even though the NCMS provided reimbursement for some basic tests in terms of the national guideline in this county. In all three counties, 90% of women had two or more ultrasound examinations (Table 11).

Table 11: Contents of prenatal care in the three counties in 2008 (% of women giving birth)

	RC (n=544)	XC (n=619)	LT (n=1071)
Advice on nutrition during pregnancy	91.2	85.1	77.4
Advice on avoiding alcohol, smoking and hazardous substances	90.1	82.4	69.0
Blood pressure measurement (3+)	81.1	84.5	82.5
Fetal heart monitoring by stethoscope (3+)	83.2	84.0	83.3
Haemoglobin test (3+)	8.1	22.1	20.8
Urine test (2+)	34.3	69.6	67.4
Ultrasound examination (1)			
1	11.5	2.8	6.6
2	30.9	15.2	21.2
3+	56.7	81.7	71.7

Recommendation in number of tests in terms of the national guidelines is shown in parentheses.

According to qualitative interviews in RC County, most women said that they followed doctors' suggestions to make visits and take tests. Several women indicated that doctors suggested that they take more expensive tests, which are not included in the NCMS. Most township health managers

and obstetricians thought that the partial coverage of prenatal care would be helpful to convince women to take the necessary tests, but there was no impact on their services provision.

#### *Costs for prenatal care*

In RC County, the average out-of-pocket expenditure for prenatal care was lower (RMB 340) than the other two counties (RMB 544 in XC and RMB 550 in LT County). It represented 8% of women's annual income in RC County, 8% in XC County and 17% in LT County. In the stratification of income group, the out-of-pocket expenditure was 26% of women's annual income for the low-income group in RC, 21% in XC, and 40% in LT County respectively. They were much higher than in the middle- and high-income groups in all three counties.

A qualitative interview with the new mothers in RC County demonstrated that some of them felt a financial burden due to prenatal visits, however they thought it was worth spending money on prenatal care in order to ensure their baby's safety.

Most township NCMS managers and obstetric doctors thought that the amount of reimbursement for prenatal care was small. They acknowledged that the criteria for the reimbursement were set up based on low technology approaches (e.g. taking blood samples and analysing samples by hand); however, health facilities used advanced equipment to test and consequently charged higher prices even for essential tests. In addition, many women did not obtain the whole RMB 100 reimbursement available, due to either losing part of the receipts or not receiving all the tests recommended by the NCMS package.

### **7.5 Relation between caesarean section and NCMS coverage (Paper IV)**

#### *CS rates*

In the five counties, 99% of women gave birth in health facilities. 46% of all births were CSs, with 13% having an emergency (self-reported), and 33% non-emergency CS. Overall, a large variation in CS rate was seen by county, ranging from 13% in ZA County, to 82% in XC County. The emergency and non-emergency CSs also varied by county, while generally reported non-emergency CSs were more common than emergency CS (Table 12).

Table 12: Rates of caesarean section (CS), emergency and non-emergency CS in five counties in 2008 (% of women giving birth)

	Total (n=3550)	FC (n=856)	XC (n=598)	RC (n=526)	LT (n=1060)	ZA (n=510)
Emergency CS	12.9	14.7	13.0	16.5	14.0	3.9
Non-emergency CS	32.9	48.7	68.9	26.7	14.2	9.0
Overall CS	45.8	63.4	81.9	43.2	28.2	12.9

#### *NCMS and CS*

Overall, women who had received reimbursement from the NCMS were more likely to have a CS, particularly a non-emergency CS, than women who paid out-of-pocket adjusting for maternal age, education and occupation, and household income, parity, previous abortions, type of birth health facility, and county (Table 13). There was no statistical association between NCMS coverage and having an emergency CS.

Adjusted logistic regressions were made separately for counties. In a combination of the counties (FC, RC, and LT) with mid-range CS rates (28%-63%), women with NCMS coverage were 1.7 times more likely to have CS and 2.1 times more likely to have non-emergency CS than women

who paid out-of-pocket; while NCMS coverage was not significantly associated with having an emergency CS. In the XC County with the highest CS rate, and the ZA County with the lowest CS rate, there was no association between NCMS coverage and having any type of CS (Table 13).

Table 13: Likelihoods of having Caesarean section (CS) by payer in five counties in 2008, logistic regression odds ratio (OR) and 95% confidence interval (CI)

	Emergency CS	Non-emergency CS	Overall CS
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Adjusted for co-variates <sup>a</sup> and county NCMS vs. Out-of-pocket <sup>b</sup>	0.86 (0.68-1.09)	1.51 (1.24-1.82)*	1.34 (1.11-1.60)*
Adjusted results for specific county			
1) XC County (the highest CS rate) NCMS vs. Out-of-pocket <sup>b</sup>	0.84 (0.47-1.49)	1.25 (0.82-1.93)	1.22 (0.73-2.05)
2) FC, RC and LT counties (middle CS rates) NCMS vs. Out-of-pocket <sup>b</sup>	0.85 (0.66-1.09)	2.17 (1.76-2.66)*	1.75 (1.45-2.11)*
3) ZA County (the lowest CS rate) NCMS vs. Out-of-pocket <sup>b</sup>	0.87 (0.30-2.56)	1.03 (0.51-2.11)	0.97 (0.52-1.80)

<sup>a</sup> Co-variates: maternal age, education, occupation, household income, previous abortions, parity, and type of birth health facility was adjusted.

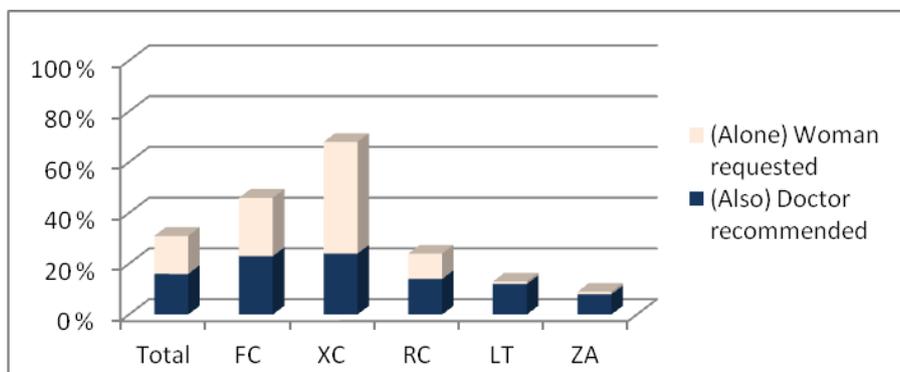
<sup>b</sup> Reference group

\* Confidence interval refers to statistically significant difference by payer at 5% level.

#### Reasons for having a non-emergency CS

Half of the non-emergency CSs, reported by the women receiving them, were recommended by a doctor (16% of all births), and nearly half were requested by themselves (15% of all births) primarily due to "fear of pain" and "perceived as better for the child". The results also differed by county. In XC and FC counties, women more often requested CS themselves. But in the other three counties, non-emergency CS was mainly recommended by a doctor (Figure 3). Overall, there were more insured women having non-emergency CS both at the recommendation of a doctor and at their own request. The statistically significant differences by payer for CS at women's own request were found in the FC and XC Counties ( $p < 0.05$ ), and the difference by payer for CS at the recommendation of a doctor was statistically significant in LT County ( $p < 0.01$ ).

Figure 3: Reasons for having a non-emergency caesarean section in five counties, 2008



## 8. DISCUSSIONS

### 8.1 Main findings

This study reviews population-based data on the utilisation, costs, and quality of maternity care in rural China and their relation to rural health insurance (NCMS). In particular, the study illustrates the importance of taking a health system approach to evaluation that links utilisation, cost and quality of care with the wider contexts of policy, maternal information and demand, in addition to provider practice patterns and motivations.

Between 2002 and 2007, the use of maternity care in western rural China improved, and the difference in care use by income groups narrowed. Although NCMS participation reduced out-of-pocket expenditure for facility-based delivery on average, financial burden for the rural poor households remained high.

Whether in the county that included prenatal care in the NCMS, or counties that did not, the proportions of women having prenatal visits were generally high, but the contents of care were not provided following the national guidelines. More expensive tests were recommended by doctors. High CS rates in the five rural counties were mainly due to non-emergency CSs. The NCMS coverage was positively associated with having a CS, particularly a non-emergency CS.

#### *Use of maternity care*

A systematic prenatal care is more likely to be effective to identify and address potential risk factors for adverse pregnancy outcomes (Alexander & Kotelchuck 2001; Carroli et al., 2001; Adam et al., 2005). Based on the recommendations of a systematic management of maternity care in rural China, starting a prenatal visit within 12 gestational weeks and having five or more visits had modestly increased in western rural areas in the study periods, which is corroborated by findings nationwide (Wu et al., 2012). Women's opinion about having prenatal care ranged from "perceived important for safety of both mother and baby" to "lack of benefit of seeking much care" reported as "not necessary" at all (Kaufman & Jing, 2002).

In contrast, facility-based delivery, as a key component of safe-motherhood strategy in China, had a great increase in rural areas. It may suggest women's high awareness and acceptance of the need for a safe delivery. More women gave birth at the county or higher level health facilities. Higher-level health facilities are often regarded by the general population as providing good care (Ma et al., 2008). Conversely, township health centres, particularly in poor areas, are often poorly equipped, have fewer qualified staff, and have poor sanitary conditions and hygiene (Guo et al., 2008). It is unsurprising that they are not favoured by women as a place of delivery. However, the overuse of higher-level health facilities has been found to affect the efficiency of service provision without increasing patient satisfaction or improving health (Eggleston et al., 2008). In addition, the longer distance to a higher-level health facility and the higher cost of receiving services in this type of facility are correlated to the increase in costs to families, and can place a heavy financial burden on poor rural households.

Another concern is the increasing CS rate in rural areas. It is unexplained by the increase in facility-based delivery (Guo et al., 2007), but it has been argued that not all CSs are medically necessary (Klemetti et al., 2010; Bogg et al., 2010). CS involves the risk of surgical infection and a potentially

adverse impact on the health of both mother and infant (Souza et al., 2010). It is also costly for individual households, since the expenditure for CS was much more expensive than vaginal delivery, and is costly for the health care system in regard to health resource consumption (Lumbiganon et al., 2010). Factors related to the use of CS in the context of rural China have been further discussed in the following sub-section *NCMS and CS*.

Consistent with other studies in rural China and other developing countries (Liu et al., 2011; Simkhada et al., 2008; Say & Raine, 2007; Anson, 2004; Short & Zhang, 2004), women with lower education, from a minority group, or higher parity, were less likely to have many prenatal visits or give birth at a health facility. Liu's study (2011) indicated that women in the households with a lower wealth index were less likely to have four or more prenatal visits and give birth at a health facility. In this study, women from the low-income group continued to have less frequent prenatal care and institutional birth, but the differences in care use by income group became smaller over time.

A possible explanation is that the NCMS covered a part of the expenditures for facility-based delivery, and may have reduced financial barriers for women to access maternity care. Moreover, since 2000, China's safe motherhood programme "Reducing maternal mortality and eliminating tetanus infection of newborn babies" was introduced to encourage facility-based delivery (Guo et al., 2008). The programme gave a regional focus to the less developed western rural areas and implemented comprehensive interventions. Those included strengthening of infrastructures, staff training, regulating referral for emergency obstetric care, providing health education to rural women, and providing subsidies to them to partly cover the expenditure for facility-based delivery. It is difficult to separate the contributions of the NCMS from those of the safe motherhood programme. However, such a programme is often run for only a certain period of time, and it cannot sustainably solve the financing problems of maternity care in rural areas. Thus the NCMS, with increasing funding by the government, can be a good opportunity to promote continued improvement in maternal health in rural China.

#### *Expenditure for facility-based delivery and financial burden*

Overall, total expenditure for a birth at health facilities sustained a notable increase in 1998-2007 in rural China. It is partly attributed to an increase in the proportion of births occurring at higher-level health facilities and the increase in births by CS, and is perhaps also partly attributed to the NCMS development. The Chinese health care system has remained heavily dependent on user fees. The coexistence of fee-for-service financing and the government run voluntary insurance programme may have contributed to the increased cost of delivery and even higher expenditure for women; however, this study cannot draw the causality. Studies of community-based health insurance in other low-income countries reported a similar result, which suggests that such schemes can lead to higher revenues from fee-for-services care (Ekman, 2004).

NCMS participation was associated with the reduced out-of-pocket expenditure for CS, but not for vaginal delivery. The scheme often views CS as necessitating hospitalisation and reimburses accordingly, which may cover 40%-50% of expenditure. In a sense, the NCMS may share the financial risk of technological procedures related to delivery. But the NCMS did not reduce out-of-pocket expenditure on vaginal delivery. A possible explanation is that the expenditure on vaginal delivery has increased dramatically, while the level of reimbursement is generally low resulting in high costs for women.

In 2007, out-of-pocket expenditure on facility-based delivery was 13% of the mean annual income of low-income households. This is a heavy financial burden on households, as it is above the 10%

of annual household income that is used as the threshold for catastrophic health care spending (Ranson, 2002). The burden was even higher for low-income households where a woman had a delivery by CS, as one-third of the average annual household income was spent on the delivery. Families are at a great risk of health care induced poverty (Xu et al., 2003) and delivery care for the poorest households has become less affordable.

In addition, non-medical costs for facility-based delivery including the costs of transportation, accommodation and food, and the cost in time for the women, as well as for their accompanying family members, can be considerable (Ensor & Ronoh, 2005; Borghi et al., 2006b). In Tanzania and Nepal, the costs of transportation have been estimated to be 50% of expenditure for a birth in health facility (Borghi et al., 2006a; Kruk et al., 2008a). How poor households manage such high expenditure in rural China is unclear. Studies in some African and South Asian countries have reported the poor households borrowed money and sell assets to cover delivery related expenditures (Nahar & Costell, 1998; Storeng et al., 2008). Those families had suffered from short- and long-term social and economic consequences (Storeng et al., 2008).

#### *NCMS and prenatal care*

Health insurance coverage has been successful in increasing the number of prenatal visits on average in the Philippines (Kozhimannil et al., 2009) and Taiwan (Chen et al., 2001), and in the context of low utilisation rate in Vietnam (Sepegri et al., 2008) and several African countries (Smith & Sulzbach, 2008). In this study, the NCMS provided reimbursement for part of prenatal care in one rural county aiming to improve systematic care use among rural women. But its implementation was affected by several factors.

The first is a factor specific to China: unauthorised pregnancies could not benefit from the maternity package of the NCMS. For beneficiaries (women who were having their first child), the demand for prenatal care to ensure safe pregnancy was high. It is understandable that NCMS coverage did not influence those women's decision to make visits. By contrast, women who had unauthorised pregnancy (having two or more children) had less prenatal visits. Less care use by unauthorised pregnancies were also reported in other studies in rural China and explanations included women's perception of low risk or greater experience of pregnancy, and family economic constraints due to facing substantial fine (Doherty et al., 2001; Li, 2004; Klemetti et al., 2011). A financial benefit may encourage this marginal group to have prenatal visits and tests at the recommended time; but it seemed to conflict with the family planning policy, creating a dilemma for policy development on improving maternal health.

The second factor that influenced the implementation of scheme is that NCMS coverage of prenatal care was not well understood by the women. In the county where part of the prenatal care was included in the NCMS, less than half of the women knew that the reimbursement for prenatal care was available. Those women who knew that they could claim reimbursement for prenatal care did not know the details of the policy and they showed distrust of doctors with regard to the amount of reimbursement that would be provided. In China, patients' complaints on unclear information of received services are common, and even some patients or their relatives have open conflicts with healthcare providers (Eggleston et al., 2008). Poor provider-women relationship due to lack of trust may have affected women's health seeking behaviour. In addition, a lack of knowledge regarding benefits available, and claim processes, have also been identified as barriers both to uptake of general health services covered by health insurance and to successfully claiming against insurance by women in India (Sinha et al., 2006) as well as in China (Harris et al., 2010; Yu et al., 2010; Yan et al., 2011).

Insurance-related increases in the use of expensive prenatal care services were found in Taiwan (Chen et al., 2001). The NCMS that provided reimbursement for the specific tests, and number of tests, recommended by the national guidelines is a cost-containment and quality control measure. In all three study counties, however, the basic components of care, such as haemoglobin tests and urine tests, were not carried out following the guideline, and this was particularly so in the county having NCMS coverage of prenatal care; while 90% of women received ultrasound examinations two or more times. Ren's (2011) and Wu's studies (2008) in other rural areas reported similar results. The frequent use of ultrasound examination might be seen as the most important channel to identify risk during pregnancy. The qualitative finding of this study, that doctors recommended more expensive tests to women, suggests that considerations other than medical needs are influencing services provision. One study, in two western rural provinces, added an explanation that the frequency use of ultrasound examination was to generate more revenue for salaries and pensions of hospital staff (Harris et al., 2007). The quality of prenatal care is called into question because of the failure to follow the guidelines for providing services. Meanwhile, providing expensive and possibly unnecessary services also increases the financial burden on women due to prenatal visits.

In the county with NCMS coverage for prenatal care, out-of-pocket expenditure for prenatal care was lower than in the other two study counties. However, the NCMS may not contribute to the lower expenditure considering that only a small proportion of women received a small amount of reimbursement. The lower expenditure for prenatal care in this county may be attributed partly to the fact that free physical check-ups are offered for all (both authorised and unauthorised) pregnancies, funded by the county government, and partly to the fact that fewer tests including some basic tests and ultrasound examination were performed than the other two counties. In all three counties, the out-of-pocket expenditure as a proportion of women's annual income in the low-income group was very high, even in the county with the lowest expenditure for prenatal care. Including prenatal care in the NCMS offers an opportunity to reduce the financial burden caused by prenatal visits, especially for the poor. But greater attention to the relationship between financial protection, quality of care, and provider motivation is necessary to make this opportunity a reality.

#### *NCMS and CS*

Feng and colleagues (2012) investigated changes in the CS rate between 1988 and 2008 in China based on national data. They found that the increase in CSs occurred in all socioeconomic groups and structural factors related to service supply were the main determinates. This study adds the information that non-medical factors, including health insurance coverage, have facilitated the epidemic of CS in rural areas. Similar results have been reported in other developing countries (Murray, 2000; Mossialos et al., 2005; Barber, 2009).

In this study, 13% of women on average had (self-reported) emergency CS, while there was little difference whether the birth was partly covered by the NCMS or was paid in full. This is in line with the WHO (1985) estimates of a 15% CS rate as the upper limit in a country, and suggests an appropriate level of accessibility to obstetric services and technology for women in need.

The high rate of non-emergency CS (33% of all births) is a matter for concern. CSs performed without medical indications have been identified to relate to increased risks of adverse maternal and neonatal outcomes, and increased costs both to families and health care systems (Lumbiganon et al., 2010; Bogg et al., 2010). Unnecessary CSs are particularly detrimental to rural health care, with its limited health resources (Feng, 2010).

NCMS coverage was associated with having a non-emergency CS. This association was found in three of the five counties with mid-range CS rates from 28% to 63%, while no association was

found in the other two counties, which had the highest and lowest CS rate. In the county with an 82% CS rate, very little room for variation may be an explanation for the lack of correlation. A lack of qualified care providers may be one explanation in the county with the lowest CS rate (13%) (Zhang et al., 2010). CSs performed in this county may depend on the procedure's availability. The proportion of non-emergency CS in this county (9%), which was mainly on the recommendation of a doctor, was still high, however.

For healthcare providers, CS has the advantage of allowing the timings of deliveries to be managed and reduction in the duration of labour (Lin & Xirasagar, 2004; Mossialos et al., 2005). CS could be performed as a defensive medical practice for fear of malpractice accusations (Dubay et al., 1999) or it could be purely profit driven, as suggested by findings from other developing countries (Grant, 2009; Barber, 2009).

In China, the income of healthcare providers is directly related to the revenue generated for facilities through a bonus system (Yip & Hsiao, 2008), and healthcare providers have become less cost conscious. Overuse of costly high technology diagnosis and treatment procedures have become common in many Chinese hospitals (Eggleston et al., 2008). The Chinese healthcare providers have opted for CS (Bogg et al., 2010) because of its high cost in terms of delivery, drug prescription (e.g. antibiotics), and subsequent longer hospital stay. Perverse financial incentives to healthcare providers, in combination with the increased funding of the NCMS, may have pushed providers to improve their income by doing as many CS procedures as possible, beyond what are necessary based on medical indications.

In the two rich counties, there were more women with NCMS coverage asking for CS than women without coverage. Women's own requests for CS is likely to be multifactorial, relating to the local socioeconomic situation, the availability of technology and health care resources, the culture and common knowledge in the community, and the perceived quality and safety of care (Langer, 2002; McCourt et al., 2007). The NCMS coverage may make women's demand for CS possible. As "fear of pain and perceived better health for child" were the most common reasons for women's request for CS, the advice and information given by healthcare providers may be an important determinant of women's decisions.

## **8.2 Public health implications**

The Chinese government has committed itself to increasing investment in health care. It has set a goal of gradually achieving an equalisation in basic public health, with maternity care as one of the targets (National Development and Reform Commission, 2009). The findings of this thesis suggest that any new injection of money by the government needs to take into account both the "volume" and "value" of care. Thus, the distribution of services should be based on needs in communities, moving towards universal access to good quality of maternity care, and negating the risk of poverty due to high expenditure for care use. There are mainly two policy considerations on health financing and health services provision.

### *Equitable financing mechanism*

In line with the equity principle, health financing based on public funding (e.g. tax) and/or pooling mechanisms (e.g. health insurance) tends to encourage high quality and responsive health care (McIntyre et al., 2007). In other developing countries, greater government participation in health financing has been found associated with increased use of skilled birth attendants and caesarean sections (Kruk et al., 2007). This reflects the government investment in supply of health facilities,

human resources, and other government related financial inputs, that are correlated with a lower level of out-of-pocket payment (Borghetti et al., 2006b; Ensor & Ronoh, 2005).

In this study, there is a concern regarding how to balance the utilisation, quality, and cost of maternity care with the increase in government spending in health. Fee-for-service payment has been embedded in the Chinese health care system since the health sector reform launched in 1980s (Hsiao, 1995). This study suggests that this payment method may act as an incentive to healthcare providers leading to the overprovision of expensive services that increase the financial burden of childbirth on rural households. The health insurance (NCMS) that is heavily invested in by the government has failed to encourage the appropriate care and cost control. Furthermore, it might facilitate healthcare provider's profit-driven behaviour.

There remains a lack of evidence on effective targeting of health resources. Knowledge of this study will be valuable for further research on health financing mechanisms, with an equity-oriented evaluation, in order to guide and sustain the continued development of the health care system.

#### *Improving maternity care provision*

Improving quality of care has been an important policy priority worldwide. In this study, maternity care in rural areas of China was provided at inappropriate volumes and contents either due to healthcare provider's poor knowledge and skill, or the simple pursuit of profit. This could shadow the effect of universal coverage with no improving mother and infant health outcomes, even increasing health risks because of unnecessary care.

To strengthen the provision of maternity care, "capacity building" needs to tackle both the health care provider's motivation, and their performance, by introducing appropriate financial or non-financial incentives, and in-services training in order to ensure adherence to clinical guidelines and reduce practice variations. In addition, since 1994, the Chinese family planning programme has emphasized the integration of birth planning with quality and safety of reproductive health care (Peng, 1998). There remains an opportunity to restructure the service provision to improve efficiency and reduce health resources waste.

This thesis illustrated that the use, quality and affordability of maternity care in rural China were intertwined. Progress in "equality in care benefits" requires long-term commitment at the central and local level, in addition to perseverance and adaptability over time.

### **8.3 Methodological considerations**

Strengths and limitations of this study are discussed here based on assessment of study design and various data sources.

#### *Strengths*

This study used data from the two NHHS surveys in 2003 and 2008 to present changes in the use of, and expenditure for, maternity care over this recent ten-year period in rural China, especially in less developed western rural areas. The data collected in the NHHS surveys have previously been shown to be of satisfactory quality in terms of representativeness of the sample and reliability (Xu et al., 2007). To have a better understanding of the data collection and management techniques, staff from the Centre of Statistics and Information, Ministry of Health of China were consulted and invited to participate in the study.

Mixed quantitative and qualitative methods were used to study the impact of health insurance on maternity care use and provision in the five rural counties. A population-based survey (CHIMACA survey) utilised random sampling, yielding a reasonable sample size. The quality of the survey, in terms of response rate and reliability, was good. Qualitative interviews were conducted carefully. The trustworthiness of qualitative data was assured by triangulating findings from different respondents and methods, and discussing preliminary findings with local policy makers and maternity care managers.

### *Limitations*

There are some limitations in the study. Generally, cross-sectional surveys and qualitative study cannot be used to draw conclusions on the causality of the phenomena studied.

In NHHS surveys, interviewees had to recall their use of, and expenditure for, maternity care over a period of one to five years. Nevertheless, most analyses were performed using data for the year immediately before the survey (i.e. for 2002 and 2007), so that serious recall bias is unlikely and it should not have influenced the trends of change reported. In addition, the maternity care covered by the NCMS and the level of reimbursement varied by counties, thus without data on these variations at national level, the findings of this work should be viewed as preliminary.

In the CHIMACA survey, there was no information regarding non-respondents, and thus examining how they may have differed from respondents was not possible. As the study women were those who lived in a rural county, it is unlikely to introduce a big sampling bias. All information was based on the women's reports. Memory bias may occur, particularly the distinction between emergency and non-emergency CS may not be accurately interpreted. Results can thus be viewed as a case study in the context of rural China and generalisations to other rural areas should be made with caution.

## 9. CONCLUSIONS

1. There was a great increase in facility-based delivery and a modest increase in the use of prenatal care in western rural China between 2002 and 2007, coinciding with the introduction of the rural health insurance (NCMS). The differences in the use of maternity care between low-income and high-income groups decreased.
2. Expenditure for facility-based delivery notably increased in rural China during 1998-2007 due to greater use of higher level health facilities, more births by caesarean section, and the introduction of the NCMS.
3. NCMS participation was associated with lower out-of-pocket expenditure for CS, but not for vaginal delivery. The financial burden of a facility-based delivery among the rural poor remained high.
4. Whether or not prenatal care was covered by the NCMS, care use was generally high, but the contents of care did not follow the national guidelines and expensive tests were recommended by doctors. Costs of prenatal care were substantial for the poor.
5. Overall the CS rate was high in the five rural counties and was mostly due to non-emergency CS. The NCMS coverage was associated with having a CS, and particularly with having a non-emergency CS.

## 10. POLICY RECOMMENDATIONS AND FURTHER STUDIES

1. Facility-based delivery is becoming universal in rural China. However, the use of higher-level health facilities is affecting the efficiency of services delivery and is related to increased costs and financial burden on rural households, especially on poor families. To enable convenient access and improve cost-effectiveness, investing in and expanding the capacity of health facilities at the township level should be considered.
2. The current health financing mechanisms may have influenced the behaviour of healthcare providers, resulting in over-provision of services which might not be medically necessary. Financing for maternity care should avoid introducing perverse financial incentives to health facility and healthcare providers.
3. The current scheme of rural health insurance (NCMS) lacks the tools required to control costs and to encourage quality of care. The design of the NCMS scheme should focus on women's needs and prevent rural poor women from medical impoverishment.
4. It must attempt to address the current conflicts between national family planning policy and NCMS policy.
5. The information regarding the maternity care included in the NCMS and reimbursement procedures to women and their families should be distributed to be more widely available and clear.

Further studies are needed to develop appropriate interventions to control cost and improve quality of maternity care in rural China. Studies should focus on payment mechanism, healthcare provider practice patterns and maternal demand. The Chinese health care system reform is ongoing. These changes need to be followed up and evaluated, using maternal and newborn health as outcome measures.

## ACKNOWLEDGEMENTS

This thesis has been carried out in the Department of Public Health, Hjelt Institute, Faculty of Medicine, University of Helsinki. This study is part of the project "Structural hindrances to, and promoters of, good maternal care in rural China-CHIMACA (015396)" funded by the European Commission INCO Programme and co-ordinated by the National Institute for Health and Welfare, Finland. The collaborating institutions involved were the Liverpool School of Tropical Medicine, International Centre for Reproductive Health, Ghent University, Karolinska Institute, Peking University, Fudan University, Anhui Medical University, Chongqing Medical University, and Xi'an Jiaotong University. I thank the Centre of Statistics and Information, Ministry of Health of China who permitted me to use national household health services survey data and the China Medical Board that funded data analysis. I am grateful to the China Scholarship Council and the Doctoral Programme in Public Health in Finland for granting me the opportunity to study at the University of Helsinki.

During my study, a number of advisors and colleagues have been a great support for my work. First of all, my deepest gratitude goes to my supervisor, Research Professor Elina Hemminki of the National Institute for Health and Welfare, for her guidance, continuous support, and encouragement through my study. Her serious dedication and passion for the research has deeply touched me. I have benefited from her broad knowledge, rich research experience and insightful views towards many scientific branches, and valuable comments on my research work and scientific writing. I am also very grateful to my second supervisor, Professor Tuohong Zhang of Peking University for her inspiring advice and comments on my manuscripts. Her positive and optimistic attitude affects me and has given me the courage to overcome various difficulties.

Without help of the CHIMACA team members, I could not have made it. I am particularly indebted to Dr. Shenglan Tang, who is now Professor of Medicine and Global Health in Duke University, Dr. Rachel Tolhurst from the Liverpool School of Tropical Medicine, Dr. Reija Klemetti from the National Institute for Health and Welfare, and Dr. Lennart Bogg from the Karolinska Institute, for their academic contributions to this work and constant encouragement. I would like to thank Prof. Yang Wang from the Chongqing Medical University, Prof. Fangbiao Tao from the Anhui Medical University, Prof. Hong Yan from the Xi'an Jiaotong University, Prof. Zhuochun Wu from the Fudan University, and the members of their research groups, for their advice and trust. Special thanks go to my colleagues and friends, Zheng Xie from the Peking University, Kun Huang from the Anhui Medical University, and Yuan Shen from the Xi'an Jiaotong University, for their openness in sharing their experience, interactive discussions, and friendship. Additionally, I wish to thank each of CHIMACA team members, co-authors in the publications, and all participants in the study.

I would like to express my sincere thanks to my reviewers Professor Päivi Rautava from the University of Turku, and Adjunct Professor Juha Teperi from the University of Tampere, for their valuable comments on the thesis.

I would like to thank Dean Yingxiong Wang who is now in charge of the School of Preclinical Medicine and Dean Jingfu Qiu of the School of Public Health and Management, Chongqing Medical University, for their permission of my leave to pursue my Ph.D. study in Finland and their concerns.

It is my pleasure to work at the National Institute for Health and Welfare. I want to express a great deal of thanks to Kristiina Poikajärvi, Maija Ritamo, Reija Klemetti, Elena Regushevskaya, Eija Raussi-Lehto, Suvi Nipuli, Tuija Tuormaa, Marja Lampola, Tuula Väänänen, and many others, whom have shown their concerns and also aided me, which made my life in Helsinki warm and pleasant.

My dearest cousins and friends, receive my deep gratitude. All of you have given me and my parents emotional support and helped me with many practical things. You are always in my heart.

Finally, my loving thanks are reserved for my mother, Manli Tao, and my father, Guozhi Long for their unconditional love, and encouragement through all these years. They always believe in me and trust in my ability to do almost anything. Wish I could show them how much I love and appreciate them.

## REFERENCES

- Adam T, Lim SS, Mehta S, Bhutta ZA, Fogstad H, Mathai M, Zupan J, & Darmstadt GL (2005) Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. *BMJ* 331(7525):1107.
- Ahmed S, Creanga AA, Gillespie DG, & Tsui AO (2010) Economic status, education and empowerment: implications for maternal health services utilization in developing countries. *Plos One* 5(6):e11190.
- Akin J, Birdsall N, & de Ferranti D (1987) Financing health services in developing countries: an agenda for reform, A World Bank Policy Study. Washington DC: The World Bank.
- Alexander GR, & Kotelchuck M (2001) Assessing the role and effectiveness of prenatal care: history, challenges, and directions for future research. *Public Health Rep* 116 (4):306-316.
- Anson O (2004) Utilization of maternal care in rural HeBei Province, the People's Republic of China: individual and structural characteristics. *Health Policy* 70(2):197-206.
- Ashford L (2002) Hidden suffering: Disabilities from pregnancy and childbirth in less developed countries. Available from: <http://www.prb.org/pdf/hiddensufferingeng.pdf> [accessed 9 May 2011].
- Barber SL (2009) Mexico's conditional cash transfer programme increases caesarean section rates among the rural poor. *Eur J Public Health* 20(4):383-388.
- Blumenthal D, & Hsiao W (2005) Privatization and its discontents-the evolving Chinese health care system. *N Engl J Med* 353(11):1165-1170.
- Bogg L (2002) Health care financing in China: equity in transition. PhD thesis, Karolinska Institute, Sweden.
- Bogg L, Wang K & Diwan V (2002) Chinese maternal health in adjustment: claim for life. *Reprod Health Matters* 10(20):95-107.
- Bogg L, Huang K, Long Q, Shen Y, & Hemminki E (2010) Dramatic increase of caesarean deliveries in the midst of health reforms in rural China. *Soc Sci Med* 70:1544-1549.
- Borghgi J, Hanson K, Acquah CA, Ekanmian G, Filippi V, Ronsmans C, Brugha R, Browne E, & Alihonou E (2003) Costs of near-miss obstetric complications for women and their families in Benin and Ghana. *Health Policy Plan* 18(4):383-390.
- Borghgi J, Ensor T, Neupane BD, & Tiwari S (2006a) Financial implications of skilled attendance at delivery in Nepal. *Trop Med Int Health* 11(2):228-237.
- Borghgi J, Ensor T, Somanathan A, Lissner C, Mills A, & Lancet Maternal Survival Series steering group (2006b) Mobilising financial resources for maternal health. *Lancet* 368:1457-1465.
- Caldwell JC (1993) Health transition: the cultural, social and behavioural determinants of health in the third world. *Soc Sci Med* 36:125-135.
- Carroli G, Villar J, Piaggio G, Khan-Neelofur D, Gülmezoglu M, Mugford M, Lumbiganon P, Farnot U, Bersgjø P; & WHO Antenatal Care Trial Research Group (2001) WHO systematic review of randomised controlled trials of routine antenatal care. *Lancet* 357(9268):1565-1570.
- Chen LM, Wen SW, & Li CY (2001) The impact of national health insurance on the utilization of health care services by pregnant women: the case in Taiwan. *Matern Child Health J* 5(1):35-42.
- Chen L, Chen CL, & Yang WC (2008) The influences of Taiwan's national health insurance on women's choice of prenatal care facility: investigation of differences between rural and non-rural areas. *BMC Health Serv Res.* 8:67.
- Dahlgren G, & Whitehead M (2007) A framework for assessing health systems from the public's perspective: the ALPS approach. *Int J Health Serv* 37(2):363-378.

- Daponte A, Guidozi F, & Marineanu A (2000) Maternal mortality in a tertiary center after introduction of free antenatal care. *Int J Gynaecol Obstet* 71(2):127-133.
- Doherty JP, Norton EC, & Veney JE (2001) China's one-child policy: the economic choices and consequences faced by pregnant women. *Soc Sci Med* 52:745-761.
- Dubay L, Kaestner R, & Waidmann T (1999) The impact of malpractice fears on caesarean section rates. *J Health Econ.* 18(4):491-522.
- Eggleston K, Li L, Meng Q, Lindelow M, & Wagstaff A (2008) Health services delivery in China: A literature review. *Health Econ* 17:149-165.
- Ekirapa-Kiracho E, Waiswa P, Rahman MH, Makumbi F, Kiwanuka N, Okui O, Rutebemberwa E, Bua J, Mutebi A, Nalwadda G, Serwadda D, Pariyo GW, & Peters DH (2011) Increasing access to institutional deliveries using demand and supply side incentives: early results from a quasi-experimental study. *BMC Int Health Hum Rights* 11 (suppl 1):S11.
- Ekman B (2004) Community-based health insurance in low-income countries: a systematic review of the evidence. *Health Policy Plan* 19(5):249-270.
- Ensor T, & Cooper S (2004) Overcoming barriers to health service access: influencing the demand side. *Health Policy Plan* 19(2):69-79.
- Ensor T, & Ronoh J (2005) Effective financing of maternal health services: a review of the literature. *Health Policy* 75:49-58.
- Feng X, Tang S, Bloom G, Segall M, & Gu Y (1995) Cooperative Medical schemes in contemporary rural China. *Soc Sci Med* 41(8):1111-1118.
- Feng XL, Zhu J, Zhang L, Song L, Hipgrave D, Guo S, Ronsmans C, Guo Y, & Yang Q (2010) Socio-economic disparities in maternal mortality in China between 1996 and 2006. *BJOG* 117(12):1527-1536.
- Feng XL, Xu L, Guo Y, & Ronsmans C (2011) Socioeconomic inequalities in hospital births in China between 1988 and 2008. *Bull World Health Organ* 89(6):432-441.
- Feng XL, Xu L, Guo Y, & Ronsmans C (2012) Factors influencing rising caesarean section rates in China between 1988 and 2008. *Bull World Health Organ* 90(1):30-39.
- Feng Z (2010) Chinese health care in rural areas. *BMJ* 341:c5254.
- Gilson L, & McIntyre D (2007) Post-apartheid challenges: Household access and use of health care. *Int J Health Serv* 37(4):673-691.
- Goddard M, & Smith P (2001) Equity of access to health care services: theory and evidence from the UK. *Soc Sci Med* 53(9):1149-1162.
- Grant D (2009) Physician financial incentives and caesarean delivery: new conclusions from the healthcare cost and utilization project. *J Health Econ* 28(1):244-250.
- Guo SF, Padmadas SS, Zhao FM, Brown JJ, & Stones RW (2007) Delivery settings and caesarean section rates in China. *Bull World Health Organ* 85(10):755-762.
- Guo Y, Zakus D, & Liang H (2008) China: policy and practice of MCH since the early 1990s. *Matern Child Health J* 12(2):139-148.
- Gwatkin DR (2005) How much would poor people gain from faster progress towards the Millennium Development Goals for health? *Lancet* 365(9461):813-817.
- Habicht J, & Kunst AE (2005) Social inequalities in health care services utilisation after eight years of health care reforms: a cross-sectional study of Estonia, 1999. *Soc Sci Med* 60(4):777-787.
- Hacker JS (1998) The historical logic of national health insurance: structure and sequence in the development of British, Canadian, and U.S. Medical Policy. *Studies in American Political Development* 12:57-130.
- Han J (2010) China's rural population. Available from: [http://www.chinadaily.com.cn/business/2010-02/25/content\\_9502683.htm](http://www.chinadaily.com.cn/business/2010-02/25/content_9502683.htm) [accessed 18 July 2011]
- Hanratty B, Zhang T, & Whitehead M (2007) How close have universal health systems come to achieving equity in use of curative services? A systematic review. *Int J Health Serv* 37(1):89-

- Harris A, Gao Y, Barclay L, Belton S, Zweng WY, Hao M, Auqun X, Liao H, & Zhou Y (2007) Consequences of birth policies and practices in post-reform China. *Reprod Health Matters* 15(30):114-124.
- Harris A, Zhou Y, Liao H, Barclay L, Zeng W & Gao Y (2010) Challenges to maternal health care utilization among ethnic minority women in a resource-poor region of Sichuan Province, China. *Health Policy Plan* 25(4):311-318.
- Hesketh T., Lu L., & Xing ZW (2005) The effect of China's one-child family policy after 25 years. *N Engl J Med* 353(11):1171-1176.
- Hillier S, & Shen J (1996) Health care systems in transition: People's Republic of China. Part I: An overview of China's health care system. *J Public Health Med* 18(3):258-265.
- Houweling TA, Ronsmans C, Campbell OM, & Kunst AE (2007) Huge poor-rich inequalities in maternity care: an international comparative study of maternity and child care in developing countries. *Bull World Health Organ* 85(10):745-54.
- Hsiao W (1995) The Chinese health care system: lessons for other nations. *Soc Sci Med* 41(8):1047-1055.
- Hu S, Tang S, Liu Y, Zhao Y, Escobar ML, & de Ferranti D (2008) Reform of how health care is paid for in China: challenges and opportunities. *Lancet* 372(9652):1846-1853.
- Ir P, Horemans D, Souk N, & Damme W (2010) Using targeted vouchers and health equity funds to improve access to skilled birth attendants for poor women: a case study in three rural health districts in Cambodia. *BMC Pregnancy Childbirth* 10:1.
- James CD, Hanson K, McPake B, Balabanova D, Gwatkin D, Hopwood I, Kirunga C, Knippenberg R, Meessen B, Morris SS, Preker A, Sounteyrand T, Tibouti A, Villeneuve P, & Xu K (2006) To retain or remove user fees?: reflections on the current debate in low- and middle-income countries. *Appl Health Econ Health Policy* 5(3):137-153.
- Jing F, & Kaufman J (2008) Reproductive health in China: improve the means to the end. *Lancet* 372:1619-1620.
- Kaufman J, & Jing F (2002) Privatization of health services and the reproductive health of rural Chinese women. *Reprod Health Matters* 10(20):108-116.
- Klein R (1993) Health care reform: The global search for utopia. *BMJ* 307(6907):752.
- Klemetti R, Che X, Gao Y, Raven J, Wu Z, Tang S, & Hemminki E (2010) Caesarean section delivery among primiparous women in rural China: an emerging epidemic. *Am J Obstet Gynecol* 202(1):65.e1-6.
- Klemetti R, Regushevskaya E, Zhang WH, Wu Z, Yan H, Wang Y, & Hemminki E (2011) Unauthorised pregnancies and use of maternity care in rural China. *Eur J Contracept Reprod Health Care* 16(5):359-368.
- Kozhimannil KB, Valera MR, Adams AS, & Ross-Degnan D (2009) The population-level impacts of a national health insurance program and franchise midwife clinics on achievement of prenatal and delivery care standards in the Philippines. *Health Policy* 92(1):55-64.
- Kruk ME, Galea S, Prescott M, & Freedman LP (2007) Health care financing and utilisation of maternal health services in developing countries. *Health Policy Plan* 22(5):303-310.
- Kruk ME, Mbaruku G, Rockers PC, & Galea S (2008a) User fee exemptions are not enough: out-of-pocket payments for "free" delivery services in rural Tanzania. *Trop Med Int Health* 13(12):1442-1451.
- Kruk ME, Prescott MR, & Galea S (2008b) Equity of skilled birth attendant utilization in developing countries: financing and policy determinants. *Am J Public Health* 98(1):142-147.
- Langer A (2002) Promoting evidence based practice in maternal care. *BMJ* 324:928.
- Li J (2004) Gender inequality, family planning and maternal and child care in a rural Chinese county. *Soc Sci Med* 59:695-708.
- Lim SS, Dandona L, Hoisington JA, Janmes SL, Hogan MC, & Gakidou E (2010) India's Janani

- Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation. *Lancet* 375:2009-2023.
- Limwattananon S, Tangcharoensathien V, & Sirlak S (2011) Trends and inequities in where women delivered their babies in 25 low-income countries: evidence from demographic and health surveys. *Reprod Health Matters* 19(37):75-85.
- Lin HC, & Xirasagar S (2004) Institutional factors in caesarean delivery rates: policy and research implications. *Obstet Gynecol* 103 (1):128-136.
- Liu Q, Smith H, Wang Y, Tang S, Wang Q, & Garner P (2010) Tuberculosis patient expenditure on drugs and tests in subsidised, public services in China: a descriptive study. *Trop Med Int Health* 15(1):26-32.
- Liu X, Zhou X, Yan H, & Wang D (2011) Use of maternal healthcare services in 10 provinces of rural western China. *Int J Gynaecol Obstet* 114(3):260-264.
- Liu YM (2010) Income disparity in China: status quo and prospects. Available from: <http://www.instituteofideas.com/documents/Income%20Disparity%20in%20China.pdf> [accessed 23 Feb. 2012]
- Liu ZQ (2005) Institution and inequality: the hukou system in China. *Journal of Comparative Economics* 33:133-157.
- Long Q, Smith H, Zhang T, Tang S, & Garner P (2011) Patient medical costs for tuberculosis treatment and impact on adherence in China: a systematic review. *BMC Public Health* 11:393.
- Lule E, Ramana GNV, Oomman N, Epp J, Huntington D, & Rosen JE (2005) Achieving the millennium development goal of improving maternal health: Determinants, Interventions and Challenges. Health, Nutrition and Population (HNP) Discussion paper. Washington DC: The World Bank.  
Available from:  
<http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/LuleAchievingtheMDGFinal.pdf> [accessed 3 Oct. 2011]
- Lumbiganon P, Laopaiboon M, Gulmezoglu AM, Souza JP, Taneepanichskul S, Ruyan P, Attygalle DE, Shrestha N, Mori R, Nguyen DH, Hoang TB, Rathaw T, Chuyun K, Cheang K, Festin M, Udomprasertgul V, Germar MJ, Yangiu G, Roy M, Carroli G, Ba-Thike K, Filatova E, Villar J; World Health Organization Global Survey on Maternal and Perinatal Health Research Group. (2010) Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007-08. *Lancet* 375(9713): 490-499.
- Ma J, Lu MS, & Quan H (2008) From a national, centrally planned health system to a system based on the market: lessons from China. *Health Affairs* 27(4):937-948.
- McCourt C, Weaver J, Statham H, Beake S, Gamble J, & Creedy DK (2007) Elective caesarean section and decision making: a critical review of the literature. *Birth* 34(1):65-79.
- McIntyre D, Whitehead M, Gilson L, Dahlgren G, & Tang S (2007) Equity impacts of neoliberal reforms: what should the policy response be? *Int J Health Serv* 37(4):693-709.
- Ministry of Health of China (2004) Report of National Health Services Survey 2003. Beijing: Peking Union Medical College Press. (Chinese)
- Ministry of Health of China (2009) Summary of health statistics in 2009. Available from: <http://www.moh.gov.cn/publicfiles/business/htmlfiles/zwgkzt/ptjty/digest2009/T7/sheet002.htm>. [accessed 10 May 2011]
- Montagu D, Yamey G, Visconti A, Harding A, & Yoong J (2011) Where do poor women in developing countries give birth? A multi-country analysis of demographic and health survey data. *Plos One* 6(2):e17155.
- Mossialos E, Allin S, Karras K, & Davaki K (2005) An investigation of Caesarean sections in three Greek hospitals: the impact of financial incentives and convenience. *Eur J Public Health* 15(3): 288-95.

- Murray SF (2000) Relation between private health insurance and high rates of caesarean section in Chile: qualitative and quantitative study. *BMJ* 321:1501-1505.
- Nahar S, & Costello A (1998) The hidden cost of "free" maternity care in Dhaka Bangladesh. *Health Policy Plan* 13:417-422.
- National Development and Reform Commission (2009) Implementation Plan for the Recent Priorities of the Health Care System Reform (2009-2011). Available from: [http://www.china.org.cn/government/scio-press-conferences/2009-04/09/content\\_17575401.htm](http://www.china.org.cn/government/scio-press-conferences/2009-04/09/content_17575401.htm) [accessed 10 May 2011]
- Niens LM, de Poel EV, Cameron A, Ewen M, Laing R, & Brouwer WBF (2012) Practical measurement of affordability: an application to medicines. *Bull World Health Organ* 90:219-227.
- Nwaru BI, Wu ZC, & Hemminki E (2012) Determinants of the use of prenatal care in rural China: the role of care content. *Matern Child Health J* 16(1):235-241.
- Oliver A, & Mossialos E (2004) Equity of access to health care: outlining the foundations for action. *J Epidemiol Community Health* 58(8):655-658.
- O'Donoghue T, & Punch K (2003) *Qualitative Educational Research in Action: Doing and Reflecting*. Routledge.p.78.
- Peng P (1998) New development of China's population programme. *China Population Today* 15(3): 4-5.
- Perkins M, Brazier E, Themmen E, Bassane B, Diallo D, Mutunga A, Mwakajonga T, Ngobola O (2009) Out-of-pocket costs for facility-based maternity care in three African countries. *Health Policy Plan* 24(4): 289-300.
- Ranson MK (2002) Reduction of catastrophic health care expenditures by a community-based health insurance scheme in Gujarat, India: current experiences and challenges. *Bull World Health Organ* 80(8):613-621.
- Ren Z (2011) Utilisation of antenatal care in four counties in Ningxia, China. *Midwifery* 27(6):e260-266.
- Ritchie J, Spencer L, & O'Connor W (2003) Carrying out qualitative analysis. In origins of *Qualitative research practice: A guide for social science students and researchers*. Edited by In J. Ritchie & J. Lewis. Thousand Oaks, CA: Sage 219-262.
- Ronsmans C, Graham WJ, & Lancet Maternal Survival Series steering group (2006a) Maternal mortality: who, when, where and why. *Lancet* 368(9542):1189-1200.
- Ronsmans C, Holtz S, & Stanton C (2006b) Socioeconomic differentials in caesarean rates in developing countries: a retrospective analysis. *Lancet* 368:1516-1523.
- Russell S (1996) Ability to pay for health care: concepts and evidence. *Health Policy Plan* 11(3):219-237.
- Russell S (2004) The economic burden of illness for households in developing countries: a review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome. *Am J Trop Med Hyg* 71(2 Suppl):147-155.
- Say L, & Raine R (2007) A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context. *Bull World Health Organ* 85:812-9.
- Sen A (2002) Health: perception versus observation. *BMJ* 324(7342):860-861.
- Septhri A, Sarma S, Simpson W, & Moshiri S (2008) How important are individual, household and commune characteristics in explaining utilization of maternal health services in Vietnam? *Soc Sci Med* 67:1009-1117.
- Short S, & Zhang F (2004) Use of maternal health services in rural China. *Popul Stud (Camb)* 58(1): 3-19.
- Simkhada B, Teijlingen ER, Porter M, & Simkhada P (2008) Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. *J Adv Nurs* 61(3):44-260.

- Sinha T, Ranson MK, Chatterjee M, Acharya A, & Mills A (2006) Barriers to accessing benefits in a community-based insurance scheme: lessons learnt from SEWA Insurance, Gujarat. *Health Policy Plan* 21:132–142.
- Smith KV, & Sulzbach S (2008) Community-based health insurance and access to maternal health services: Evidence from three West African countries. *Soc Sci Med* 66:2460-73.
- Souza JP, Gulmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, Fawole B, Ruyan P, WHO Global Survey on Maternal and Perinatal Health (2010) Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008 WHO Global Survey on Maternal and Perinatal Health Research Group. *BMC Medicine* 8:71.
- Storeng KT, Baggaley RF, Ganaba R, Ouattara F, Akoum MS, & Filippi V (2008) Paying the price: the cost and consequences of emergency obstetric care in Burkina Faso. *Soc Sci Med* 66(3):545-557.
- Tang S, Li X, & Wu Z (2006) Rising cesarean delivery rate in primiparous women in urban China: Evidence from three nationwide household health surveys. *Am J Obstet Gynecol* 195:1527-1532.
- Tang S, Meng Q, Chen L, Bekedam H, Evans T, & Whitehead M (2008) Tackling the challenges to health equity in China. *Lancet* 372(9648):1493-1501.
- Tsai YW, & Hu TW (2002) National Health Insurance, Physician Financial Incentives, and Primary Cesarean Deliveries in Taiwan. *Am J Public Health* 92(9):1514-1517.
- United Nations Development Programme (UNDP) (2009) Human development report 2009--overcoming barriers: human mobility and development. Available from: [http://hdr.undp.org/en/media/HDR\\_2009\\_EN\\_Complete.pdf](http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf) [accessed 6 May 2011]
- Wagstaff A, Lindelow M, Wang S, & Zhang S (2009a) Reforming China's Rural Health System. Available from: [http://siteresources.worldbank.org/CHINAEXTN/Resources/318949-1248160372290/rural\\_health\\_full\\_report\\_en.pdf](http://siteresources.worldbank.org/CHINAEXTN/Resources/318949-1248160372290/rural_health_full_report_en.pdf) [accessed 12 May 2011]
- Wagstaff A, Lindelow M, Gao J, Xu L, & Qian JC (2009b) Extending health insurance to the rural population: an impact evaluation of China's new cooperative medical scheme. *J Health Econ* 28(1):1-19.
- Wang L, Liu J, & Chin DP (2007) Progress in tuberculosis control and the evolving public-health system in China. *Lancet* 369(9562):691-696.
- Wang Y (2007) Development of the New Rural Cooperative Medical System in China. *China & World Economy* 15(4):66-77.
- Wang H, Gu D, & Dupre ME (2008) Factors associated with enrolment, satisfaction and sustainability of the New Cooperative Medical Scheme program in six study areas in rural Beijing. *Health Policy* 85(1):32-44.
- Ward PR (2009) The relevance of equity in health care for primary care: creating and sustaining a "fair go, for a fair innings". *Qual Prim Care* 17(1):49-54.
- Whitehead M, Dahlgren, & Evans T (2001) Equity and health sector reforms: can low-income countries escape the medical poverty trap? *Lancet* 358(9284):833-836.
- Whitehead M, & Dahlgren G (2006) Levelling up, Part I: A discussion paper on concepts and principles for tackling social inequities in health. Copenhagen: World Health Organization.
- WHO (1985) Appropriate technology for birth. *Lancet* 2(8452):436-437.
- WHO: Office of the WHO Representative in China and Social Development Department of China State Council Development Research Center (2005) China: Health, Poverty and Economic Development. Available from: [http://www.who.int/macrohealth/action/CMH\\_China.pdf](http://www.who.int/macrohealth/action/CMH_China.pdf) [accessed 25 October 2011]
- WHO, UNICEF, UNFPA and The World Bank (2010) Trends in Maternal Mortality:1990 to 2008. Geneva: World Health Organization.
- Winckler EA (2002) Chinese reproductive policy at the turn of the millennium: dynamic stability. *Population and development review* 28(3):379-418.

- World Health Assembly (1998) Health-for-all policy for the twenty-first century, Annex: World health declaration, WHA51.7. Geneva: World Health Organization.
- World Health Assembly (2005) Sustainable health financing, universal coverage and social health insurance. WHA58.33. Geneva: World Health Organization.
- Wu Z, Viisainen K, Li X, & Hemminki E (2008) Maternal care in rural China: a case study from Anhui province. *BMC Health Serv Res*. 8:55.
- Wu Z, Lei P, Hemminki E, Xu L, Tang S, Li X, Raven J, Gao J, & Tolhurst R (2012) Changes and equity in use of maternal health care in China: from 1991 to 2003. *Matern Child Health J* 16(2): 501-509.
- Xu B, Dong HJ, Zhao Q, & Bogg L (2006) DOTS in China-removing barriers or moving barriers? *Health Policy Plan* 21 (5):365-372.
- Xu K, Evans DB, Kawabata K, Zeramdini R, Klavus J, & Murray CJ (2003) Household catastrophic health expenditure: a multicountry analysis. *Lancet* 362:111-117.
- Xu L, Wang Y, Collins CD, & Tang S (2007) Urban health insurance reform and coverage in China using data from national health services surveys in 1998 and 2003. *BMC health services research* 7:37.
- Yan F, Raven J, Wang W, Tolhurst R, Zhu K, Yu B, & Collins C (2011) Management capacity and health insurance: the case of the New Cooperative Medical Scheme in six counties in rural China. *Int J Health Plann Manage* 26(4):357-378.
- Yip W, & Hsiao W (2008) The Chinese health system at a crossroads. *Health Affairs* 27(2):460-468.
- You X, & Kobayashi Y (2008) The new cooperative medical scheme in China. *Health Policy* 91(1): 1-9.
- Yu B, Meng Q, Collins C, Tolhurst R, Tang S, Yan F, Bogg L, & Liu X (2010) How does the New Cooperative Medical Scheme influence health service utilization? A study in two provinces in rural China. *BMC Health Serv Res* 10:116.
- Zhang L, Wang H, Wang L, & Hsiao W (2006) Social capital and farmer's willingness-to-join a newly established community-based health insurance in rural China. *Health Policy* 76(2):233-242.
- Zhang WH., Raven J, Zhang TH, Shen Y, Huang K, Long Q, Klemetti Reija, Temmerman Marleen , Hemminki Elina and the CHIMACA study group (2010) Implementation of interventions in the CHIMACA project. THL discussion paper 13, THL, University print, Helsinki, Finland.  
Available from: <http://www.thl.fi/thl-client/pdfs/682e76d7-c16e-45a7-ab61-6ba2dc611405>
- Zhu WX (2003) The one child family policy. *Arch Dis Child* 88:463-464.

**APPENDIX: Geographic distribution of data collections**



## **ORIGINAL PUBLICATIONS**