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Inequalities in Health of Urban China

- the Socioeconomic Correlations

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Abstract: The thesis studies on the inequalities in health as an issue of the subject Health Economics. Inequalities in health is also known as a consequence of the inequalities in socioeconomic status and factors such as income, age, gender, education, employment status, place of residence, and etc. Due to the limitation on time and data, the thesis focuses on the urban individual statistics of China in the year 2002. The purpose of the study is to evaluate how and to what extent different factors had the impact on health in an individual perspective. One of the more surprising results is that income is found to be somehow quite unimportant to health. In comparison, employment status was rather decisive to health – the unemployed people had much poorer self-reported health than the employed, even the retired ones. Similarly, health was also significantly differed by the many places of residence. Gender difference was important as well, for females had worse self-reported health than males. Completed tertiary education could effectively improve health, rather than the lower levels. Hopefully, the study can help to explain or insinuate the problems in the Chinese society and the health system, which can therefore support any future research works and social reforms.

Key words: Inequalities in Health, Socioeconomics Status, Individual Health, Urban China

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1. Introduction

1.1 Relevance

In China, many people may choose self-medication or even doing nothing rather than going for a professional medical care if they become ill. Official statistics showed that at least one third of the population could not afford hospital treatment. According to the Ministry of Health and the Statistical Yearbook 2004, 40 to 60 percent of those who remained untreated became even poorer and more ailing, 60 to 80 percent of which finally died at home (Sohu News – one of the leading network media in China).

Moreover, around 100 million rural workers were working in the city industries in the year 2005, and this number was increasing by about 5 million per year, according to the official media, Xinhua News. These workers should consequently be qualified for the health care scheme for the general employees enrolled in enterprises, but in reality their non-urban *hukou* (registration location) led them to be uncovered by any health insurance (Hougaard, Østerdal and Yu, 2008, p.7).

China's economy has kept growing for a long time while accompanied problems such as the large economic and social gaps have also emerged, for instance, the inequalities in health is one of them. As income difference is getting serious, large proportion of wealth has been controlled by a minority of the wealthiest. Costs of living are growing fast while income level remains relatively low for the most ordinary wage earners. Overall, the income differences and the gap of living conditions between regions are large (OECD, 2012). The potential risk of inequalities in health as the consequence of the income inequality has therefore received growing concerns.

The aim of the thesis is to study on the individual health and see how it is correlated with the socioeconomic factors such as income, gender, education, employment status and etc. in the Chinese context. It will focus on the urban individuals, due to the method of using micro-data and the limitation of the dataset.

1.2 Previous Studies

The Chinese health system is basically separated into three groups according to the differences in job functions. One, also considered as a sort of top-level, refers to the staff in all

kinds of governmental and institutional level entities. They are basically favored by the state insurance with all health expenses covered. The second group consists of staff with urban registration in all kinds of enterprises. Their insurance is from a pool contributed by both themselves and the enterprises. The third group consists of rural residents who are covered by specific rural cooperatives for medical services or no insurance at all (Hougaard, Østerdal and Yu, 2008, p.4-6).

Previous research has widely focused on the topic of income differences and health. Karlsson et al raised three hypotheses as the theoretical considerations on the evidence of income inequality and health, the absolute income hypothesis (AIH), the relative income hypothesis (RIH), and the income inequality hypothesis (IIH) (Karlsson et al, 2010, p.876-877).

AIH as the simplest one, 'suggests that individual health is affected by own income but not the distribution of incomes'. AIH has been found to have the strongest empirical support in most of the countries studied. Li and Zhu (2006) found the evidence of the correlation between absolute income and health in China. RIH is defined as a person's health that can be affected by the incomes of other people in the reference-group. However, the effect of RIH has previously been found to be relatively weak. Several studies as well as that of China found no virtually effects of income to the members' health in the reference-group (Li & Zhu, 2006). IIH refers to the income inequality in a society which affects everyone's health, so the IIH is usually 'tested by including the Gini coefficient or some other measure of income inequality as an independent variable'. Li and Zhu found that 'the relationship between income inequality and self-assessed health only appears in communities with a relatively high degree of inequality' in China (Karlsson, et al., 2010, p.876-877).

The empirical evidence in the developing countries is somehow like the swim against the tide, as Wagstaff proclaimed. Health inequality rises in the country where per capita income rises. However, health inequalities are 'not apparently associated with large inequalities in income or with small shares of publicly financed health spending' (Wagstaff, 2002, p.1). This is to a certain degree not consistent with Karlsson et al's AIH method and Li & Zhu's empirical findings on the positive relationship between individual income and health. Wagstaff also found that richer countries had higher relative inequalities in child mortality rate between the poor and the better-off. He suggested that 'this is probably due in part to technological change going hand-in-hand with economic growth, and a tendency for the better-off to assimilate new technology ahead of the poor' (Wagstaff, 2002, p.36-37).

Lundborg (2012) used twin design to estimate the health returns to schooling in the US. It is

by ‘relating within-twin-pair differences in schooling to within-twin-pair differences in health and health behaviors’. He found that ‘completing high school improves health, as measured through self-reported health...additional schooling does not lead to additional health gains’. Cawley (2004) measures the correlation between weight and wages in the US, and found it different among ethnicities. ‘Heavier white females, black females, Hispanic females, and Hispanic males tend to earn less, and heavier black males tend to earn more than their lighter counterparts’. Among estimations, white women with obesity tend to have lower self-esteem, but not black women. Health-weight black males tend to earn more, due to underweight black men earning less and not due to overweight black men earning more. In addition, weight is positively correlated with education and intelligence test scores among black men, which is opposite to that of most other ethnic groups (Cawley, 2004, p.468).

Grossman (1972) discussed the demand for health with relation to the differences of age, education and income. Educated people are better informed, and can better process new information and technology on their healthcare situation, thus leads to effectiveness in producing health (Cutler, Lleras-Muney & Vogl, 2011, p.140-141). Education is strongly related to health. Having a higher education is furthermore connected with higher self-assessed health and less chronic conditions (Lundborg, 2008). Grossman also illustrated the downward-slope demand curve due to diminishing marginal productivity of health capital along aging. Aging leads to the increase of shadow price as the depreciation on the stock of health rises. Under certain condition, the growing shadow price will reduce the demand for health and increase the demand for medical care and the risk of health – that is a vicious circle. Simultaneously, individual with more income or the quantity of wealth stocked will positively leads to more demand for health and medical care (Grossman, 1972).

Financial resources have a strong correlation with health as well, though the causality is far from clear and seems to vary to a large degree by ages. The mechanism is like, more money leads to the access to healthier and nutritious foods, and improved health provides better working abilities and higher wages. Conversely, being ill will have negative effect due to the wealth loss caused by health care expenses and missed workdays. Also, education can affect both health and income. Wealth and education can both have intergenerational effect. Children who are born in the family with good economic resources and healthier parents will become healthier and wealthier adults (Cutler, Lleras-Muney & Vogl, 2011, p.142-143; Garcés, 2013).

Studies also show that health is correlated with business cycles. Higher unemployment rate for instance, on the good side, leads to decreased work-related injuries and more leisure and

exercise time; however, may also cause psychosocial stress, reduction in happiness and lower consumption on healthy products. The results from the Swedish case study indicate that economic recessions increase mortality risk for men, but no significant effect for women (Ruhm, 2000; Gerdtham & Johannesson, 2005). In some other cases, good economic times may also lead to worse health due to the more stress and alcohol consumptions, etc. (Gerdtharm & Ruhm, 2006).

The aim of the thesis is, based on the above previous studies, to look at and analyze health and its influencing factors in the Chinese context. Since the rural data is quite limited, we only look at urban individuals and rural individuals are not explored. The self-reported health is used as the indicator to health. The study delineates a profile of the correlations between health and the differences or inequalities in a number of individual-level economic and demographic elements, such as income, gender, education, employment status, and etc.

The thesis proceeds as follows: right below are the research questions, defining what the thesis is to look at. Next, I present the theories, the methods as well as the limitation of the study based on which analyses will be processed. Then I introduce the dataset and the variables selected, and present the model specified for statistics analyses based on which results are obtained and discussed. In the end, I summarize the findings and discussions, and draw the conclusion.

1.3 Research Questions

How did different economic and social factors influence the health situation in urban China?

The topic relates to the hot issue of the paradox of socioeconomic efficiency and equity. Efficiency refers to the speed of economic growth which, in many countries, has been accompanied by social inequalities. The inequalities are embodied in the economic, demographic and social factors such as income, age, gender, education and etc. which consequently lead to health inequality. My study hereby focuses on such causality.

The key question is to be answered by using cross-sectional micro-data analyses. The self-reported health is the outcome variable correlated with the independent variables on economics and demographics. In order to reach the answer to the problem formulation, the thesis proceeds by also tracking the following sub-questions as the guideline.

(1) Given the dataset, what are the independent variables selected, and why they are relevant

to the self-reported health?

- (2) Given self-reported health as the outcome variable, what are the models and how can we interpret the results?
- (3) Did the differences in income, age, gender, education, status, and etc. lead to health differences in the urban China? If yes, how?
- (4) In international comparison, is there something different or particular shown in this study on the urban China?

1.4 Motivation

Inequalities in health is a hot issue in the subject of Health Economics. Many scholars have formulated that the differences in income, gender, ethnicity, business cycle such as employment status, and etc. have the correlation with health estimated in either level of individuals, groups, or nations (Lundborg, 2012; Cawley, 2004; Karlsson et al, 2010; Wagstaff, 2000; van Doorslaer et al, 1997). It might influence society and socioeconomic stability, during the period of either economic growth or recessions. Large inequalities in, for instance, income may lead to unequal opportunity to access health services, which consequently leads to inequalities in health and lives.

I want to investigate the causes of inequalities in health. Since I'm not able to do it too broadly, I choose to look at the health of urban individuals in China of the year 2002, due to the limited access to available data. Since many of the previous studies were about the western developed countries, I would hope that the thesis can contribute and enrich the study area of inequalities in health with a perspective on China.

With this in mind, I attempt to discuss the correlations between the socioeconomic independent variables and the outcome variable of self-reported health, based on theories and previous studies. Then I analyze the urban individual data of China, and see to what extent socioeconomic differences had led to health differences.

I want to gain knowledge in this field, however I also believe that academic studies should aim to improve society as oppose to simply acquiring knowledge. Hopefully, the study can also instigate improvements in the health system and institutional reforms in China.

2. Theories and Methods

2.1 Health Systems

This theory deals with the establishment and the characteristics of health systems as a whole, but mainly focuses on that of the low- and middle-income countries. The theory processes in two aspects, the economic dimensions of health systems and the distinctive characteristics that affect the policy of the health systems. The main reference is Anne Mills' article, 'Health Systems in Low- and Middle-income Countries' (LMICs) in the Glied and Smith edited 'The Oxford Handbook of Health Economics'. It represents a huge amount of countries, population and their health systems, as she states, since '84 percent of the world's population, 90 percent of the world's 2001 disease burden (Lopez et al, 2006)', but only 24 percent of the world's GDP, and 13 percent of global health expenditure are from the LMICs (Mills, 2011, p.30).

Given the diversity of the countries, their structures and institutions are usually discussed according to their differences in key features. Normally, they are classified by income level, geographical region or political or institutional characteristics. Income level is vital; as shown in previous research of the World Health Organization (WHO), life expectancy in low-income countries is in average more than 20 years lower than that in high-income countries; infant mortality in low-income countries is 85.9 (per 1,000 live births) while 5.8 in high-income countries, more than fourteen-fold difference. Besides, countries geographically closed to each other usually share similar cultural and historical identity, as well as roughly similar political and economic structures. However, this rule does not apply in all situations (Mills, 2011, p.31-32).

2.1.1 Economic Dimensions of LMIC Health Systems

'A health system comprises all the organizations, institutions, and resources that are devoted to producing health actions whose primary purpose is to improve health' (WHO, 2000; Mills, 2011, p.32). The economic dimensions of health system include four key actors and five functions.

- Four key actors: population, providers, financing agents, government/professional bodies.
- Five functions: revenue collection, pooling, resource allocation, service provision, regulation. (Mills, 2011, p.32)

Revenue is the source of the budget of health system. It is constituted by taxes, social security payments, out-of-pocket payment, and external grants and loans. The lower the income level of a country, the higher the out-of-pocket payments tend to be. For instance, in India, 83

percent of total health expenditure is from private sources, of which 94 percent is out-of-pocket payments. For low-income countries, there is a considerably higher proportion, on average 23 percent, of external resources (donation) as a part of the revenue for health expenditures (Mills, 2011, p.32-34).

Revenue pooling is the aggregation of prepayment for health care costs in advance. The members of the pooling can therefore share the risk of being ill and needing health care services. To what extent pooling can reduce risk for its members varies. For low-income countries, there are often different insurers which are small and fragmented. Most population may be too poor to join any insurance scheme; so the limited number of members and funds makes each pool less effective to reduce risk (Mills, 2011, p.34). There are also examples that support the multiple insurers, for it allows people to choose their own preferred providers and ensures high risk individuals not being discriminated. Opposite cases show that it even accentuate inequalities since people of the similar reference group tend to solidarize in together. For instance, people of higher education and income, lower age, and lower risk in health tend to join one scheme which keeps away high risk individuals. It results that high risk individuals are worse off, and their health expenses are even uncovered. However, more LMICs have intended to choose a single risk pool by merging its general tax and social security funds, for example, Costa Rica and Korea, etc. (Mills, 2011, p.36-37).

In general, large proportion of health expenditures in LMICs is allocated on hospitals, especially higher level hospitals (Hensher et al, 2006). Studies show that ‘all levels of public hospitals in developing countries absorbed a mean of 60 percent of recurrent public health expenditures’ (Mills, 2011, p.37). Besides that, general information of resource allocation in LMICs is basically unavailable. Thus one cannot characterize the pattern of how resource is allocated by shares to the sectors, such as ‘primary care, hospitals, pharmaceuticals, public health, and administration’ (Mills, 2011, p.37). Service provision also shows to be hard to evaluate due to extreme limits of data available. It is very common in low-income countries of using informal private health care. Due to the absence of widespread network of public services, private sector is rather a cheap and near source of treatment (Mills, 2011, p.38). The fifth function, regulation, is both partial and weak in LMICs, especially for the new developments of the private providers. Consequently, even publicly employed doctors may have private interest, and public hospitals can be driven by commercial purposes (Mills, 2011, p.38-40; Mills and Ranson, 2005).

In general, the health systems in LMICs remain to be unclear and fragmented. We cannot simply categorize them into any classical terms, such as the Beveridge system or the

Bismarck system. Problems and drawbacks remain, for instance, in the middle- and upper-middle-income countries, public share of revenue increases while public health provision shrinks as a response to the fast growing middle class. Consequently, when public medical care is not satisfied or enough, people shift to private sectors, and this leads to intensified needs of private sources, especially out-of-pocket payments (Mills, 2011, p.41-43; Hanson and Berman, 1998).

2.1.2 Distinctive Characteristics of LMICs

LMICs share some common features which may influence their policy making on health systems. The features consist of economic structure, political and social institutions, management capacity and external dependence for health financing (Mills, 2011, p.43-44).

Economic structure has four important aspects when talking about LMICs, the degree of poverty, the nature of labor force, income inequality and the under-developed private sector (Mills, 2011, p.44-46). Poverty has a fundamental effect on health systems. ‘Illness can readily lead to levels of cost that are catastrophic for household welfare, or alternatively the potential costs discourage household from seeking necessary care’ (Mills, 2011, p.44). Poor countries also have limited budget to finance necessary health care. At a system level, poverty also keeps away doctors and nurses, for health workers are easier to migrate to where salaries are higher and work conditions are better. Labor force is another aspect. The poorer the country is, usually the smaller share of labor is in the formal sector, and the larger share is in the informal economy. This has shrunk the country’s tax revenue as the main source of health care finance. And, to extend social health insurance to the informal sector is usually an extremely slow process (Mills, 2011, p.44-45). Income inequality is especially important in middle-income countries. It has two consequences for health systems. ‘One is that the buying power of the richer groups, given low quality public services, is focused on the private health sector, which then grows and attracts scarce physical resources such as doctors and nurses away from the public sector, further increasing disparities in quality between public and private services’. As a result, it leads to the second consequence that the inequalities between public and private sector, and the rich and the poor in health are even intensive and hard to adjust. However, as we have already discussed that Wagstaff found not apparent association between health inequalities and income inequalities, which is actually against the theory. Hence, we keep it as doubt and test it in the later analyses. The fourth aspect is the under-developed private sector which ‘limits the scope for competition as a driver of efficiency and low prices’ (Mills, 2011, p.46).

The second feature of LMICs is the relatively less-developed political, economic, and social institutions. Institutions of health care are to promote a democratic civil society as well as to keep national functions running properly. Health system should also promote efficiency and equality in health. Developing countries usually have quite centralized management of public hospitals, which hinders efficiency and financial autonomy for reducing prices. Health insurance, on another perspective, is used to reduce financial risk. However it does not always work well. In China for instance, Wagstaff and Lindelow (2008) find it actually increase out-of-pocket payment¹ and total expenses. Reasons are not clear, however, other studies show that the hospitals in China are strongly driven by revenue (Liu and Mills, 2003 & 2005). Hospitals tend to use their professional advantage to provide expensive treatment and medicine which are not really necessary for patients. In this case, the public hospitals are more like ‘income generating enterprises’, rather than promoting proper and cheap services for people (Mills, 2011, p.46-47).

The third feature is management capacity. With a context of weak institutions, management is limited by the capacity of raising money for health system. Such weakness is common for low-income country which has a bad performance of tax collection system to finance its social health insurance. Besides, a weak management capacity also makes it hard for hospitals to implement any policy changes. This leads to a delaying reform process, and can even make it fail. In addition to that, a weak information system is also a drawback for a unified health system, as it makes the public health service less attractive and pushes patients to choose private sectors which are hard to regulate (Mills, 2011, p.48-49).

External dependence for health financing is primarily a problem for low-income countries. Study shows that 22.5 percent of the total health expenditure was from external sources in low-income countries, majority of which flowed to government. This rate is even higher, over 70 percent, in certain favored countries such as Uganda, Mozambique and Cambodia. The flows of external funds are fragmented, and lack of regulations which usually exposes it to corruption (Mills, 2011, p.49-51).

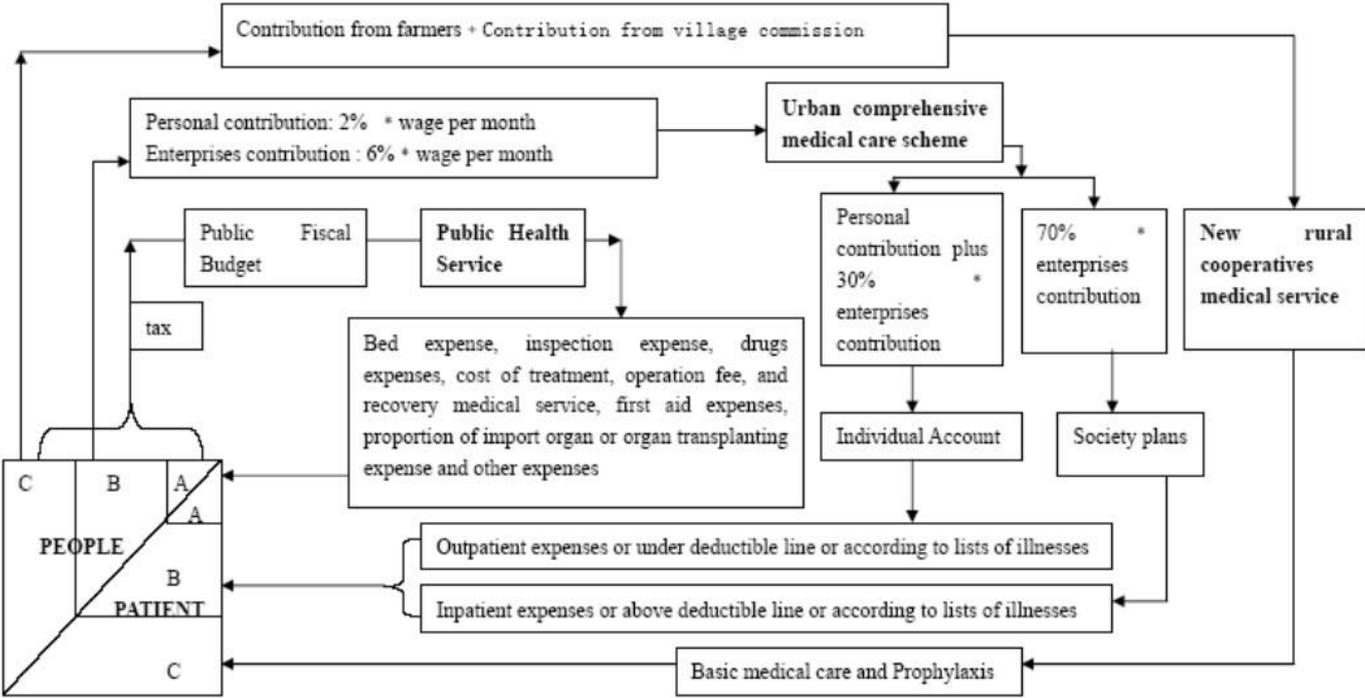
2.2 China’s Health Care System

In the pre-1980 era, China’s health care system remained to be an old communist style that the central government acted as owner, sponsor and provider to the system. Reform started since the 1980s when local authorities started to play a more important role in financing and administrating health services. In the late 1980s, reform started to launch a new social

¹ Direct outlays of cash which may or may not be later reimbursed

insurance system including pension and health care schemes in order to adapt the need of the population, which sounds fancy but was true. The provider of the health care services was ultimately transferred from the central government to local authorities. Services depended on financing which therefore paved the way for the inequalities in service-providing and health between rich and poor regions (Hougaard, Østerdal and Yu, 2008, p.3).

Figure 2.1 The Chinese health care system



(Source: Hougaard, Østerdal and Yu, 2008, p.4)

Basically, the system is based on a separation of population into three groups according to their job functions. The Group A refers to ‘staff in all levels of government, the “parties”, NGO-like groups, public organizations, the army, staff in the public health sector and research institutions as well as in the education system’. Their health care expenses are basically all covered. The Group B consists of staff in all kinds of enterprises in urban areas. And the Group C comprises the rural residents who have no insurance at all, or covered by specific rural cooperatives for medical services. However, the coverage of rural population differs a lot by geographical locations. Those in the rich southeast coastal regions can be covered by the “new rural cooperative medical care scheme”, while most of the others are not covered by any specific regulation (Hougaard, Østerdal and Yu, 2008, p.4-6).

In another perspective, the Chinese health care system can also be considered by two parts, an urban and a rural system, also known as the ‘*hukou*’ system which is a registration status of

the people classified by their geographical location. So to speak, the A and B group consists of people with urban-hukou while the C group is for people with the rural-hukou. However, the hukou-status can be changed, for example, if a rural student studies at a city university, he/she can have a temporary city-hukou which becomes permanent if he/she gets a job in the city after graduation. But for an opposite instance, people with rural-hukou work in the city industry without a city-hukou, is quite common especially in the nowadays China. In such case, they should be covered by the B-group scheme but actually uncovered by any health care insurance (Hougaard, Østerdal and Yu, 2008, p.5)

We distinguish them into three groups, also because they are actually regulated by different ministries. A-group is regulated by China National Labor Union and the Ministry of Organization; B-group is regulated by The Ministry of Labor and Social Security; and C-group is regulated by Ministry of Health. When Group A enjoys a full coverage and Group C has almost no insurance, the system of Group B is relatively complicated. The system is under the “urban comprehensive medical care scheme” which basically is an employer-based insurance scheme. It consists of two parts – an individual account and a social pooling. An individual employee pays 2% of the gross income to his/her personal account. The enterprise pays 6% of the individual’s income of which 30% is allocated to his/her individual account and 70% is allocated to the social pooling. The contribution rates may vary between regions. However, the implementation of the scheme varies between rich and poor regions, and enterprises with different types of ownership, since there is a lack of regulation. Sometimes, unskilled workers in private firms are not covered by the scheme, which happens without being sanctioned by the local government. Group C has no universal coverage, but in the rich coastal provinces, voluntary insurance schemes are established, which however does not work so well. The problem is that people are too poor to join the schemes; as a result, the funds are too small and have a limited effect (Hougaard, Østerdal and Yu, 2008, p.6-7).

The health care system is financed by three main parties, the local government, enterprises and individuals. Governments finance the system mainly by taxation. Enterprises of all types of ownership pay their share of the medical care scheme for their B-group employees. Nowadays, individual contribution has been a huge role, although the share is rather limited, the additional out-of-pocket expense is huge since the schemes leave many necessary expenses inadequate (Hougaard, Østerdal and Yu, 2008, p.8-9).

In general, China’s health care system reform is still far from completed, though it has been constantly changing in order to adapt to the need of the population. Total expenditures dramatically increased as a consequence right after the reform. Government and social

expenditures kept dropping which forced hospitals to earn profits by treatments and drug sales. This has introduced moral hazard, like that in the US (Blumenthal & Hsiao, 2005). Hospitals started to raise prices, and to gang up with pharmaceutical factories to provide new and expensive medicines (which were normally not covered by insurances) to patients. Therefore the proportion of out-of-pocket expenses has grown fast. It led to more inequality in health, due to the income and wealth differences. On top of these, the lack of regulation makes the system exposed to corruption (Hougaard, Østerdal and Yu, 2008, p.2).

The research on the Chinese health care system has raised some questions and limitations. Whether it makes sense to talk about the system as a coherent one, or should we consider the system as several co-existing subsystems by different geographic regions. Besides, the empirical analysis of the Chinese health care system usually suffers from the lack of relevant data and data uncertainties (Hougaard, Østerdal and Yu, 2008, p.2).

2.3 Health and Socioeconomic Status

The theories referred to are mainly based on Graham and her book named ‘Unequal Lives, Health and Socioeconomic Inequalities’, 2007; and Cutler, Lleras-Muney and Vogl’s working paper on ‘Socioeconomic Status and Health: Dimensions and Mechanisms’.

Hilary Graham has a wide range of projects and publications on health and social inequalities, and has been working on the policies to improve health and tackle health inequalities. The term ‘Health Inequalities’ as she mentioned, has already been widely used in the western world. It refers to the inequalities in people’s economic and social status which may therefore influence their health status. Graham also divided health inequalities into three dimensions, the inequalities between individuals, between population groups and between groups occupying unequal positions in society (Graham, 2007, p.3-4). The three dimensions, considering only income as one of the socioeconomic factor, can be understood together with Karlsson et al’s three hypotheses as the evidence of income inequalities and health. Differentiated by the objects of study for comparison, the inequalities between individuals are rather based on the absolute income hypothesis; both of them tend to look at the inequalities on the individual-level data comparison. This is also the method of the data management and analyses in this thesis. Diversely, the inequalities between population groups or groups of certain positions in society are, rather macroscopic, respectively similar with the income inequality hypothesis and the relative income (or position) hypothesis. The groups of population can be divided by, for instance, age, gender, education, ethnicity and etc., which determines the differences in socioeconomic position, occupations and social hierarchies

(Graham, 2007, p.4-8).

Differences of socioeconomic status can lead to the inequalities in living conditions and health. As measured in actual cases, differences of income, occupation, education, sometimes gender resulted in differences of social positions and hierarchies which ultimately lead to differences in health (Graham, 2007, p.36-38). Graham raised two themes of socioeconomic inequalities and lifestyles. 'An individual's socioeconomic position is shaped by unequal structures which exist outside their lives'; and 'socioeconomic positions are actively produced and reproduced by people going about their lives' (Graham, 2007, p.39). This explains the vicious circle of low income and poor health – low income makes health care services unaffordable, which in return worsen health status for working. But on top of that, the unequal allocation of sources and opportunities causes the inequalities in socioeconomic status and health (Graham, 2007, p.100).

Cutler et al (2011) defined four socioeconomic factors related to health, which are education, financial resources, rank and ethnicity. They affect health in different ways. Education is positively correlated with health. People who are better educated know better about how to keep healthy and live healthily, for instance by consuming less alcohol and cigarette, and being not overweight. They are also easier informed, and can better process new health technology (Cutler, Lleras-Muney & Vogl, 2011, p.140-141). According to Lundborg (2008), higher education also leads to higher self-reported health and less chronic conditions.

The factor of financial resources, which is usually known as income and business cycles, has a bidirectional effect to health. More income leads to more access to healthy food and products, while being healthy makes it easier to stay in occupation and earn wages. However, the effect of financial resources is still far from clear, as it varies by circumstances such as countries, ages, and etc. (Cutler, Lleras-Muney & Vogl, 2011, p.142-144). Studies on business cycles have shown that health becomes worse in good economic times, because of more consumption of alcohol and tobacco, and more psychological stresses (Ruhm, 2000 & Ruhm & Gerdtham, 2006). However, the results of the Swedish case study are opposite for men, whose health become better in economic rises; and no effect of business cycles for women (Gerdtham & Johansson, 2005).

Rank refers to a person's position in a social hierarchy, which rather than the individual's effort, determines his/her wealth and health status. For humans, 'the bulk of the research on the link between social hierarchies and health has concentrated on occupational measures of rank' (Cutler, Lleras-Muney & Vogl, 2011, p.145-146). The effect of rank is not clear and has

not met a unified conclusion, since to rank a society is hard and different from nation to nation. When we consider occupational measure of rank in China, something comes to mind such as staff from private firms or state owned firms, enterprise employees or civil servants, etc. Sometimes, different jobs are ranked and labeled by ‘noble’ or ‘menial’ in people’s heart. As a consequence, their earnings as well as health differ between each other to a large extent. However, this is not to be focused in this thesis.

Ethnic differences in health are common in many parts of the world. For instance, studies on the US show that black adults are more likely to die from varieties of causes than white adults. The explanations of the connection between health and ethnicity vary. Many people appeal to racial bias, difficulties in communication, residential segregation and the legacy of history as the main causes (Cutler, Lleras-Muney & Vogl, 2011, p.149). In China, ethnicity is more likely to be considered only by two divisions – the majority, which refers to the *Han*, and the minority, which consists of all other racial groups. Previous study shows that the effect was reversed in income in China – being minority was correlated with more income than being majority (Chen, 2012). Hereby, we may be interested to look at how ethnicity relates to health in this thesis.

2.4 Methods

2.4.1 Theoretical Approach

In general, the approach comprises two main theoretical aspects, the general health systems particularly of China, and the specific socioeconomic variables.

China belongs to the LMICs, thus the theory is in many aspects applicable, for instance, the larger proportion of out-of-pocket payments in health expenditures in LMICs, compared to high-income countries. The empirical overview of China’s health care system has explained the situation. Therefore, we can understand that medical expenses cannot reflect health, but rather people’s ability or willingness to pay, and the extent being covered by public insurances. Pooling, resource allocation and etc. may on the other side indicate the problems of the health system of China by showing the remaining large inequalities in health, therefore, help to draw discussion and conclusion on the topic of this study. Distinctive characteristics can explain the weak financial basis of LMICs, moreover, weak management and regulation that lead to misuse of resources and corruption. Both of them apply to China to a certain extent.

The theories of health and socioeconomic status goes into details of the determinants to health

by elaborating how health is different due to the economic, demographic and social differences in income, education, gender, age, employment status, and etc. The theory helps to understand more precisely what the inequalities in health are, and how they work. Keeping the previous studies and the theories in mind, the discussion on the results will be placed after the data and model analyses. It is therefore to evaluate the correlation between health and socioeconomic status in the perspective of urban China.

2.4.2 Research Design

The research is based on micro-data analyses by the cross-sectional design. Micro-data is the information collected at the level of individual respondents. The information may contain, for instance, home address, age, gender, income, educational level, employment status, and of course self-reported health, etc. (Bryman, 2008, p.48). A cross-sectional research design ‘entails the collection of data on more than one case and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association’ (Bryman, 2008, p.44). The data used in this thesis consist of the surveys in the Chinese Household Income Project, 2002. The variables comprise the key elements, such as income, educational level, gender, age, employment status, and etc. Dependent variable is the self-reported health which will be studied in connection with the independent variables. Since the self-reported health has the latent ordered values, it refers to the ordered logistic model. We introduce it further in the later chapter.

Since the results of the survey were self-reported, so to speak, the study is based on interpretivism as the epistemology of social science. Interpretivism, as a term opposed to positivism, refers to ‘the view that the subject matter of the social sciences – people and their institutions – is fundamentally different from that of the natural sciences...therefore requires the social scientist to grasp the subjective meaning of social action’ (Bryman, 2008, p.16; Olsen & Pedersen, 2008). That is to say, the thesis studies health by looking at the values reported subjectively by the respondents, rather than the more objective indicators such as mortality rate or life expectancy. This might be a problem, to be kept in mind, since the results reported subjectively may be not as accurate as the truth.

2.4.3 Limitation

The study is defined as the analysis on micro-data, rather than on groups or on the health system in a state level. Though the health system as a whole is discussed both empirically and

theoretically, it rather serves as the background that helps to raise the problems and to analyze the data. The thesis is therefore an in-country study on China, rather than a cross- region or country study. The values of the variables are consequently also in individual perspective, but not overall index such as Gini index, etc. The thesis has a limited scope to look at the system as a whole, that is to say, I am not to focus on political economy of health care, such as government involvement and institutional reform.

The object of study is further narrowed down to the in-work and retired adults. Young kids and full-time students are not included, as their health is rather influenced by their family and parents. Income and employment etc. are still not applicable to them, and educations are normally unfinished yet. The retired individuals are involved, as they receive income with the form of pensions. Individuals with congenital diseases such as the psychopathic or the retarded are not included either, as their health is not determined by the later socioeconomic factors.

The study also faces limitation on data available and time frame. Since I'm not able to collect primary data, nor have access to the recent dataset on China, the dataset I use is based on the survey conducted in the year 2002. So the time frame is limited in 2002, as a cross-sectional analysis.

Again due to the limitation on data and reality, only urban individuals can be studied. Regarding the three groups of population according to their job functions, the dataset consists of people from the Group A and B, but seldom C. Agricultural production in China proceeds under the household responsibility system (Lin, 1988; Naughton, 2007, p.231-269), and income was collected by the unit of household, not individual. However, the urban dataset still consist of rural residents (with rural-hukou) who work in urban area, though not many.

In addition, variables such as the types of work unit, employment, business sector and etc. are also relevant, as their differences may impact health of the work group. However, as the status of employed or unemployed is the focus, the employed-related variables are therefore not taken into account.

3. Data

The dataset is from the Inter-university Consortium for Political and Social Research (ICPSR), and conducted by Li Shi in the year 2002. ICPSR is a unit within the Institute for Social

Research at the University of Michigan. It is an international consortium of more than 700 academic institutions and research organizations. It maintains a data archive of more than 500,000 files of research in the fields of social sciences, and hosts 16 specialized collections of data in education, aging, criminal justice, substance abuse, terrorism, and other fields (ICPSR: About ICPSR).

The dataset used in the thesis is the ‘Urban Individual Income, Consumption, and Employment Data’ – a section of the ‘Chinese Household Income Project, 2002’ which consists of in total ten separate datasets. Data were collected through a series of questionnaire-based interviews, and it contains a wide range of economic and demographic variables. The urban individual data comprises 20632 observations, and 151 variables including economic variables such as income, employment status, and demographic variables such as gender, age, marital status, health, etc. (Shi, 2002).

The data collection was based on face-to-face interviews. ‘Individuals were not all interviewed directly; household members were allowed to answer questions on behalf of other members’ (ICPSR 21741). This may lead to the risk of deviation to the results collected. We should also be aware of that the face-to-face interview may not get the accurate data, since the answers are quite subjective. In certain sense of culture or habit, people may tend to give fake answers. One should also consider the time scope of the collection which is in 2002, therefore, be careful to simply refer to the results to explain any cases in the country today. The data collection also ignored the impact of capital mobility, for instance, how rural migrant workers dealt with the money they earned. If in case they spent a little and sent the big part back home, how should we locate the income, as it of course did not make any contribution to the workers’ living standard. Despite the limitations of the dataset, we can still expect it to reflect certain correlation between health of the population and the diverse demographic and economic characteristics. As the sample size is large enough, the impact of particularities can be dodged.

3.1 Data Cleanup

We first look at the questions on whether the respondent suffered from psychopathic or retarded, and drop the cases if the answer was yes, for they could not evaluate their own health nor answer the other questions subjectively. The *self-reported health* has five levels, 1 to 5 ranged from ‘very good’ to ‘very bad’. The cases with missing value are eliminated from the dataset. After considering the relevance, following variables are firstly picked out and discussed.

Gender is simply divided by two options – male or female. Missing values are dropped.

Income is the aggregation of personal yearly income, subsidy for minimum living standard, living hardship subsidies from work unit, second job and sideline income and monetary value of income in kind in the year 2002, in order to make sure that all kinds of income are involved.

The current *status* of members is categorized into three groups – employed, unemployed and retired. The employed occupies around half of the observations. The unemployed also consists of unable to work, laid-off (Xiagang)², left post (Ligang)³, the youth waiting for job assignment and full-time homemaker. The retired also includes officially off-duty (Lixiu)⁴, early retirement⁵ and internal retirement⁶. Students, other status and missing values are dropped.

Hukou status refers to the place of registration. Here it is categorized only by urban or rural, no matter it is of the resident city or other city.

Nation, as well, is divided into two categories – the *Han* as the majority, and all the other nations as the minority.

Marital status is categorized into three groups – unmarried (referring to those who never get married), married, and others (including divorced, widow or widower, and other).

To estimate the *insurance* coverage, the variable is considered through three types – the public insurance for medical and health services provided by the state or the work unit, the partly insured which consists of compulsory insurance for serious diseases and medical insurance purchased by self, and no insurance which refers to all services purchased by self.

With regard to the limitation on *age*, those below 18 years old are dropped from the dataset. Besides, the retired who are below 45 years old are also dropped, as it is obviously incredible regarding both early and internal retirement.

² Similar as unemployment, but personal records and registration were still at the last work unit.

³ No salary, but still registered at the last work unit; allowed to return at a certain time.

⁴ The retired cadre who entered work unit before liberation (normally 1949); their pension and insurance are much better than the normal retirement.

⁵ It applies to the special type of work such as pilot, aquanaut, etc.

⁶ It refers to the retirement before retiring age. Income is paid by the work unit, however is less than the pension after formal retirement.

Education is measured by three levels – ‘primary’ refers to the levels equal and below junior middle school; ‘secondary’ refers to senior high school and technical secondary school; and ‘tertiary’ includes junior college and the above.

Besides, *province* is also included as control variable. Though not the main focus of the thesis, it is still important, as environment, opportunities, policies, etc. differ considerably between regions which may play a big role in people’s health status. According to the dataset, not all but twelve provinces are comprised.

3.2 Summary of Variables

After data cleanup, 6650 observations have been dropped and 13982 remain in the dataset. By the end of the year 2002, China had about 353 million urban populations (Sina Finance, 2003). Therefore, the sample size was about 0.004% of the total urban population. Summary of the variables are as follow.

Table 3.1 Summary of self-reported health

Variable	Obs.	Percent	Mean	Std. Dev.	Min	Max
Self-reported health	13982		2.24	0.87	1	5
1 - Very good	2977	21.29				
2 - Good	5662	40.49				
3 - So-so	4466	31.94				
4 - bad	791	5.66				
5 - very bad	86	0.62				

The table shows that most people evaluated their health equal or above so-so. More than 40% considered their health to be good, and over 60% if including the evaluation of very good. The mean value 2.24 again indicates that the average self-evaluated health is very close to the level of good. However, the sample size of the bad and the very bad health is too small, which may lead to defect on the accuracy of the test results. One should be careful when choosing the confidence interval in order not to eliminate the effect of useful samples indeliberately.

Table 3.2 Summary of the continuous independent variables – income and age

Variable	Obs.	Mean	Std. Dev.	Min	Max
Income	13982	11167.98	8766.54	0	160000
<i>ln_income</i>	13819	9.08	0.78	2.71	11.98
Age	13982	45.25	12.43	18	93
<i>ln_age</i>	13982	3.77	0.29	2.89	4.53

We see, according to the Table 3.2, that the urban average income per month was only about 1000 *yuan* (125 USD⁷) in 2002. The mean age of the samples is 45, and its distribution was rather convergent, given the standard deviation of 12.43. I also create the logged forms for income and age, for they are continuous variables which might be a problem in the model estimation. It creates 163 missing values and reduces the total sample size to 13819 when logging income, as there are values of 0.

Table 3.3 Summary of the dummy independent variables (13982 Obs.)

Variable	Obs.	Percent
Gender		
Male	7153	51.16
Female	6829	48.84
Education		
Primary	5002	35.77
Secondary	5301	37.91
Tertiary	3679	26.31
Status		
Employed	9806	70.13
Unemployed	895	6.40
Retired	3281	23.47
Hukou		
Urban	13812	98.78
Rural	170	1.22
Nation		
<i>Han</i> (majority)	13418	95.97
Minority	564	4.03
Marriage		
Married	12401	88.69
Unmarried	1076	7.70
Others	505	3.61
Insurance		
Public insurance	3868	27.66
Part insurance	5427	38.81
No insurance	4687	33.52
Province		
Beijing	1095	7.83
Shanxi	1114	7.97
Liaoning	1580	11.30
Jiangsu	1346	9.63
Anhui	1023	7.32
Henan	1378	9.86

⁷ Roughly 1 USD = 8 *yuan*, in 2002

Hubei	1421	10.16
Guangdong	1205	8.62
Chongqing	603	4.31
Sichuan	1197	8.56
Yunnan	1225	8.76
Gansu	795	5.69

Gender and education are relatively equally distributed. Male and female are almost half and half in the dataset. It is the same with insurance and province that values are also distributed equally. Others appear to be imbalanced among values to a certain degree. It is unexpected to see the number of the retired is much more than the unemployed in the samples. The lack of the unemployed samples might be a problem in the estimation. Marital status, and even seriously, nation and *hukou* have shown to be more imbalanced. However, it is understandable anyway, since in reality much less percent of rural-hukou residents and minorities live in the urban areas in China. The places of residence appear to be rather equally distributed among the chosen administrative units. We should notice that these are not all the provinces / municipalities of China, but a number of them. So to speak, some of the provinces / municipalities were not included in the dataset. However, the ones included were located among different geographical regions of China, from the East to the West.

One should distinguish *hukou* with the actual place of residence. *Hukou* is the registered location, but we are looking at the urban individuals which also include rural migrant workers who lived in the urban areas, though the amount was quite few. Therefore, the proportions of the rural- and urban-hukou in the dataset cannot represent the proportions of the total rural and urban populations of China, but the proportions of the rural migrant workers and the urban residence that both lived in the urban areas. According to the Ministry of Agriculture and the Statistical Yearbook 2002, the total number of rural migrant workers in 2002 was about 94 million, and the total urban population was about 502 million, more than 5 times of the rural migrant workers. However, in our dataset, the cases of the rural-hukou residents were too few to represent the group. More than that, we cannot tell if they were all working or just lived in the urban areas without being involved in the labor market.

Nation, as well, shows to be quite imbalanced between the majority and the minority. By the year 2002, the total number of the majority *Han* was about 1.14 billion, while that of all the minorities was about 105 million, slightly less than 1/10 of the majority (China Statistical Yearbook, 2002). The sample size of the variable shows to be quite unequal again, for the number of minority is too few.

4. Analyses

4.1 Bivariate Analyses

Given all the variables, I hereby present the bivariate analyses between the tabulation of the dummy independent variables summed by dependent variables. The numbers presented in the following tables are the mean values, with the corresponding standard deviations in the parentheses. By doing so, we can easily compare the respondents between the categories of each variable and analyze how relevant the variable is to the self-reported health.

Table 4.1 Summary of health by *gender*

Gender	Self-reported health
Male	2.19 (0.86)
Female	2.28 (0.88)

Regarding health, different genders have showed to be rather equalized according to the Table 4.1. The gap of the self-reported health is not so big, with female being slightly worse than male. The standard errors are also quite equalized, and smaller than the mean values. Therefore, it is to a big extent possible to compare the mean values as the reference to the self-reported health between genders. We look at it further in the model.

Table 4.2 Summary of health by *education*

Education	Self-reported health
Primary	2.38 (0.91)
Secondary	2.22 (0.86)
Tertiary	2.08 (0.81)

Given that Cutlter et al described education as a socioeconomic factor to health – more education leads to better health. Statistics on self-reported health has verified the theory. Though the effect is not big, as we see that higher education only raised self-reported health slightly, the standard errors were likewise smaller. It shows that higher educated people were more intended to consider themselves to be healthier. The results are in a limited degree consistent with Lundborg's study on the US that completing high school improves health while additional education does not. However, we need to check it further, especially the levels of significance for each category in the regression model.

Table 4.3 Summary of health by *status*, and associated with *genders*

Status	Self-reported health
--------	----------------------

Employed	2.11 (0.82)
Unemployed	2.30 (0.94)
Retired	2.60 (0.89)
Male-employed	2.08 (0.81)
Male-unemployed	2.34 (0.96)
Female-employed	2.15 (0.83)
Female-unemployed	2.27 (0.93)

Health differed by status are rather rational in China's situation. People with jobs seemed to live happier. The retired, resulted by the factor of age, had worse health than the average level of the workforce. Health difference by the status-gender association is consistent with Gerdtham & Johannesson's findings on Sweden, though the effect is not big. Self-reported health indicates that female was less influenced by status than male. However, those with jobs still felt a little bit healthier than those without jobs.

Table 4.4 Summary of health by *Hukou*

<i>Hukou</i>	Self-reported health
Urban	2.24 (0.87)
Rural	2.13 (0.89)

Little surprised, rural-hukou residents in cities had more optimistic self-evaluation on health. It goes against the normal rationality that residents with rural-hukou normally had very limited or no insurance which led to worse health. Explanation is not clear yet; however, it may be that residents with rural-hukou were easier to be satisfied with their lives. It can also be explained by the problem of the dataset. As already mentioned, the cases of rural-hukou were too few, so the result could simply be understood as a case of particularity. Further research is still required; however, due to the large gap of the sample sizes and the unexpected results of the bivariate analysis, hukou status can be considered as less relevant to health, and hence not to be involved in the model test.

Table 4.5 Summary of health by *nation*

Nation	Self-reported health
<i>Han</i> (majority)	2.24 (0.87)
Minority	2.21 (0.88)

Nation difference has shown to be less relevant to health. It is not consistent with Culter et al's study on lifestyle and ethnicity status in the US where people of different ethnicities showed to be quite different. According to the Table 4.5, both the self-reported health and the corresponding standard errors are almost the same between the two groups in China. However,

as being discussed that the sample size of the minority was too few, the results may not properly reflect the true level of the self-reported health. Hence, nation is not involved as a variable in the model test.

Table 4.6 Summary of health by *marital status*

Marital status	Self-reported health
Married	2.26 (0.86)
Unmarried	1.82 (0.75)
Others	2.60 (0.98)

The unmarried refers to those who never got married, and they seemed to be the healthiest. However, it could be caused by age, more than marital status. To consider whether being married improved health significantly, we compare the married with the others. The others refer to those who were once married but had been single again, such as the divorced, widow and widower. Results have shown considerable gap in health between the others and the unmarried or the married. As Bolin et al (2002) stipulated that cohabiting improves health, our results of China have supported the viewpoint if comparing the married and the others. However, the group of single consists of both the unmarried and the others, and the unmarried were very much related to ages. More than that, the data does not tell if any people who lived together without getting married, or who got married without living together. We therefore do not keep marital status in the model test.

Table 4.7 Summary of health by *type of insurance*

insurance	Self-reported health
Public	2.28 (0.86)
Partly	2.24 (0.86)
No	2.20 (0.89)

Little surprisingly, people with less or no insurance had almost the same, even slightly better self-estimated health. The standard deviations were very much the same among the three categories. Given the results that distance between the three mean values are quite small, the type of insurance as well shows to be less relevant to health. We could not explain it, but it is an interesting result which requires further investigation.

4.2 Model

Hereby, the independent variables – age, income, gender, education, status, and province are kept in the model. Self-reported health as the outcome is to the question that has a natural ordering. Hereby, it refers to the Ordered Logit Model.

An ordered probit / logit model has an observed ordinal variable, y , as the outcome variable. In turn, y is a function of another variable, y^* which is an unmeasured, continuous latent variable, whose values determine what the observed ordered variable y equals. The latent index, y^* , has various threshold points. For instance in the self-reported health, once y^* crosses a certain value / threshold one reports very bad, then bad, then so-so, then good, then very good. The interval decision rule is like:

- $y_i=1$ (very good), if $y_i^* > k_4$
- $y_i=2$ (good), if $k_3 < y_i^* \leq k_4$
- $y_i=3$ (so-so), if $k_2 < y_i^* \leq k_3$
- $y_i=4$ (bad), if $k_1 < y_i^* \leq k_2$
- $y_i=5$ (very bad), if $y_i^* \leq k_1$

y_i^* is assumed to be the function of the independent variables as

$$y_i^* = \alpha_i + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_n x_{ni} + \varepsilon_i$$

, where y^* is the latent index of the outcome variable, y ; β s are the coefficients of the independent variables; α is the constant value, and ε stands for any other factors that may cause errors to the results (Ordered Logit Models – Overview).

4.3 Results and Discussions

Before presenting the results, we should be careful about any interaction within the variables. The retired status was related to age, since it was not possible for the too young to be retired. We should also notice that income and age are continuous variables which may cause problems. I hereby compare the models between the one using income and age as they are, and the one using their logged forms. Results show that the model with income and age logged does not significantly improve the levels of significance, nor improves the pseudo r-squared. Moreover, using the logged income and age makes it hard to interpret and understand the results. Therefore, we keep using the two continuous variables as they are, in the model. (see Appendix 1 for the model with income and age logged)

Table 4.8 Results of the prediction on self-reported health

	self-reported health		
	β (in log-odds)	$[\exp(\beta)-1]*100$ (%)	odds ratio
Age	.038*** (0.002)	3.90	1.039*** (.002)
Income (in 10000 yuan)	-.046** (.021)	-4.49	1.000** (.021)
Gender (female)	.210*** (.033)	23.31	1.233*** (.041)
Education (secondary)	-.026 (.039)	-2.56	.974 (.038)

	(tertiary)	-.169*** (.045)	-15.57	.844*** (.038)
Status	(unemployed)	.261*** (.069)	29.80	1.298*** (.089)
	(retired)	.283*** (.053)	32.66	1.327*** (.071)
Province	(shanxi)	-.726*** (.082)	-51.61	.484*** (.039)
	(liaoning)	-.759*** (.075)	-53.20	.468*** (.035)
	(jiangsu)	-.620*** (.076)	-46.22	.538*** (.041)
	(anhui)	-.541*** (.082)	-41.78	.582*** (.048)
	(henan)	-.859*** (.078)	-57.65	.423*** (.033)
	(hubei)	-.166** (.076)	-15.30	.847** (.064)
	(guangdong)	.077 (.077)	8.06	1.081 (.083)
	(chongqing)	-.203** (.094)	-18.38	.816** (.077)
	(sichuan)	-.118 (.079)	-11.13	.889 (.070)
	(yunnan)	-.045 (.078)	-4.39	.956 (.075)
	(gansu)	-.964*** (.089)	-61.87	.381*** (.034)
<i>Observations</i>		13982		
<i>Pseudo R-squared</i>		0.050		

Notes: standard errors in parentheses; *** indicates 1% significance, ** 5% significance, * 10% significance.

Before interpreting the results, the Brant Test should be mentioned. The ordered logit model provides ‘only one set of coefficients for each independent variable. Therefore, there is an assumption of parallel regression. That is, the coefficients for the variables in the equations would not vary significantly if they were estimated separately. The intercepts would be different, but the slopes would be essentially the same’ (Snedker, et al, 2002). However, the test cannot be done in the model with dummy independent variable. We therefore run the model assuming all variables to be continuous in order to get the results of the brant test. It has shown that the coefficients across the equations vary a lot. For income and gender, the slope even changes directions. Therefore the test has provided evidence that the parallel regression assumption has been violated. (see Appendix 2 for the completed results of the brant test). Besides, the pseudo r-squared is 0.050, indicating that 5% of the variation in self-reported health is accounted for by the independent variables.

We should also explain the indicators again. The self-reported health is the outcome variable which has five ordered and latent values, 1 indicates a very good health, 2 for good, 3 for so-so, 4 for bad, and 5 for very bad. Therefore, a variable is inversely proportional to the self-reported health, if the coefficient is negative. It indicates that an increase in that variable leads to a better degree of self-reported health, holding other variables in the model constant; and vice versus.

Since it is a logistic regression, the coefficients indicate the log-odds. For instance, if age increase by 1 unit, i.e., going from 30 to 31, the ordered log-odds of being in a worse health

category would increase by 0.038, given that other variables are held constant. To better understand it, we can transfer the log-odds to percentage by the formula $[\exp(\beta)-1]*100$, that is, one unit increase in age leads to 3.90% increase in the possibility of being in a worse health category.

The odds ratio provides the view of comparison in a cumulative sense. It is to compare the people in group(s) greater than k versus those in the group(s) equal to or less than k , where k is the level of the response variable. Thus, for one unit increase in age, the odds of the combined bad and very bad health versus the combined so-so and the upper levels of health are about 1.04 times greater, holding other variables in the model constant. Likewise, the odds of the combined very bad, bad and so-so health versus the good and very good health are also around 1.04 times greater, when age increases by one unit, given the other variables are held constant in the model. Similarly, being female rather than male, the odds of the combined so-so and lower levels of health versus the combined good and very good health are about 1.23 times greater, holding other variables in the model constant.⁸

Age, given the other variables involved, appears to be still significant to health, as concerning 10-year increase in age will lead to 39% possibility of shifting health to a worse level. People considered themselves to be unhealthier while aging. Though age is not our main focus and without theory on it in the thesis, its impact on health cannot be ignored, anyway.

Income, in the analysis of China, appears to be somehow not so important to health. Given the income is in per annual, we estimate it by the unit of ten thousand. Even each 10000 *yuan* (approximately 1250 US dollar in the year 2002) increase in income was accompanied by the log-odds of -0.046 – merely 4.49% increase in the possibility of shifting health to a better reported category, holding other variables in the model constant. This effect is obviously not strong, since the standard deviation is only a little more than 8000. Given the absolute income hypothesis defined by Karlsson et al is the most relevant method on studying income difference on health of China, individual health is positively and strongly correlated with individual income, argued by Li & Zhu (2006). The previous research was theoretically supported by, as Graham and Cutler et al defined, the socioeconomic status with health, and the income inequalities as a feature of the economic structure of the LMICs, argued by Mills. Nevertheless, our test results are against these previous studies and theories, but pro Wagstaff who stipulated the irrelevance between inequalities in income and inequalities in health for developing countries.

⁸ More information on the ordered logit model and the interpretation, please read the IDRE pages

There is a positive but quite weak correlation between income and health, with 5% significance. The odds ratio further indicates that the odds of any combined better levels of health versus the combined worse levels is nearly one time, which indicates no change, given the standard error is as small as 0.021. We may hereby come up with new assumption and study topic on the inequalities in health of China, both previously and contemporarily. At least other control variables seemed to be more relevant, while the significance of income is already robust after involving those variables without which income would be irrelevant to health at all (see Appendix 3). A simple conclusion is that more wealth did not lead to much better health, and vice versus. To put it in another way, wealth contributed slightly regarding whether people considered themselves to be healthy or unhealthy.

Gender difference is found to be significantly correlated with health. The possibility for females being in a poorer self-reported health category is 23.31% higher than males, given the other variables are held constant. Education as well indicates that the completed tertiary level leads to significant health improvement, 15.57% of the possibility for shifting self-reported health from a lower category to a higher one. These can be explained by Graham's theory on socioeconomic status that differences in age, gender, education and etc. can influence health by leading to different social positions, occupations and hierarchies. This may apply to China – being females or having lower education lead to worse self-reported health. However, the results are partly consistent with Lundborg's argument that higher education leads to better self-assessed health, but not consistent with the result on the US where completed high school degree improves health and additional education does not. In our analysis on China, only tertiary education significantly improved health. Secondary education made no contribution to health gain, compared to the primary education. This can still be explained by the theory of socioeconomic status – completed secondary education in China may not sufficiently support people to have better occupations, social positions or hierarchies, given the huge base of population and pressure of competition.

The employment status is critical when studying the health correlated with business cycles. Results in different countries turned to be different, as unemployment may lead to decreased work-related injuries and more leisure time, consequently better health; or it could also lead to psychosocial stress and lower consumption on healthy products, which consequently causes worse health (Ruhm, 2000). Back to our results, not surprisingly, employment was good for health rather than unemployment in China, which could be due to the limited compensation policy for unemployment. The unemployed being in a higher health category was 29.80% of possibility lower than the employed, holding other variables constant. The odds ratio indicates that, for being unemployed, the odds of the combined worse health categories versus the

relative combined better ones are 1.298 times higher than being employed, given other variables are held constant. The retired were even worse in the condition of health which however could rather be explained by age.

The effect of regions on the self-reported health, somehow, is the most significant in the model. The reference category, Beijing, had the worst self-reported health among the respondents. The regional difference on self-reported health is yet superficial and hard to tell. It could be related to many other inner differences on policies, life stress, economic development and etc. The interaction between the factors determines which one plays a more important role in the certain scope of time and space. For instance, people from Gansu Province had the best self-assessed health, which could possibly be understood by a released pace of life, or similarly. In general, more studies on this field are needed.

Also given the research from Gerdtham & Johannesson (2005), Swedish case study indicates the different results on health caused by genders during the period of economic recessions. We would like to look at it in China by creating categorized variable and using it in another regression.

Table 4.9 Self-reported health predicted by the categorized variable combined by gender and status

	self-reported health		
	β (in log-odds)	$[\exp(\beta)-1]*100$ (%)	odds ratio
Gender & Status			
(female_employed)	.218*** (.038)	24.40	1.244*** (.048)
(male_unemployed)	.388*** (.110)	47.35	1.474*** (.162)
(female_unemployed)	.405*** (.086)	49.89	1.499*** (.130)
(male_retired)	.271*** (.069)	31.07	1.311*** (.091)
(female_retired)	.504*** (.059)	65.59	1.656*** (.098)
Age, Income, Education, Province (see Appendix 4)			
<i>Observations</i>		13982	
<i>Pseudo R-squared</i>		0.050	

Notes: standard errors in parentheses; *** indicates 1% significance.

Given that the other coefficients are quite similar with those in the first regression, we hereby only look at the categorized variable of gender & status (For the completed table, please look at Appendix 4)

The in-work males had the best predicted self-reported health, while the retired females had

the worst. For the working age respondents, males' health was more sensitive to the employment status. The possibility for the unemployed males being in a worse health category is 47.35% more than the employed males when the other variables were held constant in the model. And for the unemployed males, the odds of, for instance, being in the combined category of bad and very bad health versus the combined category of so-so, good and very good health were 1.474 times more than the in-work males.

The health gap for females between the in-work and the not-in-work was much smaller – 25.49 (49.89-24.40) percentage more for the unemployed females being in a worse health category than the employed females, much smaller than that for males, 47.35%. The results have supported Gerdtham & Johannesson (2005) that the health of females is less sensitive to employment status than that of males.

Therefore, we can say that health of both male and female was sensitive to status, while male were even more sensitive. Inner gender comparison between the employed and the unemployed show that, when considering self-reported health, status difference played a more significant role than gender difference. It demonstrates that having a source of income was more important than gender and even age for people to make their lives, consequently to live better and to feel healthier. It is demonstrated by that even the retired males had better self-reported health than the younger that have no jobs.

5. Summary and Conclusion

My initial motivation was to obtain knowledge on causes of inequalities in health in the case of China. In order to so, I chose the scope to look at individual self-reported health as a consequence of individual socioeconomic characteristics such as income, age, gender, education, status and etc. While due to the limitation of data accessibility and accuracy, only urban individuals were studied since rural individuals were very much bundled in the unit of household based on which agricultural production was processed and income was calculated. Also, I was not able to study it in a broader sense, since statistics among provinces or sub-regions were very much incomplete or un-unified. The dataset was collected based on individual questionnaire, so the method of the study is the cross-sectional micro-data analysis. Since I am looking at individual health, the method of using micro-data is also more relevant than using macro-data.

Accordingly, I have initiated the key research question to investigate the economic and social

factors which could possibly influence individual health in urban China. I have found that not all initially assumed variables have a strong or significant correlation with the self-reported health, such as nation, marital status, secondary education and some of the provinces as opposed to Beijing.

Income remained to be significant, but less significant than the other variables in the model; more than that, it had a quite slight effect on self-reported health. It indicates that, holding other variables in the model constant, the poor and the wealthy had no large difference on how they assessed their own health. Explanations on this should be further looked at; however, one potential explanation could be life stress. Though the wealthy could afford medical services, they would still not consider themselves to be much healthier due to work and social pressure. Eventually, no sickness and no health expenses lead to the best health condition. However, being wealthier versus being worried about a basic life was still in a certain degree better for health. In one word, the results of the correlation between individual income and self-reported health in the urban China have shown to be somehow against the theories on socioeconomic status or financial resources and health, and the income inequalities as a feature of the economic structure of LMICs, as well as the previous studies on income differences and health drawn by Karlsson et al (2010) and Li & Zhu (2006), but in a certain degree is pro Wagstaff's finding that 'large inequalities in health are not apparently associated with large inequalities in income' (Wagstaff, 2002, p.3). Given that Wagstaff's paper was done in the year 2002 as well, my thesis gives supports to the findings for the same period of China.

The results supported the hypothesis that education has a positive effect on health, however showed to be a bit different from Lundborg's studies on the US that secondary school rather than the higher education improves health significantly. In China, only tertiary education was found to improve people's self-reported health considerably, while secondary education remained to be insignificant to health compared to the lower education. A potential explanation could be that secondary education in China was normally not able to support people to work in knowledge-intensive industries, nor it contributed that much for people to work in labor-intensive industries or similarly, compared to those who had only completed primary education but more work and social experiences. Education contributes health in different ways. An indirect one is that educational level relates to future career, income and social hierarchy which therefore have an effect on health. When people prefer senior high school rather than professional high school, it does not really contribute students' professional skills and future careers unless they are able to continue their education at a proper university or college. Therefore, it explains why only tertiary education led to better self-reported health.

However, other explanations are also possible. Further research on health and education is required.

When considering gender and employment status to health, females were unfortunately found to have worse self-reported health than males, holding other variables constant. While, the health of females was less sensitive to employment status, compared to males. In another word, males were much more sensitive than females, physically or psychologically, in case if they lost their jobs. In general, to have a source of income for an urban Chinese, regardless of the amount of it, was much more important to his/her self-reported health than gender, education, and even age, etc., given that even the retired males had better self-assessed health than the younger but the unemployed ones.

My own contribution to the study area is hereby firstly to raise the question of whether personal income was and is that important to personal health in China. Potential risks to the health behind income differences could be for instance high pressure of living and working, fast growing prices in a continuous period, and etc. The incompleteness of insurances could also be a relevant explanation, given the theories on the health systems in LMICs as well as China where out-of-pocket expenses hold a large proportion of total health expenses. The results can be put in the same level and be compared with that of the other developing and developed countries to see whether the case is just particular for China, or for certain kinds of developing countries, or else.

Secondly, the secondary education has been found to have weak or no contribution to health, which raises new issues in an interdisciplinary perspective. In the subject of Educational Science for instance, we may explore to what extent health education have been involved in the different levels of education in school; to put it in an indirect and long term perspective, how education especially professional education should be connected with future careers. It may also reflect the lack of protection on labor rights and interests, as well as big gaps in income and etc. between social hierarchies which ultimately lead to inequalities in health.

In addition to that, I also contribute the topic of business cycles and health by looking at employment status. My study shows that being employed improved health in the case of China. We do not know whether people spent their leisure time having fun, but obviously being unemployed led to much worse self-reported health. The gap was big, especially for males, probably demonstrating a large pressure on life, mentality and health if without a job.

To consider any further research, we may think about different angles within the study area

which are interesting to investigate further. Given the complexity of the theories and the previous studies on this study area, I have to say that there are still much more to do, if regardless of the limitations on time, data and etc. My study uses micro-data and studies individual health by the cross-sectional analyses. One perspective could be to look at the health care system as a whole, in order to do a study on the systematic and institutional reform. Another perspective is to deepen the analysis on some areas, for instance, health and income, or health and employment status, etc.

The poor relationship between income and health is the most important finding of the thesis. We can also explain it, as related to the health care system especially that of China. With regard to income and health, we should notice that there are something more than how much money one earns, such as insurances and other benefits. As we know that the populations are divided into three groups according to their job functions, those who work in governments or similar do not have to worry about expenses if getting ill. So behind income, there is a factor called job functions. Since individual out-of-pocket expenses in health have been playing a more significant role, such impact of job functions will turn to be even remarkable (Hougaard, Østerdal and Yu, 2008, p.2-6). More than that, the same income of two guys does not mean the same effort, the same time and the same pressure borne in their works. Therefore, one can explore more empirically and discuss on the problems and reforms in the future reform. To specify it in detail, one scope could be the structural analyses on, for instance, the health difference between rich and poor regions, job natures or functions, industries, and etc. Variables such as business activities and types of ownership of the work unit can be very important to health, when studying health among working populations.

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Appendix 1

Results of the prediction on self-reported health, with income and age logged

	self-reported health		
	β (in log-odds)	$[\exp(\beta)-1]*100$ (%)	odds ratio
In_age	1.588*** (.076)	-	4.896*** (.371)
In_Income	-.094*** (.026)	-	.911*** (.023)
Gender (female)	.179*** (.033)	19.55	1.195*** (.040)
Education (secondary)	-.003 (.039)	-.34	.997 (.039)
(tertiary)	-.129*** (.046)	-12.08	.879*** (.040)
Status (unemployed)	.204** (.080)	22.63	1.226** (.098)
(retired)	.392*** (.050)	47.97	1.480*** (.074)
Province (shanxi)	-.744*** (.082)	-52.50	.475*** (.039)
(liaoning)	-.773*** (.075)	-53.82	.462*** (.035)
(jiangsu)	-.625*** (.076)	-46.48	.535*** (.041)
(anhui)	-.569*** (.082)	-43.37	.566*** (.047)
(henan)	-.893*** (.078)	-59.05	.409*** (.032)
(hubei)	-.193** (.076)	-17.51	.825** (.063)
(guangdong)	.074 (.077)	7.72	1.077 (.083)
(chongqing)	-.217** (.094)	-19.49	.805** (.076)
(sichuan)	-.141* (.079)	-13.14	.869* (.069)
(yunnan)	-.062 (.078)	-5.99	.940 (.073)
(gansu)	-.970*** (.090)	-62.09	.379*** (.034)
<i>Observations</i>		13819	
<i>Pseudo R-squared</i>		0.050	

Notes: standard errors in parentheses; *** indicates 1% significance, ** 5% significance, * 10% significance.

Appendix 2

Results of the brant test for the Ordered Logit Regression

Estimated coefficients from j-1 binary regressions

	y>1	y>2	y>3	y>4
age	.03789423	.03422487	.04187349	.02868511
income	.0000163	7.978e-07	-.00002653	-.00001324
gender	.24834384	.24368638	.20360683	-.25334851
education	-.05820159	-.129983	-.1486231	-.5133437
status	.11056009	.12074281	.21796629	.61969977
province	.00561948	.00411372	.00239607	-.00389546
_constant	-1.1328991	-2.5186569	-5.0084136	-6.2662903

Brant Test of Parallel Regression Assumption

Variable	chi2	p>chi2	df
All	121.12	0.000	18
age	6.47	0.091	3
income	47.71	0.000	3
gender	4.63	0.201	3
education	9.76	0.021	3
status	9.39	0.025	3
province	2.44	0.486	3

A significant test statistic provides evidence that the parallel regression assumption has been violated.

Appendix 3

Self-reported health correlated with only income

self-reported health	Coef.	odds ratio	P> z
Income (in 10000 <i>yuan</i>)	-.013 (.017)	1.000 (.017)	0.447

Appendix 4

Self-reported health predicted by the categorized variable combined by gender and status

	self-reported health		
	β (in log-odds)	$[\exp(\beta)-1]*100$ (%)	odds ratio
Age	.038*** (.002)	3.91	1.039*** (.002)
Income (in 10000 <i>yuan</i>)	-.045** (.021)	-4.54	1.000** (.021)
Education (secondary)	-.026 (.039)	-2.57	.974 (.038)
(tertiary)	-.169*** (.045)	-15.55	.844*** (.038)
Gender & Status			
(female_employed)	.218*** (.038)	24.40	1.244*** (.048)
(male_unemployed)	.388*** (.110)	47.35	1.474*** (.162)
(female_unemployed)	.405*** (.086)	49.89	1.499*** (.130)
(male_retired)	.271*** (.069)	31.07	1.311*** (.091)
(female_retired)	.504*** (.059)	65.59	1.656*** (.098)
Province (shanxi)	-.722*** (.082)	-51.42	.486*** (.040)
(liaoning)	-.757*** (.075)	-53.07	.469*** (.035)
(jiangsu)	-.619*** (.076)	-46.16	.538*** (.041)
(anhui)	-.538*** (.082)	-41.60	.584*** (.048)
(henan)	-.857*** (.078)	-57.54	.425*** (.033)
(hubei)	-.164** (.076)	-15.14	.849** (.064)
(guangdong)	.077 (.077)	8.04	1.080 (.083)
(chongqing)	-.201** (.094)	-18.20	.818** (.077)
(sichuan)	-.116 (.079)	-10.96	.890 (.070)
(yunnan)	-.044 (.078)	-4.30	.957 (.075)
(gansu)	-.960*** (.089)	-61.71	.383*** (.034)
<i>Observations</i>		13982	
<i>Pseudo R-squared</i>		0.050	

Notes: standard errors in parentheses; *** indicates 1% significance, ** 5% significance, * 10% significance.