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A Review of Child Health Urban-rural Inequities in China from 1991to 2010

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Abstract

This thesis is the first systematic effort in Chinese scholarship in the social sciences to apply the concept, *benchmarks of fairness*, which was developed by Norman Daniels et al. (1996) as a tool for evaluating and discussing issues in health care equity and to identify factors that need improvement in order to improve the inequality in health care services between rural and urban communities.

Since the economic reform started in 1978, China has experienced continuous economic development, which has contributed to the improved health status of the whole population. However, the benefits of this improvement have not been distributed equally, as the data on the infant mortality rate (IMR) indicate. Hence, the key questions in this thesis include the following: 1) How is the IMR distributed between urban and rural communities in China today compared with two decades ago? 2) How can this disparity be explained? 3) Does the health care system reinforce, reduce, or maintain these disparities? 4) Is the inequality between rural and urban communities justifiable? If not, why does it exist? The main methods employed are a literature review and secondary data analysis. Based on the analysis of the IMR data from 1991 to 2010, three objectives are realized by the thesis: 1) Describe the current distribution of child health in China as measured by IMR; 2) Analyze the main health determinants that affect the distribution; 3) Discuss the equity of child health distribution according to the benchmarks of fairness.

Measured by the IMR, the results of the data analysis suggest that although the status of child health has improved tremendously in the last two decades, inequality between urban and rural areas remains a main challenge despite the fact that the decrease in IMR reduction in rural areas has been faster than that in urban areas. Over the last 20 years, the IMR has decreased by 73.9%, from 50.2 per 1000 live births in 1991 to 13.1 per 1000 live births in 2010. In 1991, in rural areas, the IMR was 3.35 times higher than in urban areas. In 2010, the IMR in rural areas was still 2.78 times higher than in urban areas. However, some health determinants, such as income disparity and unequal distribution of public facilities, can be used to explain the inequality.

Nevertheless, as evaluated by the benchmarks of fairness, the unequally distributed IMR in China between 1991 and 2010 does not show a positive result. From a total of nine benchmarks, five were adopted: inter-sectoral public health, financial barriers to equitable access, nonfinancial barriers to access, comprehensiveness of benefits and tiering, equitable financing, which is related to equity of health. The score was 2.0 of 5.0, which indicates that more effort is needed to reduce social discrimination in health care, improve the distribution of equitable finance between urban and rural areas, and improve the involvement of both urban and rural communities in the design of the health system.

Keywords: Child Health, rural-urban inequity, health inequality, distributive justice, infant mortality, benchmarks of fairness

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1. Introduction

1.1 Setting the scene

Since 1978, China's economic reform has not only brought dramatic economic development but also has contributed to the improvement of the health status of the whole population. Health status is measured by the two most frequently used health indicators of health status in developing countries: the infant mortality rate (IMR) and life expectancy at birth (Murray 1988). According to data from the Ministry of Health of China, the average life expectancy has increased from 67.9 years in the 1980s to 73 years in 2005. The IMR has decreased from 50.2 per 1000 live births in 1991 to 13.1 per 1000 live births in 2010 (Ministry of Health of China 2010a).

Although the improvement in health status is undeniable, the benefits have not been distributed equally, as the data on infant mortality shows. In 1991, the IMR was 17.3 per 1000 live births in the urban areas and 58 in the rural areas. In 2010, the IMR in the rural areas was 16.1 per l000 live births compared with only 5.8 in the urban areas in 2010 (Ministry of Health of China 2010b). In 2006, the IMR were nearly five times higher in the poorest rural counties than in the wealthiest counties (Tang et al. 2004).

Is this inequality equitable? Obviously, not all inequality can be regarded as inequity. Health inequity happens only when health inequality is avoidable, unnecessary, and unfair (Whitehead 1991; Braveman 1999; Norman Daniels et al. 2007, 72). Health equity can be justified by using different tools from different perspectives. One tool is the *benchmarks of fairness* developed by Norman Daniels and his colleagues in the 1990s. The main purpose of this paper is to review child health inequity in China by using the benchmarks of fairness. The IMR will be used as a proxy health indicator since it is not only a health indicator but also a general indicator of socio-economic development (Lindstrand 2007, 103). Research on health inequity in China is not new. However, a majority of the previous researches are empirically descriptive and do not provide a critical review from the perspective of social justice. By using the benchmarks of fairness,

this paper is trying to profile a snapshot of child health inequity in China from the last two decades.

1.2 Research questions

The research will focus on the following questions:

1) Compared to two decades ago, what is the distribution of the infant mortality rate (IMR) in urban and rural China today?
2) What are explanations for disparities between urban and rural communities?
3) Does the health care system reinforce, reduce, or maintain these disparities?
4) Is the rural-urban inequality justifiable? If not, why it is not justifiable?

Regarding the comparative scope, the study has two focuses. One focus is on the last two decades, that is, from 1990 to 2010. Although economic reform was begun in 1978, most health reforms began only after 1990. These reforms included the marketization of the health service and the establishment of the health insurance system. Because the available data are limited, the second focus is on a comparison of rural and urban areas, not a comparison across provinces.

1.3 Definitions

The source of the following definitions is a report issued by the World Health Organization (WHO)'s Commission on Social Determinants of Health (SCDH) (2008), *Closing the gap in a generation: Health equity through action on the social determinants of health* (Marmot et al. 2008).

The first group of definitions is relevant to both health inequality and health equity. *Health disparity* is a particular type of health difference that is closely linked with social or economic disadvantage. *Health inequalities* can be defined as differences in health status or in the distribution of health determinants between different population groups. *Heath inequity* is a difference or disparity in health outcomes that is systematic and unfair, but it can be ameliorated. *Health equity* is the absence of systematic, unfair disparities in health (or determinants of health) among population groups in a social hierarchy or with different levels of social advantage or disadvantage (M. Marmot et al. 2008).

Social determinants of health (SDH) are complex, integrated, and overlapping social structures and economic systems, which include the social environment, physical environment, and health services. Structural and societal factors are responsible for most health inequities. SDH are shaped by the distribution of money, power, and resources at global, national, and local levels, which are themselves influenced by policy choices. Lindstrand (2007, 53) preferred to use health determinants to refer to a similar concept. He defined health determinants as a simplification of the complex web of factors that jointly determine the health status of human populations.

Infant mortality rate refers to "the annual number of children less than one year of age who die per 1000 live births" (Lindstrand 2007, 102). The rate can be divided into neonatal and post neonatal mortality. The neonatal period stretches from birth to the 28th day of life. Survival in this period is highly dependent on the care of the mother during pregnancy, delivery, and the postpartum period. After the 28th day, the main factors that determine survival are a safe environment, good feeding practices, and the quality of care (ibid).

The definitions of *rural population* and *urban population* in China are complex. According to the National Bureau of Statistics, a rural population refers to people who have a rural *Hukou*. A rural *Hukou* is an individual who is registered as owning land and having an agriculture-based livelihood. These people generally live in rural areas, which are formed by rural townships and villages. An urban person is registered as having a non-agriculture based livelihood and residing in an urban area. Urban areas in China include capital cities, municipal cities, county-level cities, and urban townships, which are formed by urban populations. According to the population census conducted in 2010, the proportions of urban and rural populations is 49.68% and 50.32%, respectively (National Bureau of Statistics of China 2011).

Another criterion is used in this research to distinguish recipients of health care in China's rural and urban populations—national health insurance. The urban population is covered by the Urban Residents Medical Insurance System (URMIS) and the rural population is covered by the New Rural Cooperative Medical Scheme (NRCMS). More information about the health insurance system will be introduced later in section 2.1.3.

Currently, many rural populations are migrating to urban areas. However, their identification remains as rural *Hukou*, so they are still covered by the NRCMS.

The remainder of the paper is structured as follows. In section 2, the context of the health system in China is briefly introduced, followed by a review of the existing literature that is relevant to the research theme on a number of topics, such as health determinants, health inequity and inequity, and the benchmarks of fairness. In section 3, the research method and data sources are presented. Section 4 presents the main findings of the data analysis, focusing on reduction tendency, rural-urban disparity, and causes of death. Section 5 provides a discussion based on the data analysis and attempts to answer questions concerning the unequal distribution of the IMR. This section also applies the benchmarks of fairness to assess this inequity. Section 6 concludes.

2. Context and Literature Review

2.1 Health System in China

2.1.1 Service delivery

Unlike most western countries, China's health system is not based on a general practitioner (GP) system that provides each citizen with GP to provide general health services. However, China has established a fairly comprehensive health-service system. Based on the dual structure of rural and urban areas, a three-tier medical and health service network has been established.

The rural three-tier system consists of hospitals at the levels of county, township, and village. The first level refers to the health center in each village. It is responsible for basic preventive work, health education, and the diagnosis and treatment of general diseases. The health center covers a limited population in the village or community. The second level comprises township hospitals. These institutions serve a wider population and provide better medical service. For instance, the village health center normally does not have trained midwives, whereas the township hospitals provide skilled delivery services. County hospitals are the third level in the three-tier system. These hospitals normally have more than 100 beds and are equipped with better facilities. They also provide

training to lower-level health organization. In practice, all three tiers of medical facilities provide preventive and curative services, but with different qualities and costs to the patients who need these services.

The urban three-tier system consists of community health centers, municipal level hospitals, and provincial level hospitals. The first tier is the community health center, which has less than 100 beds or only a community clinic. Its function is the same as the first-level medical facility in rural areas but the quality is better in terms of the facilities and staff quality. The second tier is the municipal medical hospital, which has 100 to 500 beds. Besides providing basic preventive and curative services, it also carries out research and training. The functions of third-tier medical facilities are comprehensive. They include preventive and curative treatment, rehabilitation, research, medical training, and education. These hospitals have more than 500 beds.

However, private hospitals are not formally included in this system. Although private hospitals do not receive subsidies from the government, they have to function as an approved medical facility. In 2010, among the 936,927 health facilities in China, there were 358,890 private health organizations. Among them were 5,052 private hospitals in big cities and 353,784 private hospitals and clinics serving communities, townships, and villages (Ministry of Health of China 2010b). This number indicates that most private hospitals provide lower-level services and are located mainly in communities, townships, and villages. Private facilities in the big cities specialize in areas of medical treatment, such as orthopedic hospitals or sanitariums. Private hospitals in big cities actually serve those who can afford their services—the rich rather than the poor. Generally, if a private hospital can provide high-quality service, it can attract more patients than the public hospitals can. However, limited by financial and human resources, private hospitals are less competitive because they generally lack better equipment and better-qualified staff.[1] However, even if a private hospital provides cost-effective services, if it is not included in the health insurance system (i.e., an assigned hospital) it has difficulty attracting patients

[1] In general, people go to a private hospital for the following reasons: 1) the hospital is close to the client's apartment; 2) the patient has to wait for a long time to get the same service from a public hospital.

who are covered by the health insurance system. Patients cannot enjoy the benefits of health insurance if they do not ask for the services of assigned hospitals.

Regarding child health care, in 2010 China had 3,495 health organizations working on health care, including 72 children's hospitals, 398 obstetrical and gynecological (maternal) hospitals, and 3025 maternal and child health (MCH) centers. Among them, were 14 private children's hospitals, 225 private maternity hospitals and one private MCH center (Ministry of Health of China 2010b).

In short, most first-tier medical organizations can provide only outpatient services. It is not necessary to make an appointment and all medical centers are available, including private hospitals and clinics. However, the national health insurance covers only assigned hospitals. A referral system is in place in case the assigned hospital does not have the ability to treat the patient.

2.1.2 Health financing

Health care is typically financed by a mixture of four sources—taxes, social insurance, private insurance, and out-of-pocket payments. However, China does not exactly fit this typology. In China, health care financing is generally divided into three parts: government expenditure, social expenditure, and out-of-pocket payments.

Tax revenues are expended in two areas. First, the central government covers expenditures on public health management, health administration management, family planning management, and part of health insurance subsidies. Local governments are responsible for local expenditures, such as health centers and hospitals. It covers government subsidies to the local public hospitals, subsidizes part of the health insurance, and so on. In the 1990s, the marketization of health care affected government expenditures on health in two ways: decentralization of financing and limited financial support. After decentralization, the amount of subsidy the local hospitals could obtain from the local government depended on local economic development. The better the economic development, the more money could be spent on health. For instance, Jiangsu province has strong economic development. Thus, the local government can provide more health insurance subsidies to vulnerable groups and build more and better health

centers in rural areas. The other effect was that after marketization, the local governments could provide only limited financial support. Hence, hospitals have had to obtain their own financing, which has driven up the cost of the health care. The lowest government expenditure occurred in 2000, at only 15.5% of the total national health expenditure. In 2010, the total health expenditure in China was 5.01% of the GDP, of which the government expenditure was 28.6% (Ministry of Health of China 2010b).

Social expenditure refers to public expenditure in the health sector. Financial contributions are made by organizations outside government departments, such as the proportion of health insurance paid by employers. It includes health insurance expenditure and various social donations to health sector. The social expenditure was comparatively high (47.4% in 1978) before the economic reform since state-owned enterprises have to pay health insurance. In 2010, the social expenditure was 35.9% (Ministry of Health of China 2010b).

Out-of-pocket payment refers to the health expenditure paid by the patient, which cannot be covered by any kind of subsidy or insurance. In 1981, it was 23.7% of the total medical expenditure, 37.5% in 1991, and 35.5% in 2010. It amounted to 60% of the total health expenditure in 2001(Ministry of Health of China 2010b).

2.1.3 Health insurance system

The health insurance system in China is complicated. It includes the Urban Labor Medical Insurance System (ULMIS) and Urban Residents Medical Insurance System (URMIS) for the urban population and the New Rural Cooperative Medical Scheme (NRCMS) for the rural population. Although the commercial insurance market has grown growing, it is not predominant. At present, there is no current data available for the number of people that buy commercial health insurance. However, according to Xu et al.'s (2007) research, in 2003 only 5.6% of the total urban population was covered by commercial insurance.

Initiated in 1998, the ULMIS was designed for formal contracted labor and government officials. The individual contribution of the ULMIS is 2% of the monthly salary, and the

employer pays 6% of the employee's monthly salary. All insurance payments (8%) are deposited as a foundation based on the individual's *Hukou* location. The local governments of an individual's *Hukou* location manage the insurance payment. It is compulsory for the employer to pay the health insurance of permanently contracted labor. Moreover, an employee could ask for compensation of 60% to 90% of hospitalization costs at any time as long as he or she is treated in an assigned hospital. The proportion of outpatient expenditure compensation varies from place to place (The State Council 2005). Informal sector workers are not covered.

The URMIS was piloted in 2007. It covers unemployed urban residents, including children under 18. It is a purely voluntary system. The total annual premium varies from province to province. The local government subsidizes at least renminbi (RMB) 40 Yuan per capital (around six USD), which is 30 Yuan higher than that in rural areas. Considering the relatively poor financial situation in the western part of China, the central government subsidizes 50% of the payment burden to the local government by transfer payments. Similar to the ULMIS, this system covers inpatient costs and is restricted to assigned hospitals (The State Council 2007).

The NRCMS was piloted in 2003. In 2011, it was extended to almost all rural areas in China. However, its benefit package changes yearly. For instance, at the very beginning, it covered only inpatient expenditures. Gradually, the benefit package has been extended to cover part of outpatient expenditures. However, this system covers only catastrophic ailments in the rural population. Both the local government and individual participants pay the insurance premiums. In 2003, the local government subsidized at least 10 Yuan (two and one half US dollars). In 2011, this amount was increased to 200 Yuan (30 USD). Local authorities decide individual contributions, which are at least 10 Yuan. However, the subsidy was increased from an average of 50 Yuan in 2004 to more than 150 Yuan in 2010 in some provinces (Ministry of Health of China 2011b, 71). Nevertheless, even this is voluntary participation; the local government requires villagers to participate since the coverage rate is an indicator used in the evaluation of work performance of the local government officials.

In summary, the financing model affects the equity of health in urban and rural areas in the following ways. First, government expenditures allocate more for the urban population than for the rural population. The local government subsidy usually prioritizes urban areas, which means that thus population urban areas has greater financial support, better facilities, and better qualified staff. Second, there are more social expenditures in urban areas than rural areas because the donation cost is lower in urban areas, such as transportation cost, monitoring cost, and so on. Finally, concerning the disparity in infant mortality, women in urban areas have more opportunities to have professional services during delivery.

2.2 Literature Review

With regard to the research questions, the literature review focuses on existing research in China as well as health determinants and justice in health care. In addition to Google Scholar, the main academic databases are ScienceDirect, EBSCOhost, and JSTOR. The Chinese academic database is CNKI. The following key terms or their combinations were used in the search: infant mortality, child mortality, health (child health care) inequality (disparity), health inequity, health (social) justice, China, benchmarks of fairness, and health determinants.

2.2.1 Existing research in China

The research on health inequality and inequity in China is not new; however, the relevant literature is not rich. This might be due partly to limited databases and partly to the limited development of knowledge in health equity research. As early as 1979, Lampton (1979) studied the root cause of interprovincial inequality in education and health services. He found that economic and ecological factors are highly relevant to education and health inequality (Lampton 1979). Domestic research on health equity started after 2000 when the WHO placed China in 188th place among 191 member states in a survey on health equality (World Health Organization 2000a, 191). Until now, the relevant research has focused on health inequality among different regions (Fang et al. 2010), ethnic groups (Ouyang and Pinstrup-Andersen 2012), and income groups (Li and Zhu 2006). A systematical review was made by Tang et al. (2004). They concluded that China's health-equity challenges are truly daunting because of a vicious cycle of three

synergistic factors: the social determinants of health have become more inequitable; imbalances in the roles of the market and government have developed; and concerns among the public have grown about fairness in health. Anand et al. (2008) investigated how human resources for health allocation affect health inequality.

Regarding infant mortality and child health care, many reports have pointed out recent health improvements in the health of children, but very few have emphasized the need to address the growing health inequality among children. Song et al. (2011) used the 2001 National Family Planning and Reproductive Health Survey data and multilevel, multi-process models to show that the mother's education level is related to disparities in infant mortality. Better-educated mothers are more likely to use medical care in pregnancy. Feng et al. (2011) conducted an evidence-based research on regional disparities in child mortality within China. Focusing on the morality rate of children under five years, the study analyzed data from the National Health Services Survey, National Nutrition and Health Survey, and National Immunization Survey from 1996 to 2004. Importantly, the authors divided rural China into four regions based on economic indicators, such as income. Type I was the strongest economic area and type IV was the weakest. They found that the risk of child mortality in rural areas II-IV was two- to six-times higher than in urban areas. Rural areas II-IV also accounted for approximately 80% of the mortality burden.

Additionally, many causes of child mortality can be prevented through the provision of basic health care. The leading factor contributing to child mortality in China is insufficient coverage and poor quality of maternal and child health care services. Based on a literature review, Chan et al. (2008) readdressed disparities in children's health in China. They examined child health in China after 2000 and recommended a new emphasis on child health systems that focus on affordability, availability, and appropriateness.

In summary, most existing researches in China have focused on fact and description. In studies that have analyzed inequalities with regard to equity, less attention has been given

to a combination of empirical evidence and theoretical discussion, especially a critical review from a normative ethical and moral perspective.

2.2.2 Health determinants

Health never exists in vacuum, and the same applies to children's health. Health inequality always derives from social factors, political factors, and environmental factors, which are health determinants. In 2008, the WHO Commission on Social Determinants of Health (SCDH) concluded that the social conditions in which people are born, live, and work are the most important determinants of individual health status (World Health Organization 2008).

Many studies in the literature discussed determinants of health, focusing on both empirical evidence and theoretical discussion. The twenty-five-year Whitehall study is a classical empirical study showing the relationship between social gradients and mortality(Marmot and Shipley 1996). Four of the theoretical discussions are highlighted here because of their comprehensiveness.

Bartley (2004) classified four social determinants of health: material, cultural-behavioral, psycho-social, and life course. However, he was quick to point out that these determinants do not have to be mutually exclusive. His analysis focused on the relationship between social inequality and health inequality and the measure of health inequality. However, he did not include health care services as a health determinant. The content is more relevant to the social determinants of health.

Tarlov (1999) summarized five categories of determinants of population health: biology and genetics (e.g., sex), individual behavior (e.g., alcohol and smoking), social environment (e.g., income and education level), physical environment (e.g., place of residence and transportation systems), and health services (e.g., access to and quality of care and insurance status). Unlike Bartley (2004), who analyzed how social inequality affects health inequality, Tarlov focused on an analysis of social structure. He placed health determinants into a policy framework analysis in order to construct comprehensive public policy strategies for improving population health within OECD nations. Health service was included as a health determinant; this classification was adopted by the US

Center for Disease Control and Prevention. The social determinants of health typically refer to the latter three categories (i.e., social environment, physical environment, and health services).

Lindstrand et al. (2007) classified the health determinants into seven categories: social-economic, food, water, sanitation, other environmental determinants (e.g., housing and climate), behavior, and health services. The authors emphasized the interaction of the health determinants. They analyzed the seven health determinants from a global perspective, that is, on a macro level instead of a micro level. Health services were also an important part of their discussion. They argued that public health officials should understand the role of each health determinant and know how to modify them to improve the health status of a population.

The WHO Commission on Social Determinants of Health developed the most complex health-determinant framework thus far. The framework has five levels of analysis: socioeconomic context and position, differential exposure, differential vulnerability, differential health outcomes, and differential consequences. The analysis establishes and documents the social determinants at play on each level with regard to their contributions to inequity (Blas and Sivasankara Kurup 2010). The findings were related to how specific public health programs have addressed issues related to the social determinants of health and equity. Unfortunately, there is no room to explore the framework here.

Nevertheless, considering the accessibility and applicability of the data, this study adopts Tarlov's framework to develop the following discussion. The WHO's framework is comprehensive, but it is too broad for this paper. Bartley's framework is not appropriate for the following discussion since it excluded health care services, which is the main subject of the thesis. However, some indicators in Lindstrand's framework are used as proximate indicators to develop the discussion.

Why should the health system be a health determinant? Does the health care system enhance, reduce, or maintain health differences? There are very few instances where it is possible to isolate the effects of health services from other health determinants. A classic

study of this issue was conducted by Thomas McKeown. He compared the decline in mortality from infectious diseases in Western Europe with the availability of antibiotics and anti-tuberculosis drugs. In a time series analysis, he argued that since much of the decline in mortality occurred before the introduction of these drugs, general social factors played a more important role than drugs did in the decline in mortality (McKeown 1976). Since then, many researchers have agreed with McKeown that socioeconomic development and improvements in the environment had a marked influence on mortality reduction in the 19th and early 20th centuries. However, many researchers have disagreed about the role of the health care system, arguing for its "sizeable" place in mortality reduction (Stirbu 2008). Mackenbach et al. attempted to quantify the contribution of health care to mortality reduction in the Netherlands between 1950 and 1954 and 1980 and 1984. They concluded that medical care contributed approximately three years to the increase in life expectancy among men and four years among women (Mackenbach et al. 1988). Data from the Netherlands also indicated that since 1970, an increase of 3.9 years in life expectancy (3.3 years among women and 4.1 years among men) and a gain of 5.2 years of healthy life can be attributed to medical advances alone (Hunink et al. 1997).

According to a report issued by the Commission on Social Determinants of Health, health systems are social determinants (Gilson and Network 2007). They argued that health systems promote health equity when their design and management specifically consider the circumstances and needs of socially disadvantaged and marginalized populations. In reality, health systems fail to realize this positive potential. This failure has been entrenched by macro-economic policies and neo-liberal health sector reforms that have dominated health system development over the last decades. For instance, commercialization and globalization have undermined the capacities of health systems in low- and middle-income countries to address health inequity. They further observed that

> Health systems, defined as "all the activities whose primary purpose is to promote, restore, or maintain health," can make a difference to health equity by: providing leadership for a social rights agenda; building inter-sectoral relationships to tackle other underlying social determinants of health and promote population health; enabling social action and engagement; and providing equitable access to decent, good quality care that is affordable even to those on the lowest incomes (Gilson and Network 2007, 1).

Concerning the infant mortality rate, does the health system matter to changes in urban-rural disparity? Demographic and socio-economic factors in infant mortality rates have received wide attention from researchers but only a few have studied the impact of medical services. Using empirical data from Bangladesh, Paul (1991) examined the relative importance of the availability of health care resources in infant mortality. He indicated that the availability of medical personnel and medical facilities directly affect child health. Wise and Pursley's (1992) study suggested that the interaction of social and technologic determinants has operated to decrease absolute infant mortality rates while simultaneously maintaining broad disparities in these rates.

In China, generally, hospitals in the urban areas have more resources, better facilities, and more qualified staff than those in rural areas do. Assuming that other factors (e.g., family income) are constant, it is reasonable to accept that children in urban areas enjoy better health care services than children in rural areas do. For instance, if a rural hospital fails to diagnose and treat early-stage pneumonia due to poorly educated doctors, more children might die from pneumonia in rural areas than in urban areas. Feng et al. (2011) showed that babies born in urban hospitals had a low rate of neonatal mortality (5.7 per 1000 live births); however, those born in hospitals in type IV rural counties were almost four times more likely to die than were children born in urban hospitals. Summarized by Fleming (2008), an analysis of the social determinants impacting children's health, and children's vulnerability to these determinants, best illustrates the relationship between the social determinants of health and social justice.

2.2.3 Just Health Equity

2.2.3.1 Health justice ideology

The literature on this issue is extensive. Three classical theories of distributive justice are used to discuss the distribution of health care: utilitarianism, egalitarianism, and maximum (Rawlsian).

Utilitarianism, which focuses on maximizing overall well-being in the case of population health, is a maximizing approach, which implies indifference in health benefits to both

the poor and the rich, as long as these benefits have the same impact on overall population health (Fabienne Peter 2004, 97). However, utilitarianism is often criticized for being blind to distributive considerations (Rawls 1971, 22–33). Whereas utilitarianism emphasizes the overall well-being of a society, egalitarianism justice requires that persons be given an opportunity to have equal health status as far as possible (Fabienne Peter 2004, 98). It emphasizes equal shares and regards that access to health care is every citizens' right. Nevertheless, strong egalitarianism might result in "leveling down". For instance, a situation in which two individuals are in an equally bad state of health is considered better than a situation in which only one is in that state and the other is fit and healthy. Rawlsian seeks to maximize the position of the least well off, but the premise is that every individual should have an equal right to basic liberty. His "difference principle" states that every arrangement is evaluated in terms of the interest of the least advantaged. Building on Rawls' theory of justice as fairness, it has been argued that social inequalities in health are unjust or inequitable if they result from an basically unjust social structure (Fabienne Peter 2004, 104). However, Rawls's theory of justice has been criticized for neglecting the distinction between situations in which individuals carry no responsibility and in situations where they do (Sudhir and Anand 2004, 6).

2.2.3.2 Benchmarks of fairness for health

What are the benchmarks? They are a tool comprised of scorable benchmarks used for assessing the multi-dimensions of the fairness of a health care system, especially regarding equity, efficiency, and accountability. The benchmarks of fairness for health care reform were developed by Daniels et al. (1996) as a tool for evaluating medical insurance reform proposals in the United States around the time of the presidential election in 1992 (Daniels, Light, and Caplan 1996). This was the first time that a concept in moral philosophy had been transposed into social practice (Light 2000b). It provided a framework to debate and to clarify the social values, such as fairness, that are at stake in the complex details of health policy.

According to Daniels et al. (2000), fairness is a many-sided concept, broader than the concept of equity. Fairness includes equity in health outcomes, access to all forms of care,

and financing. Fairness also includes efficiency in management and allocation because when resources are constrained, their inefficient use means that some needs will not be met that otherwise could have been met. For the public to influence health care, fairness must also include accountability. Finally, fairness also includes appropriate forms of patient and provider autonomy (Daniels and Bryant 2000). Based on this concept, Daniels et al. (1996) developed a tool for health policy analysis—the benchmarks of fairness, the ethical rationale of which appealed to a theory of justice and health care. In Daniels' view, the benchmarks translate central ideas about justice and health into an evidence-based approach to improving health policy. The central thought is that disease and disability reduce the opportunities open to individuals, and that the principle of equal opportunity provides a basis for regulating a health care system(Norman Daniels, Light, and Caplan 1996).

In Daniels' view (1996, 11), ideologically, "we expect people to pursue their interests". "We will remain a respect for basic liberties, due process and equality of opportunity". Fair equality of opportunity is one of the three principles of John Rawls's justice as fairness (Rawls 1973). Rawls evaluated opportunity in terms of the 'primary goods' that people held, such as wealth, income and so on. Norman Daniels (1985) extended the principle to deal with fair access to health care. In line with Rawls, fairness requires that we must make the social structure work in ways that are acceptable even from the perspective of those who are worse off (Daniels et al. 1996, 30). According to Rawls' "veil of ignorance," everybody might turn out to be among the worst off, so we want provisions and rules that would be fair regardless of who we turn out to be. Moreover, the benchmarks of fairness also emphasize "equal opportunity," which means "a deep foundation for a social obligation to meet health care needs", say, right to health (ibid, 18). While health competes with education or other priorities, we must face the fact that we have to protect equality of opportunity in many different ways with resources that are limited. Therefore, equal opportunity also helps us set reasonable limits on the entitlements that come with such a right. This rationale not only reflects "equal opportunity" but also includes other views of fairness, such as political liberalism.

Additionally, as a tool the benchmarks of fairness also embody the function of a health system in determining equal health. According to the WHO, health systems are seen as encompassing all activities whose primary purpose is to promote, restore, or maintain health. Health systems thus have three fundamental objectives: good health, responsiveness to the expectations of the population, and fairness of financial contribution. The aims of good health connote the best attainable average level—*goodness*—and the smallest feasible differences among individuals and groups—*fairness* (World Health Organization 2000b). However, unfairness in health care exists in any society.

The original conception of a fair health care system was based on the ethical issues of universal access to comprehensive and equal benefits with fair financial burdens and a workable, efficient, and accountable system. To adapt the benchmarks for use in health systems in countries at different levels of development, members from Colombia, Mexico, Pakistan, and Thailand formed collaborative teams. The teams used each country as a case study for which appropriate benchmarks were developed (Daniels and Bryant 2000). In 1999, after preliminary workshops in Mexico, Columbia, Pakistan, and Thailand, the consensus was reached that the benchmarks should be adapted to take account of broader inter-sectoral public health issues before addressing the details of financing and service delivery systems. Many further changes were made in the criteria falling under each benchmark. The new version of this tool consists of nine benchmarks rather than the original ten (Pannarunothai and Srithamrongsawat 1999). The new version is used in the present study (see Table 1). Compared with the early benchmarks used in the US in 1992, the new version is comprehensive and well clustered. In the new version, each of the nine benchmarks marks out a central objective of fairness in health policy. Benchmarks 1 to 5 address equity, 6 and 7 consider efficiency, and 8 and 9 concern accountability (Daniels 2008, 246). The recommended criteria for each benchmark are included in Appendix 1.

Table 1: The Benchmarks of Fairness

US Benchmarks of Fairness	The new Benchmarks of Fairness
Benchmark 1: Universal access - Coverage and Participation	Benchmark 1: Inter-sectoral Public Health Benchmark 2: Financial Barriers to Equitable Access
Benchmark 2: Universal access - Minimizing Nonfinancial Barriers	Benchmark 3: Non-financial Barriers to Access
Benchmark 3: Comprehensive and Uniform Benefits	Benchmark 4: Comprehensiveness of Benefits and Tiering
Benchmark 4: Equitable Financing - Community-Rated Contributions	Benchmark 5: Equitable Financing
Benchmark 5: Equitable Financing - By Ability to Pay	Benchmark 6: Efficacy, Efficiency and Quality of Health Care
Benchmark 6: Value for Money - Clinical Efficacy	Benchmark 7: Administrative Efficiency Benchmark 8: Democratic Accountability and Empowerment
Benchmark 7: Value for Money - Financial Efficiency	Benchmark 9: Patient and Provider Autonomy
Benchmark 8: Public Accountability	
Benchmark 9: Comparability	
Benchmark 10: Degree of Consumer Choice	

The primary function of the benchmarks of fairness is analytic rather than justificatory (Daniels et al.1996, 31).The benchmarks are used for various purposes. First, they can be used to evaluate competing reform proposals within a country, such as their initial usage in the US. Second, they can be used in comparative research to make international comparisons of fairness across systems (Daniels and Bryant 2000), such as comparative research among developing countries. Third, they can be used to assess the fairness of current policy trends (Daniels, Light, and Caplan 1996), such as the objectives of this thesis. Finally, because they provide a systematic basis for defining key features of an ideal health care system they can be implemented in the design of new, just systems (Light 2000a).

3. Data and Methods

3.1 Methods

This study uses a comparative method, non-experimental design, and quantitative analysis of secondary data. The study is both descriptive and explanatory. In order to investigate the current situation of unequal child health care in China, the study analyzes and compares secondary data on rural and urban areas within China in order to reflect inequalities between these subgroups. The results of the data analysis are explained in the context of relevant theoretical literature.

3.2 Data

3.2.1 Data resources

Two databases are used as sources for information on the distribution of the IMR in China: the database of the Ministry of Health of People's Republic of China (MOH) and the database of the UN Inter-agency Group for Child Mortality Estimation (IGME).

The main database is from the Ministry of Health of China. In 1990, the Chinese government established a maternal and child health monitoring network. From 1990 to 1995, there were 81 monitoring stations across China to monitor the infant mortality rate and under-five mortality rate. They covered 22 provinces, 3 municipalities under the central government, and 5 minority autonomous regions. From 1996, the monitoring stations expanded to 116. Since 2007, there have been 336 monitoring stations across China, which cover 31 provinces, municipalities, and autonomous regions. The database does not include data from special regions, such as Hong Kong, Macao, and Taiwan.

The data from IGME is introduced to compare the quality of the data from MOH. IGME was formed in 2004 to share data on child mortality. This database also reports on progress towards the United Nations Millennium Development Goals and enhances the capacity of countries to produce timely and properly assessed estimates of child mortality. It is led mainly by the United Nations Children's Fund (UNICEF) and WHO. The IGME seeks to compile all available national data on child mortality, including data from vital

registration systems, population censuses, household surveys, and sample registration systems.

Economic indicators, such as income, per capital heath expenditure, and so on are excerpted from the Chinese National Statistics Bureau (NSB) database. The stratified sampling method is used for the household survey.

3.2.2 Quality of data

The MOH data is collected through the National Maternal and Child Health surveillance network. So far there are 336 surveillance sets all over the country. The professional staff that collects the data receives periodical training from the National Office for Maternal and Child Health Surveillance (NOMCHS). In rural areas, data collected from the sampled villages is reported at the township level first and then summarized at the county level. In the monitored communities or villages, if child dies at home, the parents still must go to the monitoring center to get a death certificate to de-register the household registration at the local police station. In urban areas, data from the sampled communities is reported at the district level and is then summarized at the city level. Every three months, county institutions for the health care of women and children report surveillance data to the corresponding institution at the city or provincial level. Every November, county institutions for women and child healthcare submit annual surveillance data to NOMCHS, which finalizes the collection and analyzes all information received. NOMCHS randomly checks the quality of data of 18 to 24 monitoring stations in six to eight provinces every year. Quality control focuses on missing reports and cross-examination of multisource data. This database is also used by many international organizations, such as UNICEF and the WHO (Wang et al. 2011).

3.3 Research Limitations and Advantages

This research has several limitations. First, because of limited time, space, and available data, the comparison is restricted to rural and urban areas within the last two decades. There is no interprovincial comparison despite the high heterogeneity of provinces in China. Additionally, the database has limitations. Since the data is collected by the maternal and child health surveillance set, it actually covers the private children's

hospitals and maternal hospitals; however, it does not include samples from 3,465 privately owned hospitals. In 2010, privately owned hospitals served 5.2 million people as inpatients (Ministry of Health of China 2010b). Furthermore, this database does not include children in under-privileged groups, such as children of migrant families, that is, nomadic tribes who have no fixed place to live. There is no exact number for this group. However, some demographic statistics might provide an indication. In 2011, there was a floating population 230 million people in China. The average age among the floating population is 28 years. Among the migrant youth who live in Beijing, Shanghai, and Guangzhou, 60% bring their children with them (The Xinhua News Agency 2012). Consequently, because the available data is limited, the analysis of health determinants that affect infant mortality focuses on only a few important factors, such as income, water, and sanitation. Finally, because of the limited data, I restricted the discussion to five of the nine benchmarks.

However, the advantages of the study are as follows. This study is the first systematic application of the benchmarks of fairness to review health inequity in China. It serves as a modest spur to induce future researcher to come forward with valuable contributions to this area of research. Second, China has almost realized its goal of universal coverage in the health insurance system. Hence, this research could be a baseline for further study in health equity, which is especially meaningful since the government has just initiated a special medical subsidy for ages 0 to 14 years (China Comments 2012).

4. Results

The main findings of three aspects of the IMR are presented: the tendency (reduction), the disparity between rural areas and urban areas (inequality), and the cause of death in infant mortality.

4.1 Infant Mortality Rate: Reduction

In the last two decades, IMR in China has continuously decreased in both rural and urban areas. As shown in Figures 1 and 2, the national IMR decreased from 50.2 per 1000 live births in 1991 to 13.1 per 1000 live births in 2010 (Ministry of Health of China 2010b). From 1991 to 2010, it decreased by 73.9%, and the annual decrease was 7%. In urban

areas, the IMR decreased from 17.3 per 1000 live births in 1991 to 5.8 in 2010; the decrease rate was 66.5% and the annual reduction was 5.6%. In rural areas, the rate decreased from 58 per 1000 live births in 1991 to 16.1 in 2010. It decreased by 72.2%, and the annual decrease rate was 6.5%. Therefore, according to these statistics, the reduction rate of IMR in rural areas has been greater than that in urban areas.

The reduction in the IMR seems significant considering China's huge population. Some researchers estimated that based on China's population in 2000, 16,000 to 17,000 child deaths were reduced by every 1 per thousand reduction in IMR (Ministry of Health of China 2006, 20). However, if the 9% annually economic growth is taken into account, there is an apparent discrepancy between China's child health improvement and socio-economic development. This is especially obvious in the period from 1997 to 1999. The IMR in these years increased slightly. The IMR in 1997, 1998, and 1999 is 33.1, 33.2 and 33.3 per l000 live births, respectively. China initiated the marketization reform of the health system during this period.

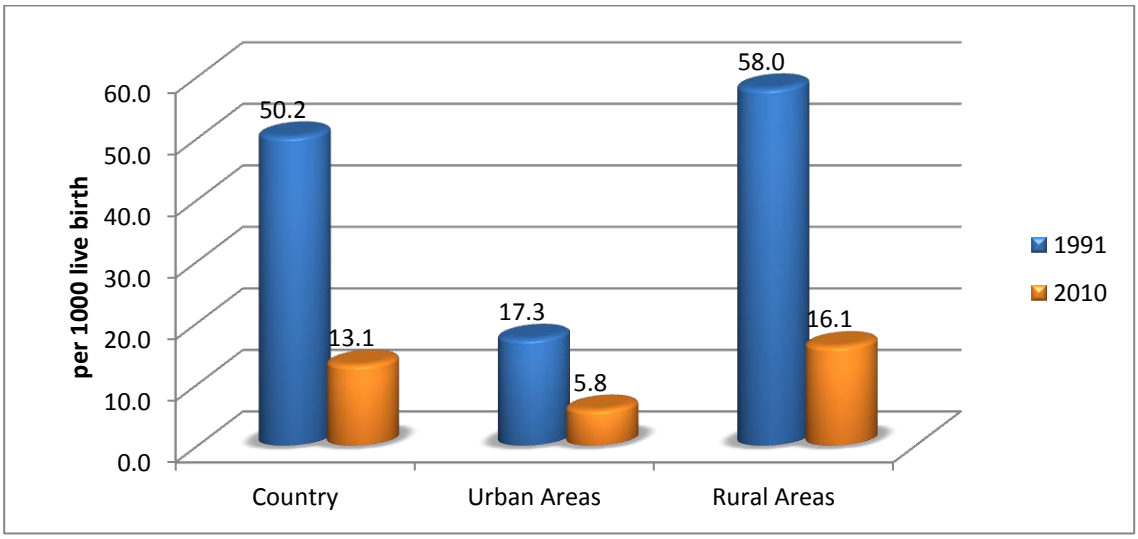

Figure 1: Infant Mortality Rate Reduction: 1990-2000 National Data

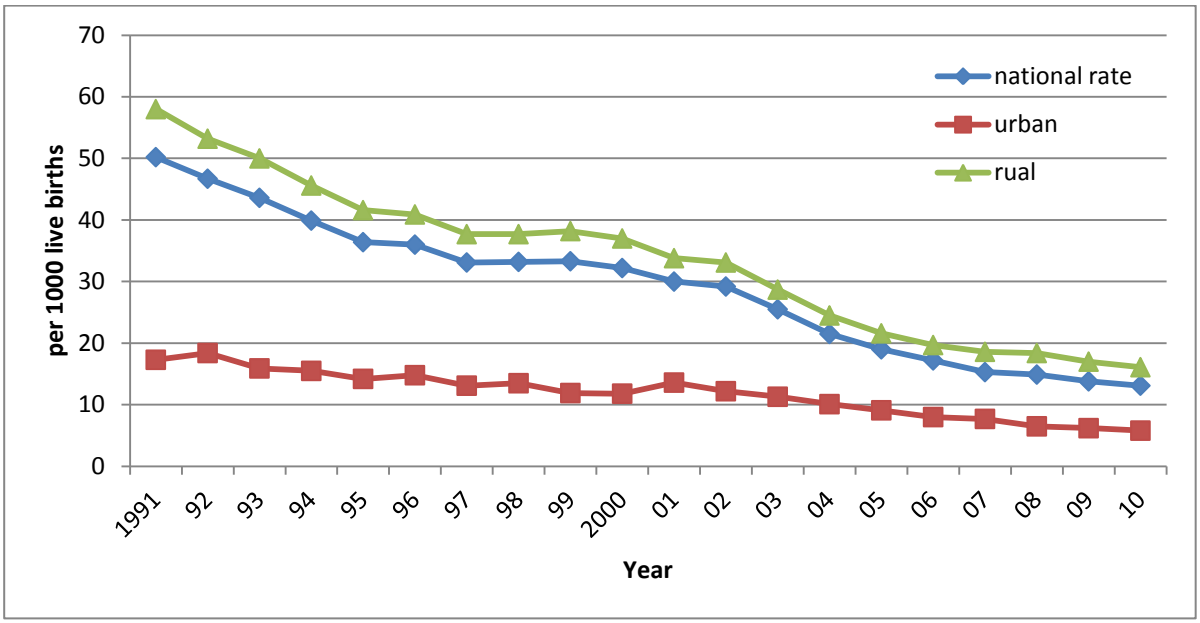

Figure 2 : Infant Mortality Rate in China: 1991-2000 National Data

However, these results differ from the IGME data. Figure 3 shows a comparison of the data from those two databases. Before 2004, the IGME data were lower than the MOH data. The difference ranged from -2.1 to -12.5. In 2004, the numbers in IGME data were higher than the MOH data. The differences ranged from 0.7 to 3.6. It is worth noting that IGME was formally organized in 2004. According to IGME, in 2010, the nation-wide infant mortality in China was 15.8 per 1000 live births compared with 13.1 from the MOH data. In its report, *China's Progress towards the Millennium Development Goals* (2010), the Chinese government used MOH data. The report stated that in 2000, the IMR was 15.7 per 1000 live births, which is close to the estimated data for 2010 (Ministry of Foreign Affairs of the People's Republic of China 2010). Since the IGME uses a time-adjusted model to adjust the data considering the report time and the actual time, it may more accurate than the MOH data considering it inclusion of children in migrant families. However, it did not include separate data for urban and rural areas. However, considering the geographic diversity of China, the MOH data is reliable.

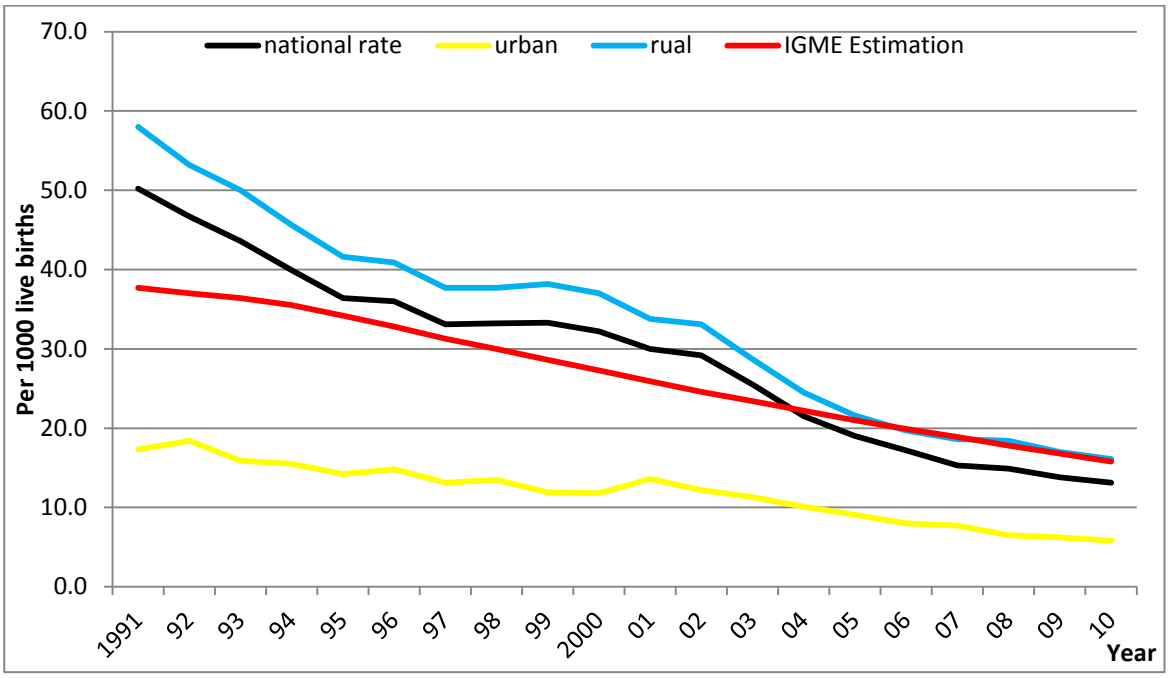

Figure 3: Infant Mortality Rate in China: National data compared with IGME

4.2 Infant Mortality Rate: Disparities between Urban and Rural Areas

The reduction of the IMR in China is optimistic. However, the disparity between urban and rural areas did not decrease dramatically. As shown in Figure 4, in 1991, the infant mortality rate in rural areas was 3.35 times higher than that in urban areas. In 2010, the IMR in rural areas was still 2.78 times higher than that in urban areas. The disparity was reduced by only 17%. However, considering China's uneven economic development, the disparity is much greater. For instance, in 2010, the IMR in Guizhou province (27 per l000 live births), a less developed province in southwestern part of China, was eight times higher than that in Beijing (3.29 per 1000 live births).

Furthermore, according to a national research conducted by the Ministry of Health in 2006, the rural IMR are nearly five times higher in the poorest rural counties than in the wealthiest counties—123 versus 26 per 1000 live births, respectively. There was a six-fold difference in under-five mortality between the highest-quintile and lowest-quintile population groups, based on socioeconomic development of the area of residence (Tang et al. 2004).

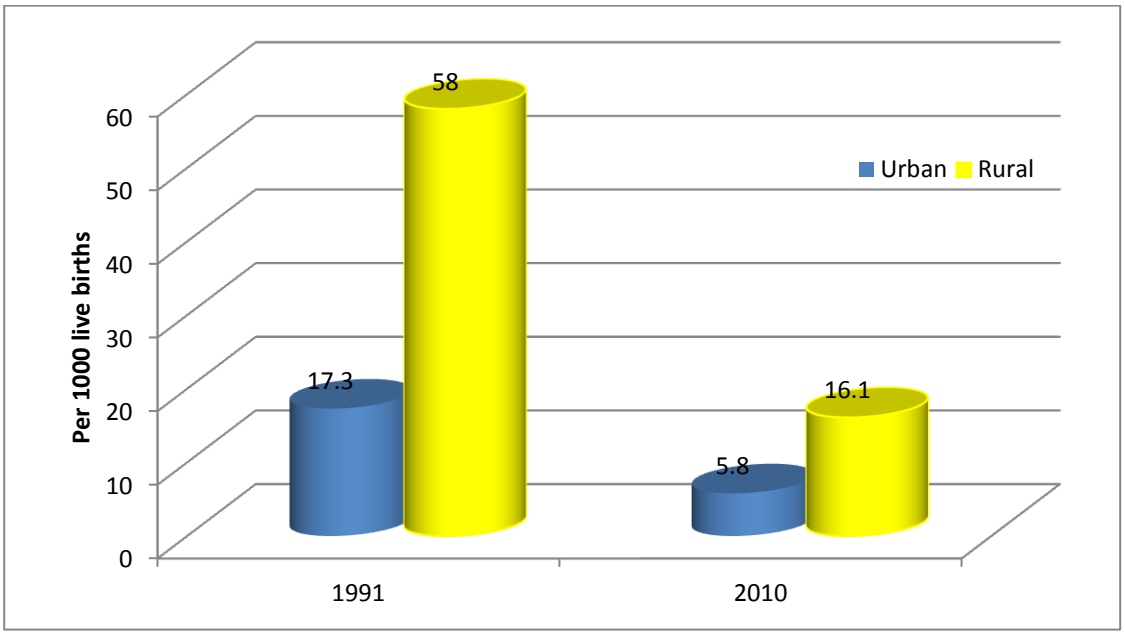

Figure 4: Infant Mortality Disparity: National data 1991, 2010

According to an official report in 2006, the reduction in IMR is also not equal among rural areas. The study divided rural areas in China into four types. Type I was the best developed and most affluent. Type IV was the least developed and the poorest. During the period from 1996 to 2004, in type I, II, and III rural areas, there was an almost 50% decline in the IMR, whereas in type IV rural areas, the decline was only 15.7%. Remote areas showed the smallest reduction (30.3%) compared to coastal areas (48.0%) and inland areas (49.8%) (Ministry of Health of China 2006). In other words, the disparity not only exists in the IMR but also in the reduction of IMR. Other indicators relevant to child health also revealed differences between urban and rural areas in China. For instance, Liu et al's (2008) study of malnutrition found that the prevalence of stunting in rural children was 5.3 times higher than that in urban children. Moreover, the prevalence of underweight children in rural areas was 4.6 times higher than that in urban children (Liu et al. 2008).

In summary, in the last two decades, the IMR in China has decreased dramatically. The reduction in the rural areas has been greater than that in the urban areas. However, the disparity between urban and rural areas persists and calls for more attention.

4.3Infant Mortality Rate: Causes of Death

As health indicators that reflect risk factors, causes of death are also relevant to the discussion of inequities in child health care. However, the data in the Maternal and Children's Health surveillance set is not available without special authorization. The only available alternative data on causes of death in the whole population in 2009 as a supplementary to support relevant literature review. Therefore, some existing research results will be summarized as a reference for future discussion. The data from 2009 will then be presented.

According to an official report, neonatal mortality has accounted for over 60% of the total child deaths in China. In 2004, 79% of neonatal deaths occurred within one week of delivery. Among the direct causes of neonatal, infant, and child death, neonatal diseases are the most serious causes of death (63.9%). Neonatal asphyxia and trauma, preterm delivery, low birth weight (LBW), hypothermia, severe infection, and congenital malformation account for 89% of all neonatal deaths (Ministry of Health of China 2006).

Based on the data from the national monitoring network, Wang et al. (2011) compared the causes death in under-five mortality (not infant mortality) between 1996 and 2006. As shown in Table 2, in 2006 the first five leading causes of death were premature birth, low birth weight, birth asphyxia, pneumonia, congenital heart disease, and accidental asphyxia. It is worth noting that compared with 2006, diarrhea was among the leading causes of death in 1996.

Table 2: Leading causes of under-five mortality in China: 1996, 2006

	Death Cause Ranking in 1996	Death Cause Ranking in 2006
National Wide	1: pneumonia 2: premature birth/low birth weight 3: birth asphyxia 4: diarrhea 5: accidental asphyxia	1: premature birth/low birth weight 2: birth asphyxia 3: pneumonia 4: congenital heart disease 5: accidental asphyxia
Urban Area	1: birth asphyxia 2: premature birth/low birth weight 3: pneumonia 4: congenital heart disease 5: intracranial hemorrhage	1: birth asphyxia 2: congenital heart disease 3: premature birth/low birth weight 4: pneumonia 5: accidental asphyxia
Rural Area	1: pneumonia 2: premature birth/low birth weight 3: birth asphyxia 4: diarrhea 5: accidental asphyxia	1: premature birth/low birth weight 2: pneumonia 3: birth asphyxia 4: congenital heart disease 5: accidental asphyxia

Note: Summarized from "Mortality rates for Children under 5 years of age in China from 1996 to 2006" (WANG et al, 2011).

In their review of publically available data in China, Igor Rudan et al. (2010) concluded that in neonates, birth asphyxia is the first cause of death. The second group of causes of death in neonates includes neonatal tetanus, intracranial hemorrhage, scleroderma, accidents, accidental asphyxia, and meningitis. The third most frequent cause of death was preterm birth complications. The fourth was congenital abnormalities. Pneumonia was the main cause of death in post-neonatal infants. However, although this study did not provide an analysis of the subgroups of urban and rural areas, the results are consistent with Wang's (2011) research. Additionally, the causes of death in age-specific data in 2009 showed more or less the same results as those summarized in Table 3. This data includes the causes of death in children <1 year. This data is also from the Ministry of Health, but they were collected and calculated differently than the Maternal and Child Health surveillance set. These data are based on a report on child deaths in hospitals.

Table 3: Main Deaths Cause of mortality <1 year in 2009 (Per 100,000 population)

	Mortality Rate < 1 year (1/100,000)		
Causes of Death	**Big Cities**	**Small Cities**	**Rural Areas**
Perinatal diseases	196.82	175.06	243.28
Congenital Abnormalities	172.81	124.65	117.98
Injury and poisons	20.16	14.96	39.14
pneumonia	16.99	33.79	29.28
circulatory system diseases	15.85	11.98	9.57
Nervous system diseases	12	16.62	6.48
Infectious disease	4.76	13.3	19.71

It is not difficult to draw conclusion from the above research. In the last two decades, the proportion of deaths caused by communicable diseases such as diarrhea decreased. The proportion of deaths stemming from complications of preterm births rose slightly. These data also imply that better child health care services are required in rural areas since most village-level health centers, township hospitals, and even county level hospitals do not have the ability and equipment to treat many natal diseases, such as birth asphyxia, intracranial hemorrhage, and severe pneumonia. Capable pediatricians and neonatal intensive care units are available only in large hospitals, which also provide expensive, high quality health services.

5. Discussion

The preceding section analyzes three aspects of the IMR in China: reduction tendency, rural-urban disparity, and causes of death. The results showed that the distribution of IMR in China is not equal in China. What is the reason for this unequal distribution? Why is infant mortality higher in rural areas? What factors affect its distribution? These questions are answered in this section. However, instead of a causal analysis, a moral interpretation is offered. The main health determinants that affect the distribution of infant mortality are discussed below, followed by a discussion of the benchmarks.

5.1Health Determinants of Infant Mortality Rate

In this section, social environment, physical environment and health care system will be discussed as health determinants to affect IMR respectively.

5.1.1 Health determinants: social environment

5.1.1.1Income disparity

Mosley and Chen (1984) regarded income as a main proximate determinants that affected child survival. Their study found that income could be a proxy indicator to discuss social environment. This indicator not only reflects the wealth distribution in a society but also decides how much money is spent on a child's health. Income is also one of the indicators used by SCDH in their framework (Barros et al. 2010, 52–53). Marmot (Marmot 2005, 1100) also confirmed that "within countries, not only is child mortality highest among the poorest households but also there is a social gradient: the higher the socioeconomic level of the household the lower the mortality rate".

The Gini index is normally used to reflect income disparity. In 2007, the Gini index in China was 0.47. In the same year, the Gini index was 0.45 in the US, 0.37 in India, and 0.26 in Austria (US CIA 2012). The income ratio between urban and rural areas was 3.33: 1. Adopting the same concept, Fang (2010) and his colleagues concluded that the overall health index in China was 0.38 in 2006; however for the maternal and child health factor, it was 0.4. As shown in Figure 4, in 2010 the per capital net income in urban areas was 19019 Yuan (2717 USD), which was 3.23 times higher than that in rural areas (5919 Yuan or 845 USD). Furthermore, the infant mortality rate was 2.8 times higher in rural areas than in urban areas.

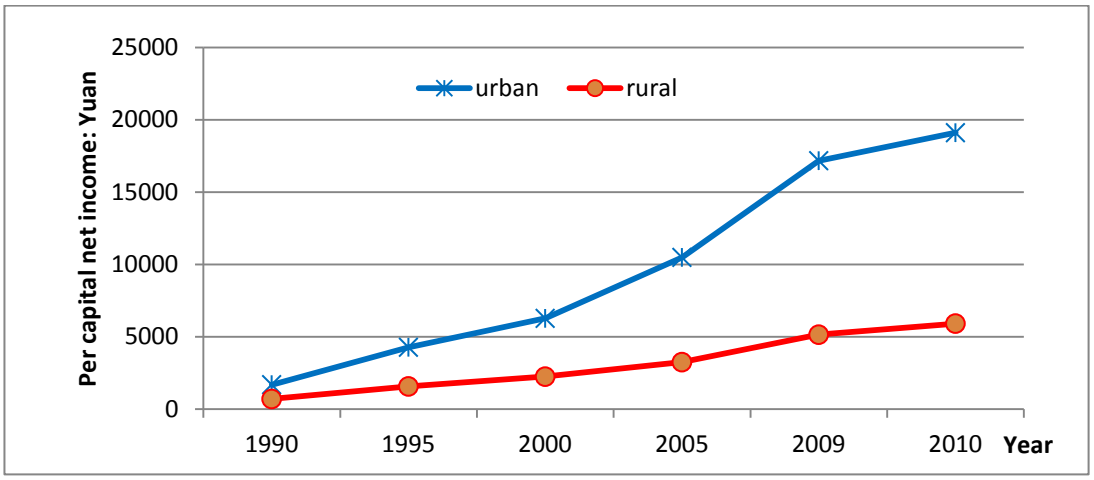

Figure 5: Net income per capital tendency in China: 1990-2010

Considering that income affects health and health inequality, by using data from the China Health and Nutrition Survey (CHNS), Li and Zhu (2006) found that income has a positive effect on self-reported health status. Moreover, high inequality in a community poses threats to health, and high inequality increases the probability of health-compromising behavior, such as smoking and alcohol consumption.

5.1.1.2 Family expenditure on health

In 1991, the annual per capital health expenditure in urban areas was 158.8 Yuan (22.6 USD) compared with only 38.8 Yuan (5.5 USD) in rural areas, which was four times higher in urban areas. In 2009, however, the annual per capital health expenditure increased to 2176.6 Yuan (311 USD) in urban areas and 562 Yuan (80 USD) in rural areas, which was still 3.87 times higher in urban areas. Because of the relatively high income, urban people spend more money on health than rural people do. As shown in Figure 6, the urban population also has a higher per capital share of the total expenditure on health per year. However, rural areas showed a greater increase, from 4.3% to 8.87%.

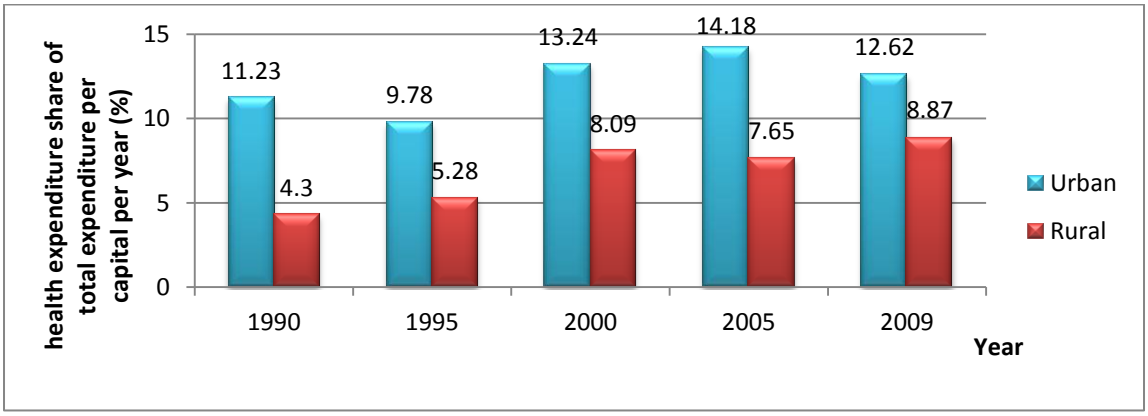

Figure 6: Annually per capital health expenditure of the total expenditure per capital per year (%)

Closely related to income, family expenditure on health is regarded as an extended indicator for measuring the impact of income inequality on health. Using the Mexican National Household Survey on Income and Expenditure data, Park and Wong (1997) examined the determinants of household health expenditures in Mexico. They found that total monetary income was positively related to the probability of health expenditures for all groups, except the lower income group, of the insured population.

Gao et al. (2010) conducted a qualitative study to explore the barriers to hospital delivery in Shanxi province in 2006. They found that financial difficulty was a main barrier expressed by 26 of 30 interviewees who did not have a hospital delivery.

> The main reason is family difficulty [no money]; it will cost lots of money in the hospital. Home delivery cost me 200 Yuan; our annual income is 3,000–5,000 Yuan. People say it [hospital birth] will cost more than 1000 Yuan; it is not possible for less than 500 Yuan. No other reasons, mainly economic difficulty (Participant 19, age 29, first birth). (Gao et al. 2010, 39)

As mentioned in the previous discussion, hospital delivery prevents neonatal deaths from birth asphyxia, and so on because equipment, such as oxygen inhalators, is available. Some better-off county hospitals also have neonatal intensive care units (NICU).

Additionally, when catastrophic diseases occur, more expenditure on health is expected. Households with catastrophic health expenditures faced challenges offset by potentially excessive health expenditures and might have been obliged to reduce the consumption of other items, which implies that extending insurance coverage and lowering out-of-pocket expenditure could be a necessary step in protecting households from health-related economic catastrophes (Kim and Yang 2011).

5.1.2 Health determinants: physical environment

Indicators such as housing, pollution, and so on are used to measure health determinants in physical environments. The existing data showed that the accessibility of water, sanitation, and transportation systems are also health determinants in physical environments.

5.1.2.1 Water and sanitation

Safe water and hygienic toilets are fundamental health determinants for human populations (Lindstrand 2007, 75–79). Water and sanitation are relevant not only to the incidence of infectious diseases, such as cholera, but also to vector diseases, such as schistosomiasis and malaria.

In 2008, 98% of the population in urban areas had access to improved sources of drinking water, but only 82% of the population in rural areas had access to safe drinking water. In 2009, tap water was supplied to almost all urban areas but only to 68.9% of the rural population. In 2008, only 58% of the urban population and 52% of the rural population used improved sanitation facilities, such as hygienic toilets, garbage disposal sites, and so on. In 2009, only 40.5% of the rural population used hygienic toilets.

Compared with the very low incidence of malaria and schistosomiasis, diarrhea is a sensitive indicator for assessing water and sanitation conditions. Diarrhea is still very common in rural areas. In 1996, diarrhea caused 11.6 deaths among per 100,000 live births in urban areas. In rural areas, the number was 304.7 per 100,000 live births. From 1996 to 2000, the average annual reduction of deaths caused by diarrhea was 34.4% in urban areas but only 6.6% in rural areas. In 2006, it was the seventh most frequent cause of death in the mortality of children under five.

5.1.2.2 Transportation

In many cases, transportation is necessary to access to health services, especially for infants since they are highly vulnerable to disease. Timely access to health services is crucial in emergency situations, such as accidental asphyxia.

In China, village clinic centers provide only primary health care, such as immunization. Hence, because of this poor quality of service these centers cannot treat complicated diseases, such as severe pneumonia or neonatal syndrome. Consequently, parents have to go to higher-level hospitals, such as county or city hospitals for treatment of their children if they suffer from severe disease. Buses pass through most rural villages only a couple of times daily. In 2008, the MOH conducted three surveys to determine how

quickly people could access the nearest health agency. The survey showed that in the big cities, 84.5% of the people surveyed could access the nearest health agency within 10 minutes. However, in the poorest areas, only 40.9% of the people surveyed could access the nearest health agency within 10 minutes; 18.5% needed more than 30 minutes to access the nearest health agency (Ministry of Health of China 2010b). It is worth noting that the nearest health agency could be the village clinic center, which means that more time is needed to go to a county hospital. Moreover, the ambulance service is not universally free. Most hospitals charge a fee for this service. However, until 2010 the ambulance service was rare in rural townships and villages.

Regarding health service accessibility, Gao et al.'s (2008) qualitative research of barriers to hospital delivery in Shanxi province also showed the importance of transportation. One interviewee said:

> It was at midnight, I could not go to hospital. I could not find a vehicle at night. The transportation was not convenient, you know, we live in the mountains (Participant 17, age 36). (39)

Thus far, no data has revealed different mortality rates related to transportation in China However, many studies have found that physical distance is an important factor in the use of health resources, especially in low-income countries. Good (1987) noted that in Africa distance is a greater factor in the utilization of biomedical health services than in traditional practice. Paul's (1991) study in Bangladesh showed that the distance of the neighborhood from the health center in direct proportion to post-neonatal deaths: mortality increases as the distance increases. In their study of child mortality in China from 1996 to 2004, Feng et al. (2011) showed that 15% to 20% of the total deaths in rural areas occur on the way to the hospital, which is possibly due to poor public transportation services and the lack of health facilities around the place of residence.

5.1.3 Health determinants: Health system

As already discussed in the preceding section, the health system is a crucial health determinant of health distribution. Some scholars regard perinatal mortality as an indicator sufficiently sensitive to assess the coverage and quality of health services (Edouard 1985). Some think that post-neonatal mortality is more sensitive to

improvements in health and social economic conditions (Acuin et al. 2011). These studies found that infant mortality is sensitive to health service and that health services are crucial the reduction of infant mortality.

As a matter of fact, many indicators are used to reflect the disparity between urban and rural health systems in China (see Table 4). In 2000, the population of urban areas, which was 36.09% of the total population, consumed 57.21% of the total national health expenditure. In 2010, when the urban population increased to 49.68%—around half of the population—it consumed 77.43% of the total national health expenditure, which was 3.4 times higher than that the rural expenditure. The total expenditure in urban areas increased by 3318.1% from 1990 (around 5.66 billion USD) to 2009 (around 193.37 billion USD) but only by 1040.1% in rural areas (5.02 billion USD in 1990 and 57.23 billion USD in 2009). In 2000, the number of registered doctors per 1000 people in urban areas was 2.79 times higher than that in rural areas, which increased to 2.88 times in 2010. The number of registered nurses per 1000 people in urban areas was 3.23 times higher than that in rural areas. However, in 2010 this difference increased to 3.47 times. In 2010, the difference in the number of beds per 1000 people between urban and rural areas was reduced from 2.98 in 2000 to 2.73.

Table 4: Proxy indicators to reflect disparities in the resources of urban and rural health systems: 2000, 2010

	2000		2010	
Indicators	**Urban**	**Rural**	**Urban**	**Rural**
Government Expenditure(% GDP)	*4.62*		*4.83*	
Government Expenditure Allocation (%)	57.21	42.79	*77.43*	*22.57*
Annual per Capital Expenditure on Health (Yuan)	813.7	214.7	2176	562
Registered Doctors Shared by per 1000 People	2.23	0.8	2.74	0.95
Registered Nurses Shared by per 1000 People	2.1	0.65	3.09	0.89
Beds for per 1000 population	2.38	0.8	3.06	1.12
Medical Insurance Coverage Rate (%)	49.6	12.7	71.9	92.5

Data resource: Ministry of Health of China, Health Yearbook 2010;

5.2. Heath Inequity Justified by Benchmarks of Fairness

The benchmarks of fairness are used as a tool to discuss the equity of child health care in China. Restrained by the lack of available data, the study uses only the benchmarks relevant to equity, that is, benchmarks 1 to 5. Findings in benchmarks system are normally scored on a scale from 5 to -5. However, this evaluation process cannot be realized here because a panel of experts and stakeholders assigns these scores. Nevertheless, this study describes the facts and recommends scores, which are based on the evidence from the data and my own understanding of the health system. Moreover, some applications of the benchmarks of fairness in other countries can serve as models. In this study, the scores are in intervals of 0.5, with the situation in 1990 as zero. My main concerns include the current situation of the inequality in distribution and the progress of improvement. Perfect equality or a perfect current situation is 5; poor is around 2; very poor is around 0. Progress in improvement is around 3; a deteriorating situation receives a negative score. Table 5 shows the benchmark system and the adapted criteria that are used in the paper.

Table 5: Adopted Benchmarks and Adapted Criteria

Benchmark 1: Inter-sectoral Public Health
1.1 Degree to which reform increases percentage of population benefiting from clean water and sanitation;
1.2 An information infrastructure needed to measure and monitor health inequalities and to carry out research about the most effective ways to reduce them
1.3 System for their coverage across sectors and their involvement of communities and vulnerable groups in these efforts
Benchmark 2: Financial Barriers to Equitable Access
2.1 Health insurance coverage both for the people working in informal sectors and the formal sectors
Benchmark 3: Non-financial Barriers to Access
3.1 Distribution of medical resources: drugs, supplies and personnel
3.2 Social discrimination in terms of the health
Benchmark 4: Comprehensiveness of Benefits and Tiering
4.1 Comprehensiveness of the benefit
4.2 Transferability of the benefit
4.3 Tiering
Benchmark 5: Equitable Financing
5.1 Equitable financing distribution between urban and rural areas

5.2.1 Benchmark 1: Inter-sectoral public health

Three adapted criteria will be discussed in this part. The first criterion for Benchmark 1 requires estimates of the degree to which a population benefits from reductions in exposure to various risk factors as a result of the reforms under consideration. A central policy implication here is that reform efforts to improve health inequalities must be inter-sectoral and not only focused on the traditional health sector. In China, this indicator can be adapted to the degree to which reform increases the percentage of the population benefiting from clean water and sanitation. As a proxy indicator, it is relevant to the incidences of diarrhea and vector disease. In China, a program of safe water in rural areas started in the late 1980s, but the sanitation program started in the early 2000s. Hygienic facilities in rural areas are still very poor. For instance, a majority of villages in rural China have no garbage disposal facilities or waste water drainage systems. In the western part of China, the absence of hygienic toilets and bathrooms is still very common. Only in 2009 was the special subsidiary for hygienic toilets transferred from the central government to all provinces. In the last two decades, the accessibility to safe water increased in rural areas, but not to sanitation facilities. In rural China, the percentage of hygienic toilet was still very low in 2009, at 40.5%. The recommended score for this criterion is 3.5.

The second criterion in Benchmark 1 calls for developing an information infrastructure to measure and monitor health inequalities and to carry out research on the most effective ways to reduce them. Concerning the monitoring of child health care, as described, in 2006 there were 336 monitoring sites among 3025 Maternal and Child Health Centers. An information infrastructure has been established. The problem is that the information is not publically available and does not cover children in migrant families. Therefore, the recommended score for this criterion is 2.0.

The third criterion evaluates health systems for their coverage across sectors and their involvement of communities and vulnerable groups in these efforts. Because of the lack of specific data, this indicator is not very satisfactory in China. At least 11 ministries involved in health-system development in China, each with a separate agenda, which

makes it difficult to coordinate efforts. The fractured nature of the health system is compounded by the structure of the current administration. However, this fragmentation does not necessary entail lack of cooperation. For instance, concerning child health, some local Women's Federation staff participates in monitoring work. However, the participation of the community and vulnerable population is weak (Wang 2005). Recommended score for this criterion is 0.5.

In summary, the average score for Benchmark 1 is 2.0. The weakness is in the lack of cooperation in health improvement, as well as the lack of participation by community and disadvantaged groups in monitoring the health system.

5.2.2 Benchmark 2: Financial barriers to equitable access

Benchmark 2 concerns the health insurance coverage of people working in both informal and formal sectors, that is, universal coverage. In their report on American children, Cook et al. (2011, 21) indicated that health insurance coverage is an important factor in the health care of children. Children with health insurance whether public or private are more likely to have a regular and accessible source of health care. In China, by the end of 2008, people working in the formal sector received 44.2% of the social medical insurance in urban areas and only 1.5% in rural areas (Table 6). According to the law, health insurance is universal for the formal sector. By the end of 2010, the NRCMS covered 96% of the population in rural areas but this percentage was lower in urban areas. This is partially due to government pressure in rural areas. Medical insurance coverage is an indicator of government performance, which was reflected in the under-developed private insurance system in rural areas. Since 2010, the government has taken extensive action; six catastrophic diseases treatment for children ages 0 to 14 years, including congenital heart disease, are now eligible for special medical aid from the government.

Table 6: Percentage of Social Medical Insurance in China: 2003, 2008

	National Total		Urban		Rural	
Item	**2003**	**2008**	**2003**	**2008**	**2003**	**2008**
Employment Medical Insurance	8.9	12.7	30.4	44.2	1.5	1.5
Government	1.2	1	4	3	0.2	0.3
URBMI (urban residents)	NA	3.8	NA	12.5	NA	0.7
NRCMS (rural residents)	NA	68.7	NA	9.5	NA	89.7
Others	12	1	15.2	2.8	10.9	0.4
No Medical Insurance	77.9	12.9	50.4	28.1	87.3	7.5

Data resource: Ministry of Health of China, Health Yearbook 2010.

Two aspects of health insurance coverage in China are highlighted here. First, the medical insurance system is a household registration-based system. Therefore, migrant workers who leave their place of *Hukou* registration cannot enjoy insurance benefits if they do not ask for medical service from an assigned hospital. For instance, if a migrant worker has a rural *Hukou* in Sichuan province, when he migrates to Beijing and works in the informal sector, he or she cannot receive health insurance benefits provided by the government by unauthorized medical practitioners. Moreover, if a child is born in the city, he or she is not covered by the insurance system until a household registration certificate is obtained from the hometown of the migrant. Wherever the child is born, he or she can be registered in either parent's hometown. Without household registration, she/he cannot buy the commercial medical insurance either. Second, the employment-based health insurance system for the formal sector does not cover family members. Thus, children of these parents must be covered by either commercial medical insurance or URMBI. In the early 2000s, there was a trial of Benchmark 2 in Yunnan Province. A team, including academics from Kunming Medical School, various medical professionals, and health authorities, used a benchmarking approach to measure the effects of a new rural insurance program in selected districts and municipalities in Yunnan Province. They found significant financial barriers to the enrolment of the poorest farmers, who could not afford a contribution of 10 Yuan per year and who had limited access to subsidies that were supposed to reach the very poor (Daniels et al. 2005) .

Nevertheless, before the health insurance reform in the 2000s, children were not covered by any health insurance system. Because of the great progress made by the government to improve the insurance coverage of and special attention to children's health, the recommended score is 3.0 for this indicator. However, the social insurance system needs improved flexibility in order to cover the migrant population. It is worth noting that universal coverage does not necessarily mean that there are no financial barriers to health care services.

5.2.3 Benchmark 3: Non-financial barriers to access

Daniels et al. identified four criteria for this benchmark: poor distribution of drugs, supplies, personnel, and so on; the gender barrier; the cultural barrier; and social discrimination. This study focuses on the poor distribution of drugs, supplies and personnel as well as social discrimination.

The poor distribution of medical resources is shown in Table 4 and Table 6. Moreover, Feng et al. (2011) noted that, only 20% to 50% of newborns in rural type II, III, and IV areas have access to basic emergency obstetrical care. Because comprehensive emergency obstetrical care (CEOC) is provided mainly in county and city hospitals, access is available to only 10% to 30% of newborns in rural type II, III, and IV areas, and to only 40% in type I areas. Furthermore, in Gao et al.'s (2010) study in Shanxi Province, the township hospital was described as a poor facility:

> The first township hospital was located in a mountainous area. Its catchment population was 15,000, covering 43 villages in 2005. The hospital had not received any funds from government since the 1970s, except for subsidies around 30% of staff salaries. The hospital did not have a labor bed, x-ray machine, ultrasound or telephone. (38)

This case is common in China; the health service in rural areas is generally poor. The quality of personnel is also lower in rural areas. For instance, in 2010 no postgraduate-level health professionals were working at the township level. Most health professionals in township hospitals have graduated from junior colleges (33.9%) and secondary technical schools (52.2%). In contrast, in hospitals above the township level, 4.8% of the professional staff is postgraduates, 27.8% from universities and 36.6% from junior

colleges. Only 28% graduated from secondary technical schools. Therefore, the recommended score for this criterion is 2.0.

Regarding the nonfinancial barrier of social discrimination, urban-rural migration is highlighted here. Both financial and nonfinancial barriers compromise access to health services. The financial barriers are obvious; the incomes of migrants in urban areas are low compared to the high health costs in urban areas. For instance, in 2009, the average expenditure for treating inpatients with pneumonia at a provincial hospital was 3388.6 Yuan (484 USD), but 1252.4 Yuan (179 USD) at a county level hospital, a difference of 2.7 (Ministry of Health of China 2010b). Social discrimination against migrants occurs in many situations, such as employment (Ya Ping Wang 2004). The recommended score for this criterion is 0.5. Therefore, the average score of benchmark 3 is 1.25.

5.2.4 Benchmark 4: Comprehensiveness of benefits and tiering

The rationale for benchmark 4 is that all people, regardless of class, ethnicity, or gender, have comparable health needs and there are similar social obligations to meet these needs. Inequality in health coverage and quality of care (tiering) reduce the fairness of the health system. The criteria in benchmark 4 focus on differential treatment of people by class within a system (Daniels 2008, 258). Three indicators are adopted to analyze this benchmark: the comprehensiveness of the benefit, the transferability of the benefit, and tiering.

The benefit package provided by both URBMI and NRCMS has long been criticized for its limitations. If they are provided at all, outpatient services are inadequately insured in many parts of China. Inpatient services, where covered, leave patients with significant costs (co-payments, deductibles, or additional fees) to bear (Shanlian Hu et al. 2008). In 2008, the rural cooperative medical scheme, for instance, reimbursed only 30% of inpatient expenditures. In Shanxi Province, the maximum compensation amount is 40000 Yuan (5715 USD) for per qualified inpatient person per year. In 2011, however, inpatient expenditure could be reimbursed to more than 60% of expenditures that qualify for reimbursement. (Not all inpatient expenditures are reimbursed; some medicines and physical check-ups cannot be reimbursed). Portions of outpatient expenditures are also covered in some better-off provinces. Since 2011, in principle, the maximum amount

reimbursed was six times higher than the net income per capital per year (Ministry of Health of China 2011a). Therefore, based on this tendency to improve, in policy at least, the recommended score is 3.5.

However, transferability of benefits is not easily realized. As mentioned, both URMBI and NRCMS are managed according to household registration. Premium collection, health seeking, and expenditure reimbursement are supposed occur at the place of household registration. In principle, NRCMS benefits cover only inpatient expenditures at the local county and township levels. Expenditures beyond the county level (65%) are permitted with an appropriate referral. The higher the level of the hospitals, the lower the expenditure amount that can be reimbursed (a maximum of 45% at provincial hospitals). If the treatment is given outside the place of household registration without proper referral, as is often the case with migrant workers, the expenditure cannot be reimbursed. The same applies to migrant children. Considering the restrictions exerted by the household registration system, the recommended score is 2.0.

Tiering exists for people covered in different insurance groups and people living in different provinces. Normally, civil servants have the best medical benefit packages, which include pre-payment and lower out-of-pocket requirements. People in better-off provinces enjoy a higher proportion of reimbursed expenditure. For instance, in 2009, the maximum reimbursement for people in the rural Guizhou province was 50,000 Yuan (7143 USD) but 90,000 Yuan (12858 USD) in Hangzhou City. Therefore, the recommended score is 2.0 for this indicator because some ongoing reforms were made by the government after 2010. In summary, the average recommended score for benchmark 4 is 2.0.

5.2.5 Benchmark 5: Equitable financing

This benchmark is based on the assumption that financing medical service, as opposed to access, should be based on the ability to pay. Three main sources of funding are involved in most health care systems: tax-based revenues, insurance premiums, and out-of-pocket payments. Tax-based systems are more equitable if their structure is progressive. Premium-based schemes are more equitable if they are community-rated rather than risk-

rated. The same inequality is involved in out-of-pocket payment in both tax-based and premium-based systems (Daniels 2008, 259).

Nonetheless, in China the financing of medical services is far from equitable. As demonstrated in the previous section, in 2009 the total expenditure in urban areas was 3.38 times higher than that in rural areas. However, in 1990, the difference was 1.13 times. This disparity has continued to increase in the last 20 years. Moreover, out-of-pocket payments have been increased from 35.7% to the acme of 60% in 2001, which gradually reduced to 38.2% in 2009. In 1993, the proportion of out-of-pocket payments in urban areas was 27.3% compared with 84.1% in rural areas. In 2003, the proportion in urban areas was 44.8% compared with 79% in the rural areas.

High medical costs and high out-of-pocket payments prevent poor people from seeking heath service. Cost versus availability then becomes the problem. In an analysis of the national household health surveys in 1998 and 2003, Xu (2008) found that people in the lowest income group paid the highest proportion of hospital costs out-of-pocket (>60%), and even the highest group paid nearly half (48%) of their hospital expenditure out-of-pocket. Although the lower the income group, the more likely people are to be ill and need health care, current expenditures on hospital care decline with income. Thus, expenditure is not relative to need (Xu 2008 cited in Tang et al. 2004). Financial decentralization is another factor causing unequal financing. Areas that are more affluent have a stronger financial capacity to provide more subsidies and benefits to people living there. For instance, in 2007 in Shanghai, the financial contribution per person of the government and beneficiaries in the rural cooperative medical scheme was around 450 Yuan (65 USD) per person compared with only 50 Yuan (7 USD) per person in most provinces in central and western China (Shanlian Hu et al. 2008). Hence, the recommended score for this benchmark is 1.5 because unequal financing occurs among different insurance systems as well within as the same insurance system. It is worth noting that financing reforms have not been implemented for many years. Therefore, financing sustainability is not an indicator in this study. However, it should be included in future studies.

As summarized in Table 7, the average score of the five benchmarks analyzed here is 2.0. The lowest score is for nonfinancial barriers to access (1.25). The highest score is for financial barriers to equal access (3.0). There is no negative score, which means that compared with 1990, health inequity in China has not become worse. However, it must be emphasized that this research looks backward, not forward. Moreover, much change has occurred in China in the last two decades. Nevertheless, the benchmarks show an imbalanced improvement in several dimensions of health equity. These scores indicate that more work should be done to reduce the social discrimination in the health care system. The distribution of equitable financing should be also improved, including the involvement of the public and vulnerable groups in system design.

Table 7: Score summary of the adopted benchmarks

Adopted Benchmarks	Score
Benchmark 1: Inter-sectoral Public Health	***2.0***
1.1 Degree to which reform increases percentage of population benefiting from clean water and sanitation	3.5
1.2 An information infrastructure needed to measure and monitor health inequalities and to carry out research about the most effective ways to reduce these	2.0
1.3 System for their coverage across sectors and their involvement of communities and vulnerable groups in these efforts	0.5
Benchmark 2: Financial Barriers to Equitable Access	***3.0***
2.1 Health insurance coverage both for the people working in informal sectors and the formal sectors	3.0
Benchmark 3: Non-financial Barriers to Access	***1.25***
3.1 Distribution of medical resources: drugs, supplies and personnel	2.0
3.2 Social discrimination in terms of the health	0.5
Benchmark 4: Comprehensiveness of Benefits and Tiering	***2.5***
4.1 Comprehensiveness of the benefit	3.5
4.2 Transferability of the benefit	2.0
4.3 Tiering	2.0
Benchmark 5: Equitable Financing	***1.5***
5.1 Equitable financing distribution between urban and rural areas	1.5

As mention previously, different ideologies have different understandings and measurements of health inequity. Utilitarianism focuses on the overall utility of the whole population while egalitarianism focuses on the equitable distribution over the whole population. It is worth noting that, as mentioned by Daniels (2000), "benchmarks supplement or complement, rather than compete with, various other efforts to monitor equity in health systems". For example, considering that WHO sponsored efforts to develop measures for monitoring health inequities across demographic groups and for setting goals and targets for reducing these inequities, which might better matched with the demographic transitions taking place across the world currently. Some new approaches to measuring health inequalities may better highlight subgroup differences. Some of these measures could be incorporated into the benchmark approach; in addition, since setting targets requires evaluating how reforms will affect a system, the benchmarks would be a useful supplement to such an approach (Daniels and Bryant 2000). The advantage of using the benchmarks of fairness as a tool is that it more or less covers these objectives. Moreover, the benchmarks can be applied to both the global South and the global North.

6. Conclusion

The aim of this thesis is to profile a complete picture of the inequality and inequity in child health care in China over the last two decades by applying the benchmarks of fairness. The conducted a literature review and compared and analyzed relevant data from the last two decades. Three tasks were achieved: describe the currently child health distribution in China measured by infant mortality rate; analyze the main health determinants that affect the distribution; discuss the equity of child health distribution according to the benchmarks of fairness applied in the study.

The main conclusion of the thesis is summarized as follows. First, measured by infant mortality, the status of child health has improved tremendously in the last two decades. Infant mortality during the last 20 years has decreased by 73.9%, from 50.2 per 1000 live births in 1991 to 13.1 per 1000 live births in 2010. This improvement has progressed more quickly in rural areas than in urban areas. The reduction rate in rural areas and urban areas is 77.2%

and 66.5% respectively. Nevertheless, the disparity between rural and urban areas demands attention. In 1991, the infant mortality rate in rural areas was 3.35 times higher than that in urban areas. In 2010, the rate in rural areas was still 2.78 times higher than that in urban areas. Secondly, the unequal distribution of the infant mortality rate is explained by health determinants, such as disparity between rural and urban incomes and the unequal distribution of public facilities, such as water and sanitation, transportation, health services, and so on.

Finally, the unequally distributed infant mortality rate evaluated by the benchmarks of fairness does not show a positive result. Of Daniels' nine benchmarks, five were adopted for use in this study: inter-sectoral public health, financial barriers to equitable access, nonfinancial barriers to access, comprehensiveness of benefits and tiering, and equitable financing, which is related to just equity of health. The score of the latter benchmark was 2.0 of a scale from -5 to 5. The highest scoring benchmark was financial barriers to equitable access at 3.0, which is a result of reforms to the health insurance system reform after 2000. The lowest scoring benchmark was nonfinancial barriers to access, which was only 1.25 because of the distortion caused by poor health facilities in rural areas and the large uninsured migrant population. The benchmark of inter-sectoral public health scored 2. Comprehensive benefits and tiering scored 2.5, and equitable financing scored 1.5. There is no negative score. These scores show the inequity in child health care in China. Therefore, the current status of health services in China calls for effective, mitigating action. More reforms are needed, particularly to reduce social discrimination regarding health care, to improve the equitable distribution of financing between urban and rural areas, and to foster community involvement in the design of China's health system.

A systematic application of the benchmarks of fairness could be adopted in future research on China's health care system to include a moral and ethical perspective, which is very rare in current research. Furthermore, comprehensive, inclusive databases are needed to improve future research in this field. This study has pointed to a way forward to develop a contextualized benchmark system, better databases, and further research in order to strengthen policy evaluation and decision making in the design of an equitable health care system for the people of China.

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Appendix :Benchmarks of Fairness Recommended (by Norman Daniels et al)

Benchmark	Recommended main criteria
Benchmark 1. Intersectoral public health	1. Degree to which reform increases the percentage of population, demographically differentiated where relevant and possible, receiving the following • Basic nutrition • Housing Crowding Homelessness Physical adequacy • Environmental factors Clean water (and water treatment) Sanitation (vector control) Clean air Reduced exposure to workplace and environmental toxins • Education and health education Literacy Basic education Health literacy Nutritional education Sex education and promotion Substance abuse education Anti-smoking education Anti-drug and alcohol abuse education • Public safety and violence reduction Vehicular accident reduction Violence reduction (homicide, rape) Domestic abuse (women, children) 2. Development of information infrastructure for monitoring health status inequalities • Provision for regular measurement of health status inequalities, using appropriate indicators • Research into interventions most likely to reduce health status inequalities 3. Degree to which reform has actively engaged intersectoral efforts at

	local, regional, and/or national level to improve social determinants of health, and the degree to which vulnerable groups have been involved in defining these efforts.
Benchmark 2. Financial barriers to equitable access	1. Informal sector coverage: Universal access to the most appropriate package of basic services, and improvement of packages over time; Portability of coverage (geographical, employment status) 2. Insurance for formal sector: Reduction of the obstacles to enrolling people in the formal sector; Family coverage for enrolled workers; Drug coverage; Medical transportation costs; Producing uniform benefits across all groups of workers; Integrating various schemes involving those workers
Benchmark 3. Nonfinancial barriers to access	1. Reduction in geographical maldistribution of services, supplies, etc. 2. Gender issues affecting access: degree of reproductive autonomy, access to resources, authority in family regarding decisions, sensitivity of services 3. Cultural barriers: language, attitudes towards disease 4. Discrimination (race, religion, class, sexual orientation, disease stigma)
Benchmark 4. Comprehensiveness of benefits and tiering	**1.** All effective and needed services deemed affordable, by all needed providers, no categorical exclusion. **2.** Reform reduces tiering and achieves more uniform quality Integrates services to the poor and others
Benchmark 5. Equitable financing	Is financing by ability to pay? • If tax based-scheme: How progressive (by population subgroup)? How much reliance on cash payments (by subgroup)? • If premium-based: Is it community-rated (by subgroup)? Reliance on cash payments (by subgroup)? • Out-of-pocket payments contribute to both: Main source of shifting burdens to the sick
Benchmark 6. Efficacy, efficiency and quality of health care	1. Primary health care (PHC) focus • PHC training for community-based delivery Population-based Community participation Integration with rest of system (referrals) Intersectoral integration (social and environmental determinants) • Incentives • Appropriate allocation of resources to PHC • Interactive community participation, including vulnerable subgroups • Referral mechanisms Primary health care gatekeepers By-passing primary health care sites Respect for autonomy 2. Implementation of evidence-based practice

	• Health policies • Public health and clinical prevention • Therapeutic interventions Incentives for clinical guidelines Evidence-based evaluation of methods for managing utilization of services • Information infrastructure and database Evidence-based research on clinical and public health measures Health services research on patterns of care Population health needs and utilization rates, including variation studies (with demographic differentiation) 3. Measures to improve quality • Regular assessment of quality, including satisfaction, with surveys or community group involvement as appropriate • Accreditation of plans and hospitals • Professional training Curriculum focused on fair design of system Continuing education
Benchmark 7. Administrative efficiency	1. Minimize administrative overheads • Appropriate technology acquisition Purchase Maintenance Training • Reduce excessive marketing costs (hospitals or plans) • Efficient use of personnel Reduction of excess Appointments and promotions based on competence • Appropriate economies of scale Adequate risk pools for insurers • Reduction of duplicate structures, including integration of vertically organized programs • Minimize transaction costs Enrolment and disenrollment costs Transfers of personnel or patients Minimize loss of needed personnel from system as a whole (brain drain) • Oversupply of some services in some areas 2. Cost-reducing purchasing • Reduce price variation

	• Drug cost reduction through large scale purchasing • Reliance on (quality) generics where possible 3. Minimize cost shifting • Cost shifting from PC to tertiary • Cost shifting to patients • Cost shifting to public sector or insurance from other types • Cost shifting between schemes 4. Minimize abuse and fraud and inappropriate incentives • Shadow providers, partial and total • Practitioner auto-referral • Drug sales at profit by rural doctor • Billing practices • Unqualified practitioners in rural areas (also a problem in urban areas in Karachi) • Vehicles and other perks • Inappropriate promotion of drugs and devices • Appropriation of public resources for private practice
Benchmark 8. Democratic accountability and empowerment	1. Explicit, public, detailed procedures for evaluating services with full public reports • Use reports • Performance reports • Compliance reports • Use of adequately qualified consultants 2. Explicit deliberative procedures for resource allocation with transparency and rationales for decisions based on reasons all "stakeholders" can agree are relevant 3. Global budgeting 4. Fair grievance procedures • Legal procedures (malpractice) • Non-legal dispute resolution procedures 5. Adequate privacy protection 6. Measures for enforcement of compliance with rules and laws 7. Strengthening civil society • Enabling environment for advocacy groups • Stimulating public debate, including participation of vulnerable groups
Benchmark 9. Patient and provider autonomy	1. Degree of consumer choice: choice of primary care providers, choice of specialized care providers, choice of alternative providers, choice of procedures; 2. Degree of practitioner autonomy