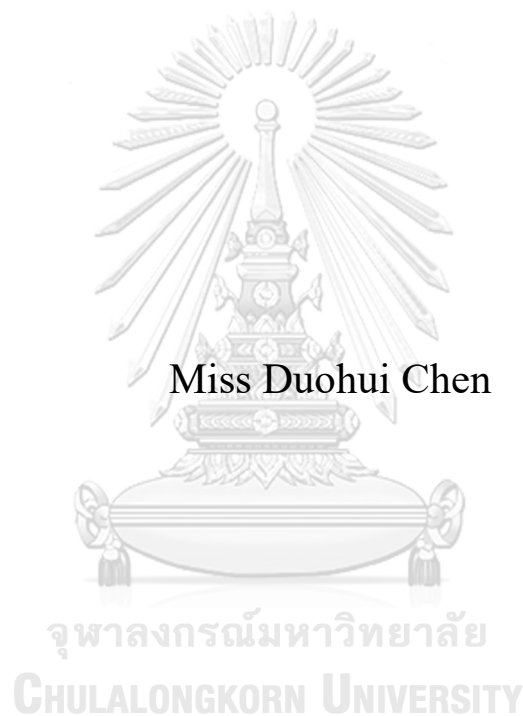


Association between Medical Insurance Choices and Healthcare  
Utilization among Diabetes Patients in the People's Republic of  
China: A Secondary Data Analysis



Miss Duohui Chen

A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Public Health in Public Health

COLLEGE OF PUBLIC HEALTH SCIENCES

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ความสัมพันธ์ระหว่างทางเลือกการประกันสุขภาพ และการใช้ประโยชน์ด้านสุขภาพ ในผู้ป่วย

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Diabetes Patients in the People's Republic of China: A Secondary Data Analysis

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บทคัดย่อ

ในปี 2561 อัตราการประกันสุขภาพถ้วนหน้าในจีนสูงถึง 95% เนื่องจากขาดแคลนทรัพยากรทางการแพทย์และสุขภาพ และความสามารถในการให้บริการด้านสุขภาพไม่เพียงพอของสถานพยาบาลระดับปฐมภูมิในจีน ทำให้ปัญหาที่ใหญ่ที่สุดของระบบสาธารณสุขในจีน คือความแออัด โดยเฉพาะอย่างยิ่งในการใช้บริการผู้ป่วยนอกในโรงพยาบาลระดับทุติยภูมิและตติยภูมิ

การศึกษานี้มีวัตถุประสงค์เพื่อ วิเคราะห์ปัจจัยความสัมพันธ์ระหว่างการเลือกประกันสุขภาพ กับการใช้บริการด้านสุขภาพของผู้ป่วยเบาหวาน ในกลุ่มผู้ป่วยอายุ 45 ปีขึ้นไป ในประเทศจีน สถิติการคลอดยาลิจิสติกนำมาใช้เพื่อประเมินความสัมพันธ์ ระหว่างประเภทโรงพยาบาลของผู้ป่วยเบาหวานสูงอายุ กับการประกันสุขภาพขั้นพื้นฐานในประเทศจีน โดยใช้ข้อมูลทุติยภูมิจากการสำรวจด้านสุขภาพในปี 2018 ในประเทศจีน โดยใช้ข้อมูลประชากรทั้งสิ้น 19,305 คน

ผลการศึกษาพบว่า ชาวจีนวัยกลางคนและผู้สูงอายุ ที่เป็นผู้ป่วยเบาหวานที่มีโรคเรื้อรัง มีการใช้บริการผู้ป่วยนอกในโรงพยาบาลสูง เมื่อเทียบกับผู้ป่วยอื่นๆ ที่ไม่มีโรคเบาหวาน และผู้ป่วยเบาหวานที่ไม่มีโรคเรื้อรังอื่น ๆ นอกจากนี้ ผลการศึกษายังพบว่า ในหมู่ผู้ใหญ่วัยกลางคนและวัยชราชาวจีน ที่มีน้ำหนักน้อย จะมีการใช้บริการผู้ป่วยนอก มากกว่าผู้ที่น้ำหนักปกติ จากผลการวิจัยนี้ การให้บริการผู้ป่วยนอกในโรงพยาบาลระดับทุติยภูมิและระดับตติยภูมิในจีน ควรมีการปรับปรุงคุณภาพของบริการ ที่ให้บริการจากสถานพยาบาลระดับปฐมภูมิ และการใช้ประโยชน์จากสถานพยาบาลระดับปฐมภูมิ ด้วยเหตุนี้ การศึกษานี้จึงต้องการเสนอแนะ ให้ส่งเสริมระบบการวินิจฉัย และการรักษาตามลำดับขั้น และสร้างความร่วมมือด้านการรักษาพยาบาล เพื่อปรับปรุงระบบการประกันสุขภาพถ้วนหน้าให้ดีขึ้นได้



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#### ABSTRACT

Since 2018, the universal medical insurance coverage rate has reached 95% in China. Due to the lack of medical and health resources and insufficient health service capacity of primary health care facilities in China, the biggest problem with the health system in China is overcrowding, especially in the utilization of outpatient services in secondary and tertiary hospitals.

This study aimed to analyze the factors Association between Medical insurance Choices and healthcare Utilization among diabetes patients among patients of age >45 years in China. The logistic regression was used to assess the association between type of hospital of elder diabetic patients and basic medical insurance in China. Data from 2018 waves of the China Health and Retirement Longitudinal Survey were used, 19,305 samples were analyzed.

This study found that among Chinese middle-aged and elderly, diabetes patients with other chronic disease increased the likelihood of using outpatient care in hospital than compared to patients without diabetes and diabetes patients without other chronic diseases. The results also found that among Chinese middle-aged and old adults, underweight people increased the likelihood of using outpatient care than healthy weight people.

Based on the findings of this study, reducing the utilization of outpatient services in secondary and tertiary hospitals in China were required improving the quality of services rendered from primary health care facilities and the utilization of primary health care facilities. As a result, this study would like to suggest that continue to promote the hierarchical diagnosis and treatment system and establish medical treatment partnerships, to improve medical insurances system.

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Duohui Chen

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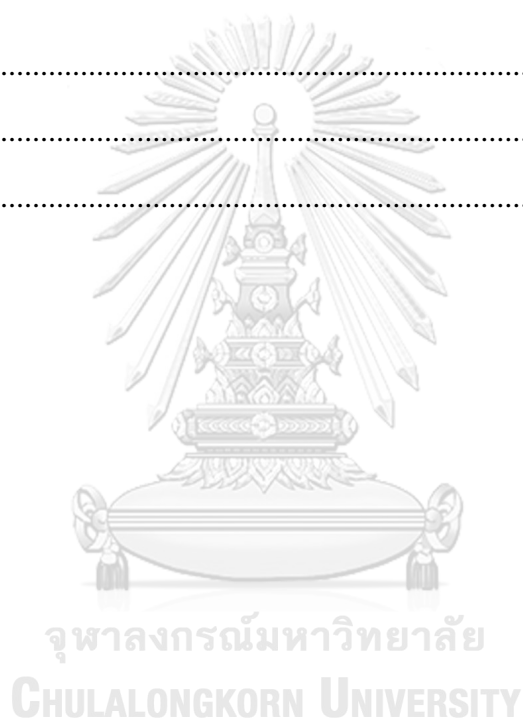
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## List of Abbreviations

**WHO:** World Health Organization

**NBSC:** National Bureau of Statistics of China

**NCBI:** The National Center for Biotechnology Information

**NRCMS:** Respectively are New Rural Cooperative Medical Scheme

**BMIUE:** Basic Medical insurance for Urban Employees

**BMIURR:** Basic Medical Insurance for Urban and Rural Residents

**BMIUR:** Basic Medical insurance for Urban Residents

**NRCM:** New Rural Cooperative Medical Insurance system

**COPD:** Chronic Obstructive Pulmonary Disease

**DALY:** Disability-adjusted life years

**BMI:** Body Mass Index

**NCDs:** Noncommunicable diseases

**IDF:** International Diabetes Federation

**HSB:** Health seeking behavior

**PHC:** Primary health care

**CHARLS:** China Health and Retirement Longitudinal Survey

**CDS:** Chinese Diabetes Society

**T1DM:** Type 1 Diabetes mellitus

**T2DM:** Type 2 Diabetes mellitus

NHSA: National Healthcare Security Administration

## CHAPTER 1: INTRODUCTION

### 1.1 Background and Rationale

With the development of society, improving social economy and living standard, the requirements of the quality of medical services for Chinese have risen, in particular. However, due to the severe aging of the population, China's demographic structure has changed, and the disease spectrum has also changed, leading to changes in Chinese residents' demand for social health care services. The demand for high-quality medical and health services has been increasing.

The aging population has become a prominent problem facing all countries in the world. Virtually, every country in the world is experiencing growth in both the size and the proportion of elderly in the population. Globally, the population aged 65 and over is growing faster than all other age groups.

In 2019, there were 703 million persons aged 65 years or over, in term of the global population. This number of populations worldwide is estimated to double to 1.5 billion in 2050. Globally, the proportion of the aged 65 and above populations increased from 6 % in 1990 to 9 % accounting for the total population in 2019. There is estimated to rise further to 16 % in 2050 indeed, which implies that one in six people worldwide will be



aged 65 years or over. By region, Eastern and South-Eastern Asia was ranked the first which indicates that the number of elderly residents in this area is largest (261 million) among the world, followed by Europe and Northern America (over 200 million)(WHO, 2021a).

In the next 30 years, from 2019 to 2050, the number of elderly people in all regions of the world will increase. The population growth rate in East and Southeast Asia is expected to be the largest (312 million), increasing from 261 million in 2019 to 573 million in 2050. It is expected that by 2050, East and Southeast Asia will still be the most populous regions. By 2019, the number of elderly people in Central Asia and South Asia will account for one sixth (17%) of the World population. It is expected that by 2050, this number will rise to about one fifth (21%) of the World population(Economic & Affairs, 2020).

In terms of the growth rate of elderly population, nine of the top ten countries or territories in the world are located in Eastern and South-Eastern Asia during 2019 to 2050. The largest increase is foreseen for the Republic of Korea (23 %), followed by Singapore (21 %) and Taiwan (20%)(Economic & Affairs, 2020).

Since the beginning of 21st century, China has become one of the countries with the fastest aging population in the world. The number of people aged 65 and above increased from 88.21 million in 2000 to 176.03 million in 2019, accounting for 12.6 % of the total population, up from 7.0 %. By 2040, people years 65 and older are expected to make up more than 20 % of the whole population of China. At the same time, the elderly live longer: the number of people aged 80 and over is growing at a rate of 5%

a year and will exceed 74 million by 2040 (Chatterji et al., 2008). The rapid trend of population aging is also closely related to the decline in fertility and birth rates, the decline in death rates and the increase in life expectancy.

In addition, with the advancement of industrialization and urbanization, as well as, the change of ecological environment and lifestyle, chronic diseases were become the main cause of Chinese residents' disease burden.

As shown in the Global Burden of Disease Study of systematic analysis, chronic diseases such as stroke, ischemic heart disease, diabetes and lung cancer are now the leading causes of disease burden in China (Zhou, Wang, et al.,2019).

Meanwhile, data from China's disease surveillance system shown that from 1991 to 2019, the proportion of deaths from chronic diseases in the total deaths in China has been on the rise, from 73.8% in 1991 to 88.46% in 2019, and the number of deaths is nearly 67.451 million. Chronic diseases have become the main cause of death among urban and rural residents in China, accounting for 88.69% and 88.35% of urban and rural deaths, respectively. The proportion of deaths from endocrine, nutritional, and metabolic diseases increased from 2.78% in 1998 to 3.42% in 2019, and still showing a trend of rapid rise (NBSC, 2000-2020; Zhou et al., 2019). In terms of the potential determinants of death and disability-adjusted life years (DALY), high blood pressure, smoking, and a heavy-salt diet were the top risk factors for Chinese residents by 2017. Among them, smoking was the biggest risk factor for disease burden, while drinking was the tenth biggest risk factor in China. In 2017, high blood pressure caused 2.5 million deaths in China, 96% of which were ultimately due to cardiovascular disease. From 1990 to 2017, in the ten major risk factors, overweight of Chinese population

accounted for the biggest change, which increased by 185 percent. Future more, diabetes has become one of the main causes in Chinese patient death among other chronic diseases.

Diabetes was top 10 in terms of the death in China. With the accelerated process of aging, the number of diabetes patients in China is increasing year by year. China has one-third of the world's diabetics (lu, 2018). The prevalence of diabetes in global average is lower than China, with the 113.9 million patients in China (Han Cho, 2014; Xu et al., 2013).

For diabetes, type 2 diabetes is the main type suffered by patients in China which accounting for more than 90% of total patients with diabetes. And the prevalence of type 2 diabetes in the elderly is 20.4%. Diabetes patients have a high incidence of complications and disability (Castro-Rodríguez et al., 2016; Domingueti et al., 2016; Salinas et al., 2018), which increases the utilization of medical and health service resources and is the main component of social and economic burden (Lehnert et al., 2011). If diabetes is not effectively controlled, it is easy to cause complications of multiple systems, such as nervous system, cardiovascular system, urinary system, and respiratory system, etc. The occurrence of complications not only aggravates the physical pain of patients, but also promotes the breeding of psychological negative emotions of patients, which has a serious impact on the treatment and prognosis of patients (Lin, 2017).

Summarizing the current situation of the disease spectrum in China, it can be found that malignant tumors, cardiovascular diseases, and endocrine diseases are the diseases with rapidly increasing morbidity and mortality. Chronic diseases such as cardiovascular and

cerebrovascular diseases, cancer, chronic respiratory diseases, and diabetes account for more than 70% of the total disease burden. Also have become an important factor restricting the improvement of healthy life expectancy (China, 2006).

At present, chronic diseases have become a major public health problem that seriously threatens the health of Chinese residents and affects the economic and social development of China. Tackling chronic diseases, especially among the elderly, has been a priority strategy in China's expanding health care system.

However, the rising prevalence of chronic diseases has greatly increased the demand for medical and health services among Chinese residents and posed challenges to the existing medical and health system. Due to the weakness of health resources and primary hospitals with insufficient health service capacity in China, the healthcare system presents an "inverted pyramid" pattern of resource allocation, which leads to the dilemma of "difficult and expensive access to medical services". Patients prefer to bypass the primary health care facilities due to the unbalanced resources allocation, that will make the secondary and tertiary healthcare hospital overwhelmed.

In order to solve the problem of unbalanced resource allocation, on September 8, 2015, the General Office of the State Council of China issued the Guiding Opinions on Promoting the Construction of the Hierarchical Diagnosis and Treatment System, which planned to accelerate the construction of the Hierarchical Diagnosis and Treatment System, and form a scientific and orderly pattern of medical treatment, to improve people's health, as well as, guarantee and improve people's livelihood (Min, 2015).

Relevant studies have shown that the hierarchical diagnosis and treatment system can fully mobilize patients to use primary health care facilities, which plays an important role in improving the effectiveness of prevention and treatment of chronic diseases and

reducing medical costs for patients. However, the behavior of patients seeking medical treatment is often influenced by various subjective and objective factors, and the behavior of patients with chronic diseases presents a certain bias due to their special disease characteristics (slow onset, long course of disease, and difficult recovery of some diseases, etc.) (WHO, 2020; Zhou et al., 2019).

China has eliminated absolute poverty, but there is still a certain gap between rich and poor. Low-income groups face challenges in accessing health services and are more likely to be pushed into poverty by health spending. This has exacerbated the gap between the use of health care by the poor and the rich.

There are two different types of basic medical insurance in China including Basic Medical insurance for Urban Employees (BMIUE) and Basic Medical Insurance for Urban Residents (BMIURR). BMIUE is covering all urban employees, including enterprises, government organs, public institutions, social organizations, private non-enterprise units and their employees. With the former Ministry of Labor and Social Security clarifying the insurance policy for flexible employees, migrant workers and non-public economic organizations, the basic medical insurance for urban workers covers all urban employees. The 220 million Chinese people had participated in the BMIUE in the end of 2009. BMIUE is largely funded by beneficiaries' payroll taxes.

BMIURR is mainly covers urban and rural residents who are not covered by the basic medical insurance system for workers, including students (including college students), children and other non-working residents, and can voluntarily participate in the medical insurance for Chinese residents. Meanwhile, the rural cooperative medical care system

and urban medical insurance are integrating into BMIURR in 2017. From 2011 to 2015, the premium level of the new rural cooperative medical care system and the quality-of-life insurance for urban residents both increased considerably, and its coverage was further expanded. In general, the reimbursement scope of "New Rural Cooperative Medical Care" and "Basic Medical Insurance for Urban Employees" is smaller than that of "urban medical insurance", and the reimbursement ratio is lower than. In 2017, the reform of China health insurance system had implemented, urban and rural medical insurance had integrated, and basically realized the health insurance coverage. If the coverage reaches 90%, it is universal health insurance. Now china's coverage is 95%. The funding sources of the new rural and urban residents' insurance medical system are mainly government and insurance premiums, of which government subsidies account for the majority.

Some scholars believe that the type of medical insurance and its payment scheme also has a certain impact on choosing of primary health care facilities for patients. Therefore, how to make reasonable and fair use of medical insurance to change the habits of Chinese residents, achieve a reasonable allocation of medical and health resources, and promote the development of China's medical and health undertakings, is a problem worthy of attention and research.

This study will use the Chinese health and pension tracking data in patients with chronic disease especially diabetes treatment choice preference. The potential affecting factors of the utilization of health care services are analyzed. This study also gives the advice to formulate and perfect the chronic disease management policy and provide a reference basis in terms of suggesting policymakers make policies more targeted, as well as guide the patients with chronic disease especially diabetes to primary health care facilities to

get health care services.

## **1.2 Statement of the problem**

### **1.2.1 Research Gap**

1. The coverage of medical insurance is a key factor to explore whether patients with diabetes can actively access health services in primary health care institutions, especially in a multi-level medical security system with full coverage of medical insurance.
2. Whether the medical insurance policy can be adjusted to reasonably regulate the medical seeking behavior of diabetic patients, to more reasonably allocate medical and health resources and promote the promotion of hierarchical diagnosis and treatment system.

### **1.3 Research Questions**

1. Is there any association between medical insurance and the healthcare utilization for diabetic in China?
2. How do different medical insurance schemes affect the decision to use outpatient service for diabetic in China?
3. How do different medical insurance schemes affect the choice of primary and higher level (secondary and tertiary) health care facilities among diabetic in China?

### **1.4 Objectives of the Study**

#### **1.4.1 General objective**

To assess how socio-demographic factors and medical insurance scheme affect the decision to utilize outpatient services and conditioning on use the

choice among primary and higher level which are secondary and tertiary health care facilities utilized by diabetic in China.

#### **1.4.2 Specific objective**

1. To assess the impact of socioeconomic-demographic factors on the use of outpatient service for diabetic.
2. To assess the effect of socioeconomic-demographic factors on the choice of three-tiered health care facilities among diabetic who use outpatient services.
3. To assess the impact of different medical insurance schemes on the use of outpatient service for diabetic.
4. To assess the effect of different medical insurance schemes on the choice of primary and higher level (secondary and tertiary) health care facilities among diabetic who use outpatient services.

#### **1.5 Expected Benefits**

1. Clarifying the health service needs of diabetic patients in China.
2. Clarify the preference of Chinese diabetic patients in primary health care.
3. Clarify whether medical insurance has an impact on the medical preference of patients with chronic diseases.
4. Policy support for basic medical insurance reform.

#### **1.6 Conceptual Framework**

In this study, the third stage of Andersen behavioral model was selected as the theoretical framework, and based on this model, the factors influencing the choice of medical treatment in diabetic patients were identified. It is composed of three parts: main determinants, health behaviors and health outcomes, and points out the impact of health



services on maintaining and improving the health status of the population, covering both the cognitive health service utilization of individuals and the health service utilization assessed by doctors.

Health behaviors include individual health behaviors (diet and exercise) and health service utilization, while health outcomes include cognitive health status, objective health status and patient satisfaction. The interplay between personal hygiene behaviors (diet, exercise and self-care) and health service utilization (choice of medical care for patients with diabetes) influences health outcomes.

Based on the interaction of each part, the research purpose and the accessibility of variable information are considered comprehensively. This study proposes a model of influencing factors for the choice of medical institutions for patients with diabetes.

The conceptual framework is illustrated as follows: (Figure 1)

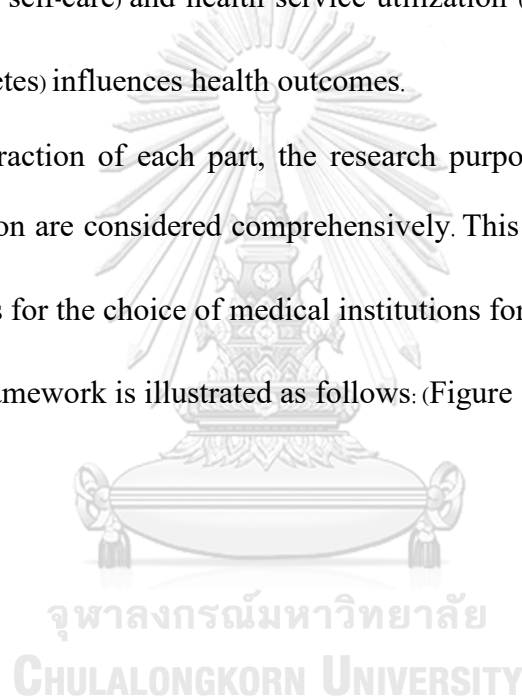
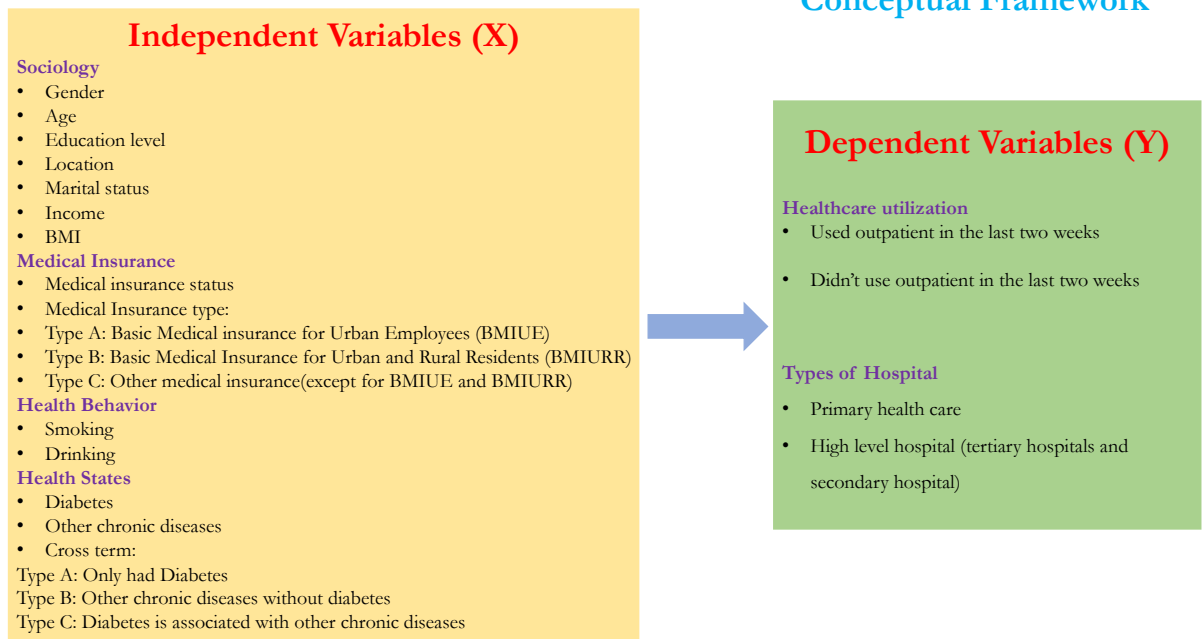


Figure 1: Conceptual Framework

## Conceptual Framework



### 1.7 Research Hypotheses

- **Null Hypothesis:** There is not an association between type of hospital of elder diabetic patients and basic medical insurance in China.
- **Alternative Hypothesis:** There is an association between type of hospital of elder diabetic patients and basic medical insurance in China.

### 1.8 Operational Definition

Operational definition of dependent variable is described as follows:

Table 1: Operational Definition of Dependent Variables

Variables	Definition
<b>Healthcare utilization</b>	The utilization of healthcare refers to the number or description of services that individuals use to prevent and treat health problems, promote the maintenance of

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health and well-being, or obtain health status and diagnostic information.(Aday & Awe, 1997; Andersen & Newman, 1973; Andersen, 2008).

In this study, the variable was defined as the utilization of outpatient services.

### **Types of Hospital**

Type of hospital is a hospital qualification assessment based on hospital scale, research direction, personnel and technical strength, medical hardware equipment, etc. The type of hospital is determined as the third level after evaluation, primary hospitals, secondary hospitals, tertiary hospitals.

A primary hospital that provides services to citizens residing in rural areas or small communities; they typically have less than 100 beds.

Secondary hospitals provide services to individuals residing in small and medium-sized cities. They usually have 100 to 500 beds.

Tertiary hospitals provide services to communities and large cities, providing professional care in larger areas(Li et al., 2019).

**Primary health care (PHC)** Primary health care is a health approach for the entire society, aimed at ensuring the highest possible level of health, well-being, and equitable distribution by paying attention to people's needs, from health promotion and

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disease prevention to treatment and rehabilitation.

Palliative treatment(World Health, 2019).

**High level hospitals (including tertiary hospitals and secondary hospitals)** Tertiary hospitals (also called a tertiary hospital, tertiary referral center, tertiary care center, or tertiary center) is a hospital that provides tertiary care(Chun et al., 2009).

Secondary Hospital Services Component: This component is intended for a smaller acute care hospital without a licensed pharmacy in a rural setting that is receiving licensed pharmacist services from a larger hospital in another location or from a community pharmacy. The level of pharmacy practice meets the needs of the hospital and typically involves drug distribution, limited hours and patient care services.

This does not include a facility with only transitional care beds, long term care beds or a mixture of both.

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Operational definition of independent variables are describes as follows:

Table 2: Operational Definition of Independent Variables

<b>Variables</b>	<b>Definition</b>
<b>Predisposing factors</b>	
Gender	Defined as Male and Female.
Age	There is divided into following three groups basic on CHARLS Database

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	(Population age is 45 and above) and Elder Age standard in WHO:  45-54 years old group and 55-64 years old group and above 65 years old group.
Education level	Highest level of education that population achieved.  That attained categorized into “illiteracy” “Primary school” “Middle school” “High school” and “above High school” (including “High Vocational Certificate” “Bachelor's degree”, and “Higher than bachelor's degree”).
Location	The residential area where population Hukou at the time of the survey. That include into urban area and rural area.
Marital status	Marital status of the population at the time of the survey, defined as Married (including “divorced”, “widowed” and “separated”) and Never married
Income	Defined as a range of average income per month at tome of the survey questionnaire.

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There were following three groups basic on the median proportion method (income less than 50% of the national median standard in the median proportion method).

the individual's income is 0 (people without income of the sample size)

the individual's income is (0-18000) in second third (people with income between the 0%-50% of the sample size)

the individual's income is (>18000) in the highest third the highest 50% of the sample size)

#### BMI (Body Mass Index)

BMI is a measure for indicating nutritional status in adults.

BMI was divided into the following four groups according to WHO standards(Consultation, 2004; Lim et al., 2017; Organization, 2000; Pan & Yeh, 2008):

Underweight (< 18.5),

Health weight (18.5 - 22.9)

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Overweight (23.0 27.5)

Obesity ( $\geq 27.5$ )

### Enabling factors

Basic Medical Insurance System

At present, China's basic medical insurance system includes two parts: the BMIURR (including NRCM and URBMI) and the BMIUE.

Medical insurance status

Medical insurance ownership status, (including "have" and "have not")

Health Insurance type

**Type A:** Basic Medical insurance for Urban Employees (BMIUE)

**Type B:** Basic Medical Insurance for Urban and Rural Residents (BMIURR)

The BMIURR is integrated the BMIUR and the NRCM.

**Type C:** Other medical insurance

In this study, that include commercial insurance and supplementary insurance.

### Need factors

Smoking

Defined to Never smoking and Smoking.

Drinking

Defined to Never drinking and Drinking (including Drink more than once a month

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	and Drink but less than once a month)
Diabetes	Have been diagnosed with Diabetes or high blood sugar by a doctor (Not including physical examination)
Other chronic diseases	have been diagnosed with other chronic diseases without Diabetes or high blood sugar by a doctor.
Cross term:	<b>Type A:</b> Only had Diabetes
the partial effect, elasticity, or semi-elasticity of the dependent variable with respect to an explanatory variable to depend on the magnitude of yet another explanatory variable(Wooldridge, 2006).	have been diagnosed with Diabetes or high blood sugar by a doctor (Not including physical examination) <b>Type B:</b> Other chronic diseases without diabetes have been diagnosed with other chronic diseases without Diabetes or high blood sugar by a doctor. <b>Type C:</b> Diabetes is associated with other chronic diseases have been diagnosed with Diabetes (high blood sugar) also have other chronic diseases by a doctor.

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## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Andersen behavioral model**

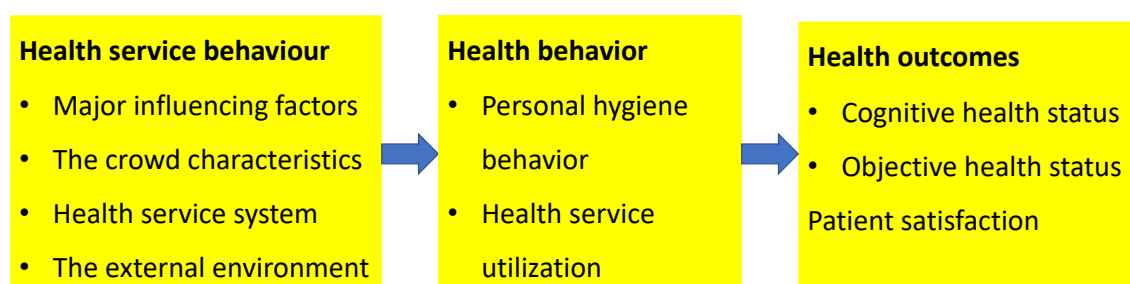
Anderson model of health service utilization is one of the three classical models of health service utilization. Since its establishment, it has been widely used in health service research and health system evaluation. Anderson Model is a conceptual model created by Professor Dr. Anderson of University of Chicago in 1968 to explain why families use health services, and to define and measure the equitable access of health services. The model shows that the decision of individuals to use health services (including inpatient, outpatient, dental care, etc.) is mainly influenced by three aspects: predisposing characteristics, enabling resources, and need factors. Predisposing characteristics including the social structure, education level, occupation, ethnicity, social networks, health belief, attitude, values, the understanding of the health system and demographic characteristics (age, gender, etc.) Enabling resources including family income, health insurance, and the accessibility of medical service, personal community resources, etc.; Necessity is the most direct determinative of health service utilization. Need factors refer to an individual's understanding of medical treatment and treatment options, while assessment need which is also known as clinical need and objective need, is closely related to the type and quantity of health service utilization.

In 1985, Anderson model evolved into the third stage, forming three linear components: 1) the main determinants, 2) healthy behaviors, and 3) health outcomes. It is also pointed out that the impact of health service team on maintaining and improving the health

status of the population covers both the health service utilization as perceived by individuals and the health service utilization as assessed by health service providers. The Anderson model at this stage recognizes that external environmental factors (natural, political, and economic environment) are an important component of health service utilization and interprets the view that health behaviors determine health outcomes. Health behaviors are related to individual health behaviors including diet, physical activities, and health service utilization, while health outcomes include cognitive health status, objective health status and patient satisfaction. Personal health behaviors such as diet, exercise and self-assurance interact with the use of health services to influence health outcomes (YQ Wang et al., 2017).

In addition, enabling factor refers to the variable that promotes or hinders the behavior of people seeking medical treatment and reflects the accessibility of health services. Demand factors include subjective perception and objectivity of the patient's health status. The indicators selected in different studies are different. (Figure 2)

Figure 2: The third stage Anderson model (1985)



Source: (YQ Wang et al., 2017)

This study mainly analyzed the utilization of outpatient services and combined with the medical behavior in the Anderson Health Service Model, improved the utilization of

outpatient services of patients with diabetes, in particular, the types of health care facilities they choose to utilize outpatient services. Based on the Anderson Health Service Model, the factors influencing the utilization of outpatient services for diabetic were analyzed and studied from the dimension of personal characteristics, and it is used as the theoretical framework in terms of accessing the utilization of outpatient services for diabetic in this study.

## 2.2 Chronic Disease

The World Health Organization (WHO) indicates chronic diseases are diseases that do not constitute infection, with hidden onset, long duration, and slow development. It is the result of a combination of genetic, physiological, environmental, and behavioral factors. The four major chronic diseases are cardiovascular and cerebrovascular diseases, diabetes, malignant tumors, and chronic respiratory diseases.

- Characteristics of chronic diseases
  1. Chronic disease is not a specific disease, it is a general designation of a variety of diseases and these diseases have common features. For example, cancer diseases such as stomach cancer and rectal cancer, as well as chronic mental diseases such as obsessive-compulsive disorder and depression. Every species has different characteristics and treatments.
  2. The etiology of chronic diseases is characterized by complexity. Sometimes there is no specific source and cause of a certain disease, which may be related to the patient's living environment, eating habits, family history and other contextual factors.

3. The onset of chronic diseases cannot be found. In the initial stage, the symptoms are not obvious, after a long course of disease development and spread, symptoms have been highlighted. The relatively long time during the occurring of obviously symptoms resulted in missing the best treatment opportunity. It is also one of the factors that make chronic diseases difficult to control.
4. Chronic disease cycle is long, the disease spread fast, most of the disease is difficult to heal. Patients with chronic diseases not only need to accept the reality psychologically, but also insist on continuous treatment.

Currently, chronic diseases are a major threat to the health of the population worldwide. It was reported that 39.5 million people died from chronic diseases in 2016, accounting for 72.3% of global deaths, and that the combination of disability adjusted life years (DALYs) due to chronic diseases (DALYs) is an indicator of health years lost from disease and health years lost from disease, that is a comprehensive indicator of quantity of life and quality of life in terms of time) increased by 36.6 percent from 1990 to 2016. The four main types of chronic are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes as these diseases have high mortality rate. Chronic diseases tremendously influenced people in low- and middle-income countries, and the total death a number of people caused by chronic diseases in these countries account for more than three quarters among the worlds.

### **2.2.1 Chronic diseases in the World**

As mentioned above, cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes are the top four main type of chronic diseases in terms of mortality rate. Interventions to reduce environmental, metabolic, and behavioral risk factors, such as air pollution, smoking, obesity, hypertension, unhealthy diets, lack of exercise, and harmful alcohol consumption, can reduce the risk of infection Chronic diseases.

Even though these diseases are somehow preventable and demographic changes may decrease in chronic diseases mortality rates, the number of chronic diseases attributed deaths are still rising(Lopez & Murray, 1998). There is trend cutting across all income groups, globally, from low-income countries to wealthier nations. Hence, chronic diseases account for most of global deaths each year.

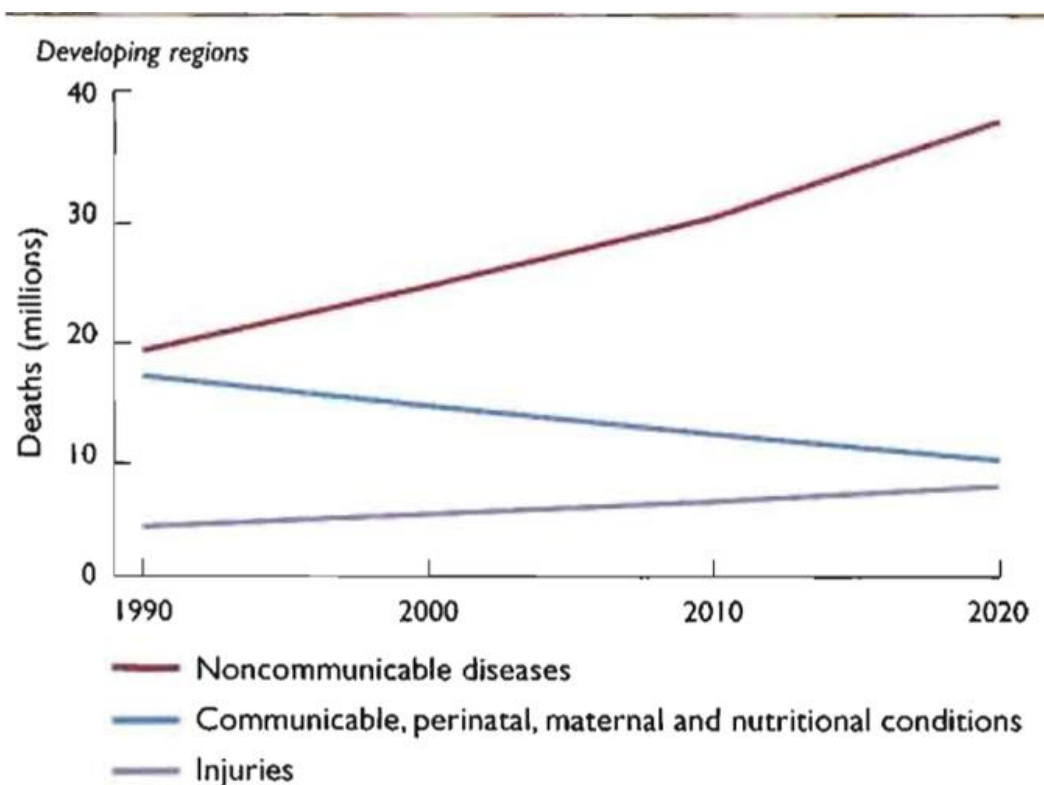
There are dramatic changes in the health needs of the world's populations in the next two decades. In the developing area where 80% of the population people live in the world, chronic diseases become the fast replacing the communicable diseases to be the biggest health problem, such as depression, heart disease, diabetes, and malnutrition, as chronic disease are the leading causes of premature death. By 2020, chronic diseases are expected to account for seven over ten deaths in the developing regions, compared with less than half today. And the chronic diseases could rival infectious diseases worldwide as a source of unhealth(Lopez & Murray, 1998).

It is expected that these changes will be attributed to the rapid aging of the population in developing countries, a decrease in birth rates, and a relative increase in the number of adults and children. The most common health problem is for adults, not children. In other regions of Asia and Latin America, the so-called 'pandemic shift' is now more advanced than many public health experts(Lopez & Murray, 1998).

Deaths from chronic diseases are expected to climb from 28.1 million a year in 1990 to

49.7 million by 2020 an increase in absolute numbers of 77%. (Figure 3)

Figure 3: Projected trends in death by broad cause Group, developing regions



Source: (Lopez & Murray, 1998)

### 2.2.2 Chronic diseases in China

With the deepening of industrialization, urbanization, and the aging of China's population, as well as the change of ecological environment and lifestyle, chronic diseases have gradually become the main cause of death and disease burden of Chinese residents (Li et al., 2017; Tan et al., 2019; WHO, 2014, 2019). Chronic diseases such as cardiovascular disease, cancer, chronic respiratory disease and diabetes account for more than 70% of the total Disease burden (Thomas et al., 2020).

As a population's birth rate falls, the number of adults relative to children increases, and the population's commonest health problems become those of adults rather than those

of children (Lopez & Murray, 1998). For example, the commonest health problems become adults rather than children in some other parts of Asia and Latin America (Yang et al., 2013).

The 25 major DALYs causes, ranked by the number of DALYs in 2017, as shown in Figure 4. From 1990 to 2017, 18 items experienced an increase in DALYs. In 2017, stroke and ischemic heart disease replaced lower respiratory tract infections and neonatal disease in 1990 as the leading cause of all-age DALYs. In 2017, lower respiratory tract infections dropped from the primary cause of all age DALYs to the 25th. That shows a significant drop in overall DALYs due to infectious disease, pregnant and birth-giving women, newborn, and nutritional status. Age-standardized DALYs per 100,000 population declined for 17 out of 21 non-communicable diseases from 1990 to 2017, with chronic obstructive pulmonary disease, congenital defects, cirrhosis of the liver and stomach cancer showing the biggest descents (Zhou et al., 2019).

Figure 4: Top 25 causes of DALYs in China, 1990–2017 Causes are ranked by

number of DALYs in 2017. COPD=chronic obstructive pulmonary disease.

DALY=disability-adjusted life-years.

Leading causes 1990	Leading causes 2017	Percentage change in number of all-age DALYs	Percentage change in all-age DALYs per 100 000 population	Percentage change in age-standardised DALYs per 100 000 population
1 Lower respiratory infections	1 Stroke	46.8 (38.1 to 53.9)	24.4 (17 to 30.4)	-33.1 (-37.4 to -29.8)
2 Neonatal disorders	2 Ischaemic heart disease	125.3 (109.4 to 138.5)	90.9 (77.5 to 102.1)	4.6 (-3.3 to 10.7)
3 Stroke	3 COPD	-24.2 (-28.9 to -12.9)	-35.8 (-39.7 to -26.2)	-66.4 (-68.4 to -61.2)
4 COPD	4 Lung cancer	140.3 (117.2 to 157.7)	103.6 (84.1 to 118.3)	13.1 (2.3 to 21.2)
5 Congenital birth defects	5 Road injuries	-3.8 (-13.9 to 5.2)	-18.5 (-27.1 to -10.9)	-25.0 (-32.5 to -18.8)
6 Road injuries	6 Neonatal disorders	-64.8 (-70 to -58.8)	-70.2 (-74.6 to -65.1)	-60.8 (-66 to -55.3)
7 Ischaemic heart disease	7 Liver cancer	43.5 (31.3 to 60.3)	21.6 (11.3 to 35.9)	-28.3 (-34.4 to -19.9)
8 Drowning	8 Diabetes mellitus	102.5 (93 to 112.3)	71.6 (63.5 to 79.9)	4.8 (-0.6 to 10)
9 Self-harm	9 Neck pain	81.1 (71.6 to 91.1)	53.4 (45.4 to 62)	2.6 (-1.3 to 6.6)
10 Diarrhoeal diseases	10 Depressive disorders	36.5 (29.3 to 43.9)	15.7 (9.6 to 21.9)	-12.5 (-14.7 to -10.3)
11 Liver cancer	11 Age-related hearing loss	81.3 (77.7 to 84.7)	53.6 (50.6 to 56.5)	-2.6 (-4.1 to -1.3)
12 Stomach cancer	12 Stomach cancer	5.4 (-2.4 to 12.5)	-10.7 (-17.3 to -4.6)	-50.3 (-54 to -47)
13 Tuberculosis	13 Low back pain	23.2 (14.7 to 31.4)	4.4 (-2.8 to 11.3)	-23.2 (-26.9 to -19)
14 Lung cancer	14 Alzheimer's disease	157.0 (138.4 to 170.3)	117.8 (102.1 to 129.1)	-7.5 (-13.8 to -3.1)
15 Depressive disorders	15 Other musculoskeletal	60.8 (50.6 to 72.1)	36.3 (27.7 to 45.8)	-1.2 (-5.4 to 2.1)
16 Drug use disorders	16 Headache disorders	36.2 (31.8 to 41.5)	15.4 (11.7 to 19.9)	-0.2 (-2.5 to 2.2)
17 Low back pain	17 Falls	51.9 ( 8.4 to 74.1)	28.7 (-8.1 to 47.6)	3.8 (-25.6 to 18.6)
18 Cirrhosis	18 Drug use disorders	-5.0 (-12.8 to 2.8)	-19.5 (-26.1 to -12.9)	-21.2 (-28.1 to -14.9)
19 Diabetes mellitus	19 Blindness	74.9 (70.9 to 79.2)	48.2 (44.8 to 51.8)	-7.3 (-9 to -5.9)
20 Headache disorders	20 Congenital birth defects	63.4 (-68.5 to -58.1)	-69.0 (-73.3 to -64.5)	-55.4 (-61 to -48.8)
21 Neck pain	21 Chronic kidney disease	15.5 (8 to 21.3)	-2.1 (-8.5 to 2.8)	-36.1 (-40.6 to -32.9)
22 Age-related hearing loss	22 Hypertensive heart disease	18.3 (6.7 to 39.1)	0.3 (-9.6 to 17.9)	-48.6 (-53.8 to -39.4)
23 Chronic kidney disease	23 Cirrhosis	-12.5 (-23.8 to 24.6)	-25.9 (-35.4 to 5.6)	-53.9 (-59.9 to -34.9)
24 Other musculoskeletal	24 Oesophageal cancer	9.5 (0.7 to 17.8)	-7.2 (-14.6 to -0.1)	-50.1 (-54.1 to -46.4)
25 Hypertensive heart disease	25 Lower respiratory infection	-88.6 (-89.8 to -86)	-90.3 (-91.3 to -88.2)	-88.6 (-89.9 to -86.4)
26 Oesophageal cancer	26 Self-harm			
27 Falls	28 Drowning			
28 Blindness	34 Tuberculosis			
29 Alzheimer's disease	37 Diarrhoeal diseases			

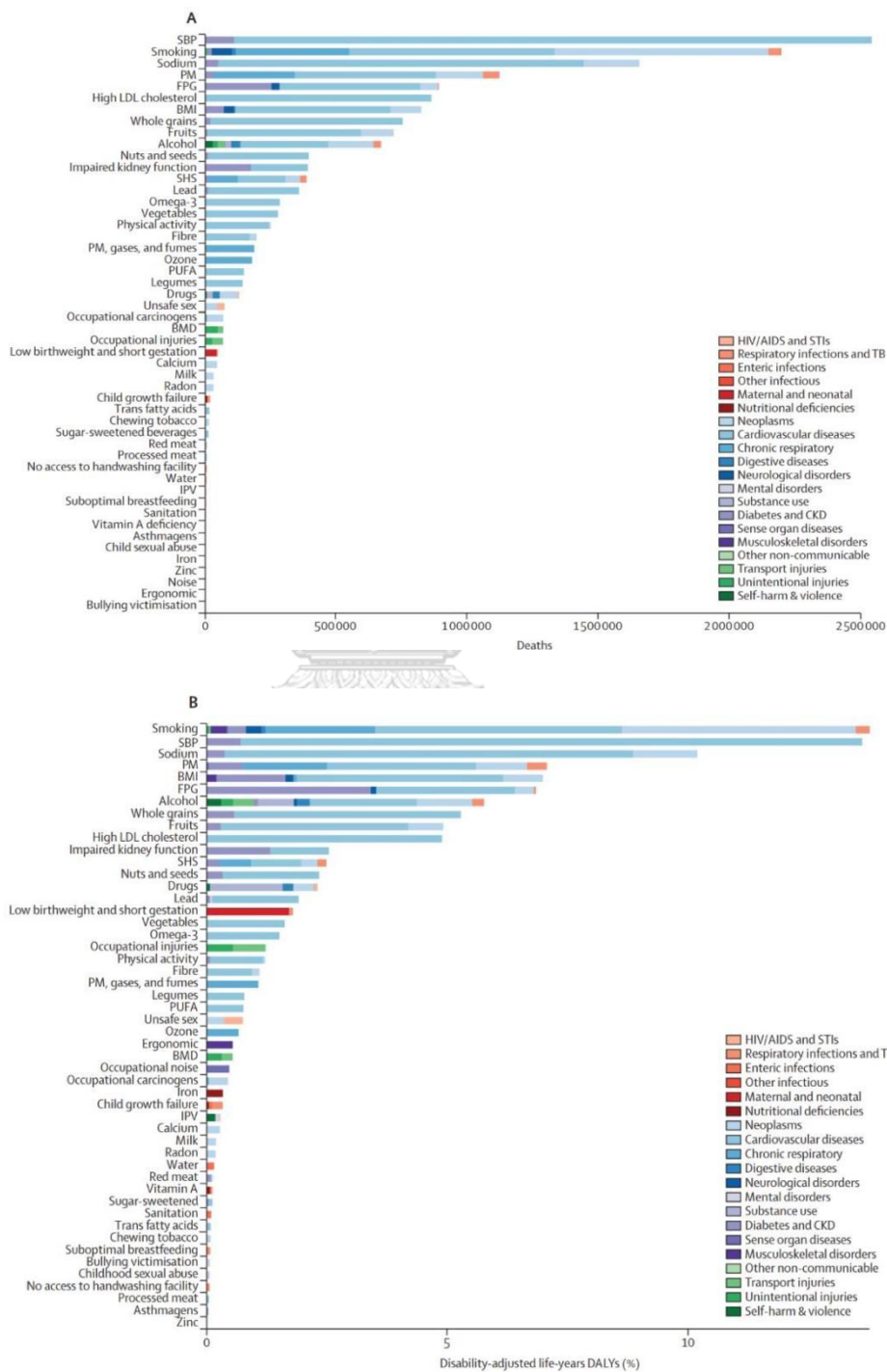
■ Communicable, maternal, neonatal and nutritional  
■ Non-communicable  
■ Injuries

Source: (Zhou et al., 2019)





Figure 5: Number of deaths and percentage of DALYs related to the leading level 3 risk factors in China in 2017



(A) Risk factors and related deaths. (B) Risk factors as percentages of DALYs. Alcohol=alcohol use disorders. Asthmagens=occupational asthmagens. BMD=low bone mineral density. BMI=high body-mass index. Calcium=diet low in calcium. CKD=chronic kidney disease. Drugs=drug use disorders. Ergonomic=occupational ergonomic factors. Fibre=diet low in fibre. FPG=high fasting plasma glucose. Fruits=diet low in fruits. IPV=intimate partner violence. Iron=iron-deficiency anaemia. Milk=diet low in milk. Nuts and seeds=diet low in nuts and seeds. Lead=lead exposure. Legumes=diet low in legumes. Noise=occupational noise. Omega 3=diet low in seafood omega-3 fatty acids. Ozone=ambient ozone pollution. Physical activity=low physical activity. PM=particulate matter pollution. PM, gases, and fumes=occupational particulate matter, gases, and fumes. Processed meat=diet high in processed meat. PUFA=diet low in polyunsaturated fatty acids. Radon=residential radon. Red meat=diet high in red meat. Sanitation=unsafe sanitation. SBP=high systolic blood pressure. SHS=second hand smoke. Sodium=diet high in sodium. Sugar-sweetened beverages=diet high in sugar-sweetened beverages. TB=tuberculosis. Vegetables=diet low in vegetables. Water=unsafe water. Whole grains=diet low in whole grains. Zinc=zinc deficiency.

Source: (Zhou et al., 2019)

### 2.3 Diabetes

Diabetes is a chronic, metabolic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin (a hormone that regulates blood sugar) it produces. That characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. Hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes. The most common is type 2 diabetes that patients suffering, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin (WHO, 2021b).

The potential risk factors for treatment are genetic and environmental factors. Environmental factors may include obesity and physical inactivity. There are Diabetes mellitus type 1 (T1DM), Diabetes mellitus type 2 (T2DM), gestational diabetes and other types of diabetes and the chronic types are T1DM and T2DM.

Table 3: Detailed comparison of diabetes

T1DM	T2DM	Gestational diabetes	Other types of diabetes (IGR)
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			<b>Impaired glucose tolerance (IGT)</b>	<b>Impaired fasting glycaemia (IFG)</b>
<b>Category</b>	Chronic types	—	On an empty stomach	After the meal
<b>Definition</b>	It is a type of diabetes caused by the destruction of pancreatic $\beta$ cells and the absolute lack of insulin. Diabetes with $\beta$ cell destruction for clear reasons does not belong to type 1	The body develops a resistance to insulin, accounts for 90 percent of diabetics worldwide.	It is a type of diabetes that occurs or is diagnosed during pregnancy in women who have normal glucose metabolism before pregnancy or have underlying hypoglycemia.	Pre-diabetes, the intermediate condition between diabetes and healthy people.

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	diabetes.			
<b>Etiology</b>	Occurs when the body fails to produce enough insulin for a variety of reasons.	Heredity, environment, race, age, lifestyle, etc.	It may be related to insulin resistance, heredity, and other factors.	Insulin resistance and Mild deficiency of insulin secretion
<b>Symptoms</b>	The excessive excretion of urine (polyuria), thirst (polydipsia), constant hunger, weight loss, vision changes, and fatigue.	Polydipsia, frequent urination, unexplained weight loss, and possibly too much time, fatigue, or soreness.	Symptoms such as polydipsia, polyuria and appear during pregnancy.	—
<b>Multiple groups</b>	It is common in children (and can	Middle-aged and elderly people with a family	A pregnant woman.	—

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occur in any	history of
age group).	obesity.

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Diabetes itself is not terrible compared to its complications as the complications may harm the physical body of patients. Long-term increase in blood glucose can damage the great blood vessels and micro vessels and endanger the heart, brain, kidney, peripheral nerves, eyes, feet, etc. According to the statistics of the World Health Organization (WHO), diabetes has more than 100 complications, which is one of the diseases with the most known complications. More than half of the deaths from diabetes are caused by cardiovascular and cerebrovascular diseases, and 10% are caused by nephropathy. Amputations due to diabetes are 10 to 20 times more common than those without diabetes (CDS, 2018; Ji et al., 2013).

Acute complication including diabetic ketoacidosis, diabetic non-ketone hypertonic coma, etc.

Chronic complication including loss of vision or blindness, Kidney damage or kidney failure, Neuralgia or nerve damage, Heart and vascular diseases, High blood pressure, Dental problems, Diabetic hand disease, Diabetic foot disease.

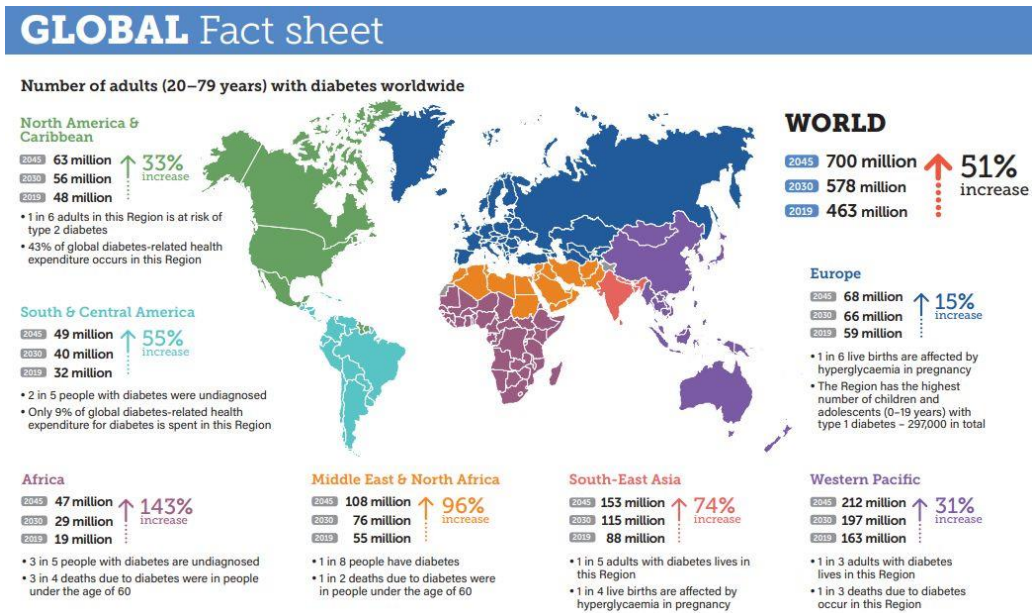
### **2.3.1 Diabetes in the World**

422 million people worldwide have diabetes, particularly in low-and middle-income countries. The number of people with diabetes rose from 108 million in 1980 to 422 million in 2014. Prevalence has been rising more rapidly in low- and middle-income countries than in high-income countries in the world. Between 2000 and 2016, there was

a 5% increase in premature mortality from diabetes. In 2019, an estimated 1.5 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012. Diabetes is one of the leading causes of death in the world. The World Health Organization (WHO) considers diabetes as one of the four major chronic diseases worthy of close attention. The number of deaths from diabetes worldwide increased by 31.1% from 2006 to 2016. Most of the burden of diabetes now falls on patients from low - and middle-income countries, covering most of the world's population; The prevalence and death rates of diabetes have risen sharply in recent decades.

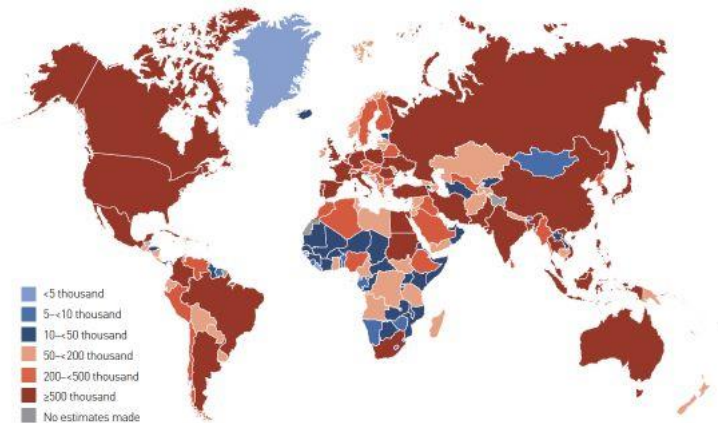
According to the IDF Diabetes Atlas (9th Edition) published on the official website of the International Diabetes Federation (IDF), in 2019, approximately 463 million adults aged between 20 and 79 years have diabetes worldwide (1 in 11 is diabetic). By 2030, the number of diabetics is expected to reach 578.4 million. The number of people with diabetes is expected to reach 700.2 million by 2045 (IDF, 2019). In 2019, there were 351.7 million people with diabetes in the main working group (aged 20-64), and this number is estimated to reach 417.3 million in 2030 and 486.1 million in 2045.

Figure 6: Global Fact Sheet in 2019



Source: (IDF, 2019)

Figure 7: Global distribution of adult diabetes over 65 years of age



Source:(IDF, 2019)

Figure 8: Estimated number of people (20-79 years old) with diabetes in 2019, 2030, 2045

At a glance	2019	2030	2045
Total world population	7.7 billion	8.6 billion	9.5 billion
Adult population (20–79 years)	5.0 billion	5.7 billion	6.4 billion
<b>Diabetes (20–79 years)</b>			
Global Prevalence	9.3%	10.2%	10.9%
Number of people with diabetes	463.0 million	578.4 million	700.2 million
Number of deaths due to diabetes	4.2 million	-	-
Total health expenditures for diabetes <sup>1</sup>	USD 760.3 billion	USD 824.7 billion	USD 845.0 billion
<b>Hyperglycaemia in pregnancy (20–49 years)</b>			
Proportion of live births affected	15.8%	14.0% <sup>ii</sup>	13.3% <sup>ii</sup>
Number of live births affected	20.4 million	18.3 million	18.0 million
<b>Impaired glucose tolerance (20–79 years)</b>			
Global prevalence	7.5%	8.0%	8.6%
Number of people with impaired glucose tolerance	373.9 million	453.8 million	548.4 million

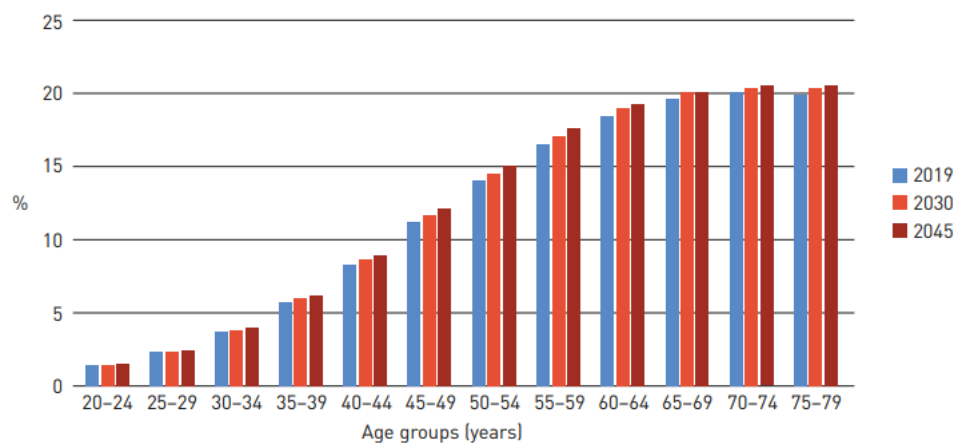
Source: (IDF, 2019)

In 2019, there were 351.7 million people with diabetes in the productive group (aged 20-64), and this number is estimated to reach 417.3 million in 2030 and 486.1 million in 2045.

The global crude prevalence of diabetes (20-79 years old) is 9.3% in 2019 and is projected to be 10.2% in 2030 and 10.9% in 2045; the age-standardized prevalence of diabetes is 8.3% in 2019 and is projected to be 9.2% in 2030 and 9.6% in 2045.



Figure 9: Prevalence of diabetes by age groups in adults (20-79 years) in 2019, 2030 and 2045



Source: (IDF, 2019)

Figure 10 shows the top 10 countries/territories with the highest number of diabetics in 2019. The top 3 countries are China, India, and the United States, with 116.4 million, 77 million and 31 million diabetics (aged 20-79 years), respectively. The top 3 rankings are expected to remain unchanged through 2030.

Figure 10: Top 10 countries/regions with the highest number of people with diabetes (20-79 years old)

2019			2030			2045		
Rank	Country or territory	Number of people with diabetes (millions)	Rank	Country or territory	Number of people with diabetes (millions)	Rank	Country or territory	Number of people with diabetes (millions)
1	China	35.5 (32.6–40.6)	1	China	54.3 (49.7–62.6)	1	China	78.1 (70.9–92.3)
2	United States of America	14.6 (12.5–17.1)	2	United States of America	20.0 (17.1–23.4)	2	India	27.5 (20.6–38.6)
3	India	12.1 (9.0–16.4)	3	India	18.0 (13.5–24.7)	3	United States of America	23.2 (19.8–27.3)
4	Germany	6.3 (5.2–7.0)	4	Brazil	9.6 (8.6–10.9)	4	Brazil	14.9 (13.4–17.0)
5	Brazil	6.1 (5.5–6.9)	5	Germany	7.6 (6.3–8.5)	5	Germany	8.7 (7.2–9.8)
6	Japan	4.9 (4.0–5.7)	6	Japan	5.1 (4.1–6.0)	6	Mexico	7.7 (4.5–10.8)
7	Russian Federation	3.7 (2.2–4.3)	7	Russian Federation	4.6 (2.7–5.4)	7	Pakistan	6.4 (3.0–10.0)
8	Italy	2.9 (2.6–3.3)	8	Mexico	4.3 (2.5–5.9)	8	Japan	5.4 (4.4–6.5)
9	Mexico	2.7 (1.6–3.8)	9	Pakistan	3.8 (1.8–5.9)	9	Turkey	4.8 (3.3–6.4)
10	Pakistan	2.6 (1.2–3.9)	10	Italy	3.4 (3.1–3.9)	10	Indonesia	4.8 (4.2–5.5)

Source: (IDF, 2019)

### 2.3.2 Diabetes in China

The all-age prevalence rate of diabetes in China, the world's most populous country, is 6.6 percent, and the number of people with diabetes is among the highest in the world. According to data from a nationwide survey, the estimated prevalence of diabetes among adults was 2.6 percent in 2002, but only five years later, the figure rose rapidly to 9.7 percent, and then to 10.9 percent in 2013 (Chan et al., 2014).

According to the data of the 9th edition of the IDF Diabetes Atlas published by the International Diabetes Federation in 2019, China belongs to the western Pacific region in the regional division of IDF. China now has 116.4 million diabetics (not including Hong Kong, Macao, and Taiwan), ranking first in the world. According to the statistical results after adjusting for age, the morbidity of adult diabetes in mainland China is close to 10%, which is also far higher than in other countries and regions. (Table 4)

Table 4: Current situation of diabetes in China

Country	Adults with diabetes	Adults	Incidence	Relative incidence of diabetes adjusted for age	Cost	Diabetes-related deaths	Type 1 diabetes	Proportion of undiagnosed diabetes	One in X people has diabetes
China	10654	1164	10.9	9.2	93	823,780	54,040	56.0	9
Hong Kong, China	5915.0	723.4	12.2	4.5	-	-	222	64.4	8
Macao, China	513.9	50.9	9.9	4.3	-	-	19	46.7	10
Taiwan, China	18523.4	1228.8	6.6	6.3	-	-	2,828	42.8	15

Source: (IDF, 2019)

## 2.4 China's Basic Health Insurance System

There used to be three different types of basic medical insurance schemes in China.

Respectively are the NRCMS, the BMIUE and the BMIUR. To improve the equality in

healthcare utilization for urban and rural residents, Chinese government decided to integrate BMIUR and NRCMS into a unified medical insurance scheme named BMIURR in 2017. Recently, there are two types of basic medical insurance schemes which are BMIUE for employees and BMIUR for those no formal job.

Table 5: Comparison of China's basic medical insurance system

	BMIUE	BMIURR
		BMIUR      NRCMS
<b>Mark policy</b>	“Do a good job to expand the notice that insurance of basic medical treatment of urban worker covers scope work further”	“Opinions on integrating the basic medical insurance system for urban and rural residents”
<b>Ensure the crowd</b>	Employees of enterprises, government organs, institutions, social organizations, and private non-enterprise units	Urban and Rural residents
<b>Principles</b>	Mandatory	Voluntary
<b>Management institutions</b>	Ministry of Human Resources and Social Security	
<b>Apanage management</b>	Take the city as the overall planning unit	
<b>Financing method</b>	The basic medical insurance premium must be jointly borne by the employer and workers, and the employer and workers	Each region adopts a fixed financing method based on its own actual situation, using a transitional period of two to three

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	jointly pay a mixed fee	years to end payments.
<b>Fees to pay</b>	It is mainly used for medical expenses of serious diseases in hospital and outpatient department of insured workers	About 75% of hospitalization expenses will be paid, and about 50% of outpatient expenses will be paid as a whole, so as to reduce the gap with the actual reimbursement rate as possible.
<b>Basic idea</b>	Low level, wide coverage, both sides burden, unified account combination	High treatment is not low, the list is not narrow

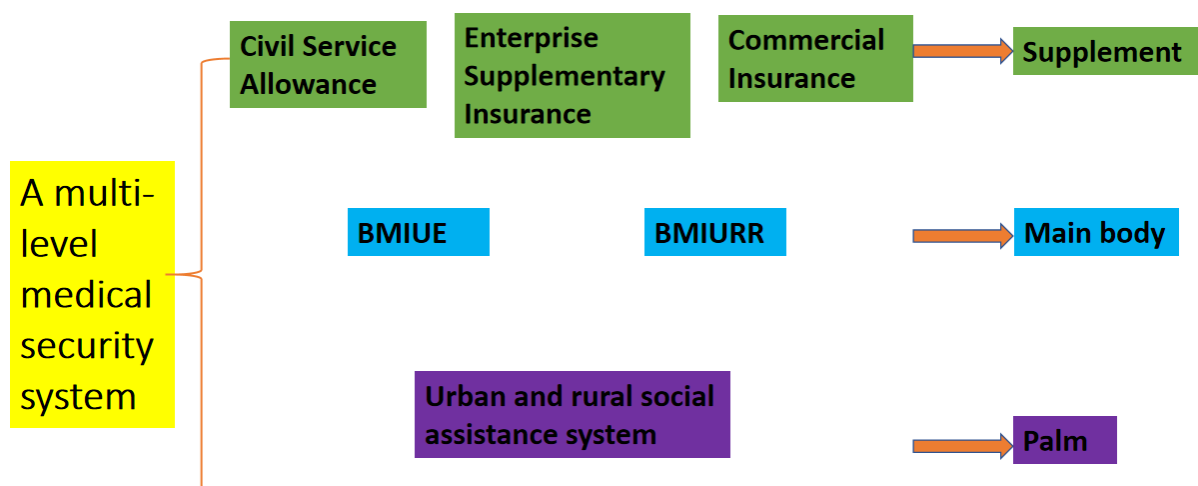
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There is built the basic medical insurance system nearly has all urban and rural residents of coverage after more than 70 years of reform and development. At present, the basic medical security system conceptual framework of China has been clearly shown as "Two vertical lines" which refers to the BMIURR (including NRCM and URBMI) and the BMIUE; and "Three horizontal lines" which refers to urban and rural medical assistance and social charitable donations to people in need, social insurance systems, and through supplementary medical insurance and commercial health insurance to be met the people's higher medical needs(Li & Yang, 2021).

With the advancement of urbanization, the multi-level medical security system has become an inevitable trend to adapt to the change of social structure and economic development. As can be seen from the Figure 11, the development and evolution of China's current multi-level medical security system always aims at improving the equity and equality of the medical insurance system and achieving sustainable development,

gradually promoting the overall planning of the health insurance system for residents in rural and urban area, building a unified medical insurance system for all, and improving the fairness of the health insurance system.

Figure 11: A multi-level medical security system



Before health-care reform was announced in 2009 (Yip & Hsiao, 2009), the Chinese government is facing widespread dissatisfaction from the public regarding the unaffordability of healthcare and the widening gap in access to healthcare and health status among different regions and populations. In 2016, the Chinese government established a universal medical insurance system, including BMIUE and BMIURR. In 2018, China's medical insurance covered 1,344,590,000 people, with the insured rate stable at more than 95%, basically realizing full coverage. Among them, 316,810,000 are insured by BMIUE. The BMIURR insured 1,027,780,000 people. While only 3.64% (50,790,000) still have no insurance coverage (Table 6).

Table 6: Social Medical Insurance State

	Freq.	%
<b>Have insurance</b>	1,344,590,000	96.36%

<b>BMIUE</b>	31,6810,000	76.44%
<b>BMIURR</b>	1,027,780,000	23.56%
<b>No insurance</b>	50,790,000	3.64%
<b>Total</b>	1,395,380,000	100.00

Source: NBSC

According to the research of CHARLS database, the main factors affecting the coverage of social medical insurance 30.27% of cannot afford it, and also 11.15% of respondents choose do not need it, another respondents do not to choose medical insurance is reason for do not know where or from whom to get it, do not trust the institutions that offer health insurance, do not have suitable programs for me to buy, and never thought of it. It shown that the insufficient depth of medical insurance believer, the heavy economic burden of individuals, and the lack of rationality in the allocation of health resources and so on(hong, 2014).

#### 2.4.1 Basic Medical Insurance of Urban Employees (BMIUE)

The State Council issued 1998 "about the decision that establishes system of insurance of basic medical treatment of town worker" (country hair [1998]44), undertake system of insurance of medical treatment of worker in the whole country scope reform. Covering all urban employers, including enterprises, government, public institutions, social organizations, private non-enterprise units and the employees. With the former Ministry of Labor and Social Security clarifying the insurance policy for flexible employees, migrant workers and non-public economic organizations, the basic medical insurance

for urban workers covers all urban employees. The 220 million Chinese people had the BMIUE in the end of 2009.

Since the 1980s, the Chinese government has carried out a series of reforms on BMIUE. From 1980 to 1992, the main goal of China's medical insurance system reform was to control the rapid growth of medical expenses by introducing medical expense sharing mechanism and strengthen hospital supply chain management. In 1994, China's central government carried out a pilot reform, and the medical insurance reform entered the second stage. On April 7, 2021, the State Council confirmed the measures to establish and improve the mutual aid guarantee mechanism of basic medical insurance for employees, which broaden the scope of the use of personal account funds, reduce the burden of medical care for the masses, and there will be major changes in medical insurance.

On April 22, 2021, the General Office of the State Council put forward specific measures from five aspects to establish and improve the mutual aid and security mechanism of employee medical insurance outpatient clinics. It includes strengthening the outpatient mutual aid guarantee function, improving the personal account accounting method, standardizing the use range of personal account, strengthening the supervision and management, and perfecting the payment mechanism corresponding to the outpatient mutual aid guarantee.

Table 7.Character of the BMIUE

<b>Objective</b>	<b>Interpretation</b>
<b>Date Started</b>	1998(Formally established)
<b>Enrolled</b>	Employees and retirees of government agencies, public institutions and private



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	non enterprise organizations in urban areas.
<b>Guideline</b>	Party Central Committee and the State Council
<b>Risk pooling</b>	Urban level
<b>Target population</b>	Urban residents
<b>Financing mechanism</b>	Insurance premium of primary medical treatment is united in union by unit of choose and employ persons and worker pay photograph. Unit pay cost of choose and employ persons should control the 6% or so of worker total wages, worker pay cost is the 2% of its wage income commonly. Of this, 30 per cent of employee donations and personal accounts, and seven in ten of insurance premiums paid by employers, go to the social pooling scheme funds
<b>Reimbursement mechanism</b>	Outpatient medical charge paid from personal accounts Inpatient medical charge paid from social pooling funds
<b>Designated health facilities</b>	All levels of health facilities
<b>Covered services</b>	Inpatient stays and outpatient visits

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#### 2.4.2 Basic Medical Insurance for Urban and Rural Residents (BMIURR)

The State Council of China issued “Opinion on the integration of basic medical insurance systems between urban and rural residents” in January 2016, which integrates the BMIUR and the NRCMS to establish an equity basic medical insurance system for urban and rural residents. It covers all urban and rural residents except those who should be covered by BMIUE (Qiu & Wang, 2018).

The system mainly guiding ideology, including principle of six unifications of coverage, financing policy, benefit packages, lists of drugs and services, contract suppliers and fund management(Council, 2016).

The policy mainly serves to promote the coordinated development of urban and rural economy and society(Zhu et al., 2017). Xiang and his college (2014) illustrate that China has achieved full coverage of urban and rural areas by the end of 2008,since the establishment of medical aid system in rural and urban areas in 2003 and 2005. This policy has benefited nearly 100 million people in need. The medical insurance system for urban and rural residents has alleviated difficult and expensive medical treatment and reduced the burden of medical treatment for urban and rural residents(Wang et al., 2018).

Table 8: Character of the BMIURR

<b>Objective</b>	<b>Interpretation</b>
<b>Date Started</b>	2016
<b>Enrolled</b>	Voluntary at city-level
<b>Coverage</b>	all urban and rural residents except those who should be covered by BMIUE
<b>Guideline</b>	General guideline was issued by the central government, local government

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	(province and country government) retain considerable discretion over the details
<b>Risk pooling</b>	Adhere to multi-channel fundraising and continue to implement a fundraising method that combines personal payment and government subsidies as the mainstay
<b>Target population</b>	Urban and Rural residents
<b>Reimbursement scope</b>	Outpatient compensation, inpatient compensation, serious illness compensation 2020: 280 RMB(US\$43.53)
<b>Issuing authority</b>	The State Council of China
<b>Designated health facilities</b>	All levels of health facilities
<b>Covered services</b>	outpatient and inpatient services

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#### 2.4.2.1 New Rural Cooperative Medical Scheme (NRCMS)

The new rural cooperative medical care scheme is a basic medical insurance system mainly funded by the government for rural residents. All rural residents can participate in the new rural cooperative medical care voluntarily with household level. By the end of 2009, the number of participants was 833 million.

In the China's planned economy, most of all rural residents were covered by a traditional Rural Medical Insurance Scheme which was established in the 1950s. That was based on the People's Commune system. By 1976, 90 percent of the country's farmers had taken part in the cooperative medical care system, which basically solved the problem

of “difficulty in seeing a doctor for most of the rural residents of society and have become an important stage for the development of the rural medical security cause of New China.

However, China started the transition from planned economy to market economy, the People's Commune System was collapsed. Finally, the traditional Rural Cooperative Medical Insurance Scheme cancelled in 1980s. Without the traditional Rural Medical Insurance System, the situation of diastatic burden was very severity in the rural area. In some places, it is difficult for farmers to see a doctor, cannot afford the cost of disease, or even get into trouble because of the disease. The rural residents impending need for health care project in the cause of tolerable health care burden, so the New Rural Cooperative Medical Scheme (NRCMS) is being developed in 2003. And adhere to the rural residents as the object of protection, to the masses of voluntary principle, based on the collective economy.

Table 9: Character of the NRCMS

<b>Objective</b>	<b>Interpretation</b>
<b>Date Started</b>	2003
<b>Enrolled</b>	Voluntary at rural household level
<b>Coverage</b>	97.5% of whole population in 2012
<b>Guideline</b>	General guideline was issued by the central government, local government (province and country government) retain considerable discretion over the details
<b>To raise</b>	Individual, collective and government coordination

<b>Risk pooling</b>	Country level
<b>Target population</b>	Rural residents (832 million)
<b>Reimbursement scope</b>	Outpatient compensation, inpatient compensation, serious illness compensation 2003-2012: 10 RMB (US \$1.60)- 240 RMB(US\$38.51)
<b>Issuing authority</b>	The State Council
<b>Designated health facilities</b>	All levels of health facilities
<b>Covered services</b>	Inpatient series, catastrophic outpatient

#### 2.4.2.2 Basic Medical Insurance for Urban Residents (BMIUR)

To solve the problem of medical security for non-working urban residents, the State Council issued the Guiding Opinions on the Pilot Implementation of Basic Medical Insurance for Urban Residents (Guo Fa [2007] No. 20) in July 2007. This system has been rolled out across the country. It mainly covers urban residents who are not covered by the basic medical insurance system for urban workers, including students (including college students), children and other non-working urban residents, and can voluntarily participate in the medical insurance for urban residents. By the end of 2009, 180 million urban residents had been insured by medical insurance.

Established BMIUR was the one of important measures for non-working urban residents; this system followed by the NRCMS and BMIUE. A pilot program was launched in 2007 and expanded to 299 cities in 2008. Now this system already almost

coverage the target populations.

Table 10: Character of the BMIUR

<b>Objective</b>	<b>Interpretation</b>
<b>Date Started</b>	1998
<b>Enrolled</b>	Minors, college students and unemployed residents
<b>Guideline</b>	Party Central Committee and the State Council
<b>Risk pooling</b>	Urban level
<b>Target population</b>	181 million, 2010
<b>Insurance minimum payment standard</b>	Level 3: 980 Level 2: 720 Level 1: 540
<b>Basic coverage</b>	The maximum payment limit is 16,000 yuan per year, which can be raised to 20,000 yuan per person per year for serious outpatient cases

## 2.5 Medical insurance system in the world

National medical insurance model, social medical insurance model, savings medical insurance model and commercial health insurance model are four typical medical insurance models in the world at present. The financing mode of national medical insurance is mainly based on national tax, and the risk sharing method is used to guarantee the operation of the medical system, which has the characteristics of high welfare and comprehensive coverage. The financing source of the social medical insurance model is mainly social insurance premiums, replenished by government tax

subsidies. The risk sharing method is used to solve the risks of the disease randomly produced by a few members of the society in the form of shared by all the people. It has the characteristics of payment obligation, wide coverage, and relatively basic sureness. The financing of the savings medical insurance model only comes from the employer and the employee. The compensation and treatment are obviously targeted and hierarchical, and the differentiation of payment and treatment is its obvious feature. In the United States, dominated by commercial medical insurance, financing mainly comes from private premiums, which is the risk allocation realized among certain payment groups. Its medical expenditure is relatively high, but its demand satisfaction capacity is also much higher than other medical insurance models.

Table 11: Combing and comparison of major global medical insurance models

<b>Medical model</b>	<b>Countries</b>	<b>Financing pattern</b>	<b>operations</b>	<b>System evaluation</b>
<b>National medical insurance</b>	Britain	The government tax	The government	Universal coverage, security and welfare are better
	China		The government	Covering most of the population, private investment is high and efficiency is

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<b>Social medical insurance</b>	Germany	Social and national financing, financing sources are the social medical insurance fund paid by each fund, government tax and fiscal subsidy income respectively	Government and non-profit organizations	low Coverage of most of the population, better medical security
<b>Commercial insurance</b>	The United States	The market mechanism	Commercial insurance	Covering the entire population, there will be a multi-tiered and specific medical insurance plan Medical costs are high and coverage for low-income

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				groups	is
				limited	
<b>Savings health insurance</b>	Singapore	Both the employee and the employer	the Central Provident Fund Board	Basic universal coverage, mandatory savings by the state	

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Source: Public data collation

### 2.5.1 Social medical insurance system

- **Japan**

Japan's "National Health Insurance Law" was comprehensively revised in 1961, and the medical insurance system covered all citizens in a compulsory form, realizing universal insurance. In April 1961, Japan fully implemented the public medical insurance system for rural residents and self-employed people, requiring people without fixed occupation and income to join this medical insurance compulsively. Japan's medical insurance system is universal, mandatory and fair, and its "universal insurance" is based on the premise of sharing costs. According to statistics from the Ministry of Health, Labor and Welfare, Japan's medical insurance coverage reached 100 percent in 2016.

The medical insurance system in Japan can be segmented into regional insurance, employee health insurance and old-age health insurance according to the insured objects. The district insurance is set up on the basis of the National Health Insurance Act and the National Health Insurance System and is applicable to all districts and special districts of the country, covering both ordinary citizens and retirees.

Among them, government financial subsidies, insurance premiums paid by employers and employees, and patients' out-of-pocket expenses are the major sources of medical insurance funds in Japan. The medical insurance system in Japan has the characteristics of compulsory medical insurance, pattern (unified payment, charge according to service items), public service and fairness.

- **Germany**

Affected by the political and economic system of the "social market economy", the German health insurance system is dominated by statutory insurance and supplemented by private insurance. The statutory social medical insurance, private medical insurance and statutory long-term care insurance are the three main parts of the German medical insurance system. Low-income people must participate in the social medical insurance, while high-income people can freely choose the statutory social insurance or private medical insurance. In addition, State civil servants and self-employed persons (including entrepreneurs) are not obligated to participate in the statutory (social) health insurance. Commercial health insurance is a useful supplement to the legal medical insurance and independent of the legal medical insurance. Comprehensive medical insurance, supplementary medical insurance and long-term care insurance are the three components of commercial health insurance in Germany.

The contributions of employers and employees are the major source of medical insurance funds, each bearing half of the cost of medical insurance. German social medical insurance system embodies the spirit of society in all aid, social medical insurance fee is determined by the economic income, high low over-paid, accept pay less, and the pay cost standard of different people enjoy equal treatment of medical

treatment insurance, the country's medical insurance fund is not set up a personal account, pensions and unemployment insurance for retirees and the unemployed in the payment.

The principle of social insurance payment mechanism in Germany is "to determine expenditure according to income and balance of income and expenditure", which can not only guarantee the demand and supply of medical services, but also effectively restrain the growth of unreasonable medical expenses.

- **National health care systems are converging**

First, the government should combine with the market to build a diversified medical service system. In the practice of world medical insurance reform, the completely government-led mode of universal medical insurance and the completely market-led mode of medical and health care are fading out, and countries are gradually moving towards a diversified medical service system that combines government and market.

Second, we should combine compulsory insurance with voluntary insurance to establish a more flexible and effective medical financing mechanism. At the same time, in recent years, voluntary coordinated serious illness insurance and commercial health insurance in various countries have developed rapidly, and the public voluntarily participates in a variety of supplementary medical insurance to meet the needs of personalized, diversified and differentiated medical services.

Third, combine basic medical services with non-basic medical services and adhere to the government-led basic medical service system. In the field of basic medical services, the government has emphasized the concept of fairness first, adhered to the principle of social justice, implemented government responsibilities, and maintained the

commonweal nature of basic medical and health services. In the field of non-basic medical and health services, we will give full play to market forces and actively develop commercial health insurance and private medical institutions(Benedictet Clements, 2017).

## **2.6 Utilization of outpatient services**

Utilization of outpatient services is idented or described the use of outpatient services to prevent and treat health problems, promote health and well-being, and maintain or obtain information about personal health status and diagnosis(Aday & Awe, 1997).

That refers to whether the patients receive the outpatient services from health care providers, the reasons why they go to utilize outpatient services. Meanwhile, it concerned with the health expenditure for the patients who use outpatient services(Williams, 1988).

Firstly, the type of outpatient services utilization means the type of healthcare utilization refers to the place where the health care is received including ordinary outpatient department, or emergency department. Secondly, the site of outpatient services utilization refers to the place where the health care is received (primary, secondary, and tertiary health care facilities) by the patients(Aday & Andersen, 1974).

The outpatient services utilization also can be viewed as a type of individual behavior. Societal determinants affect the individual determinants both directly and through the health services system. Different types of individual determinants then influence outpatient services utilization (Andersen & Newman, 1973).

## **2.7 Empirical review of literature**

Many scholars had researched the utilization of outpatient services for patients in different fields and countries, as well as, used different kinds of methodologies.

In reviewed studies founded that the individuals are more likelihood to increased the utilization of healthcare as they become elder. Wang et al. and Zhou et al. shown that the population of elder than 65 years old were more likely to receive outpatient services (YQ Wang et al., 2017; Zhang et al., 2019).

Zhou et al. and Wang et al. and Zhang et al. illustrated that female are more likely to utilize outpatient services. A possible explanation for these patterns is that male have a higher price elasticity of demand for healthcare than female, whereas pregnancy and have specific physiological conditions female have a lower elasticity of demand for healthcare (Wang et al., 2018; Zhang et al., 2019; Zhou et al., 2020).

There are three studies support that the individuals with higher education status were more likely to receive outpatient services. Liu & Zhao and Zhou et al. showed that the individuals had better educate is inclined to utilize more outpatient services and preventive services. Respondents who have completed more years of education are usually better informed about potential health risks and problems. They also tend to have more wealth and resources, so they are able to use their abundant resources to choose better solutions for timely health problems(Liu & Zhao, 2012; Zhou et al., 2020).

Zhou et al. and Wang et al. studies illustrated that the total amount of healthcare utilization for outpatient services was increased in the highest income groups, that means that high level income groups were more likely to receive outpatient services. However, the regressions from one study found that low-income respondents utilize more health care compared to high-income individuals. This study argued that lower and

middle level income groups have more access to healthcare services due to their enrollment in the BMIUR program. Liu & Zhao and Milcent & Jin found suggest that further economic growth is more likelihood to induce more Chinese individuals to use outpatient services(Liu & Zhao, 2012; Milcent & Jin, 2010; Wang et al., 2018; Zhou et al., 2020).

Moreover, Li et al. founded that compared to obese people, population of healthy weight decreased the likelihood of outpatient and inpatient care utilization(Li & Yang, 2021).

Zhou et al. study showed that the urban areas were less likely to receive outpatient services, study used the multivariate model, shows a lower likelihood of utilization of outpatient services among elderly adults who age more than 65, those who are living in urban areas(Li et al., 2018; Zhou et al., 2020).

Li et al. conducted by 17 which is also reviewed in this article, from 1993 to 2011, based on the CHNS data, the summarizations of several important patterns of healthcare utilization in China. As shown by Li et al, from 1993 to 2011, most rural patients chose outpatient services as their primary treatment option. Notes that with the reform of China's healthcare system in mid-2000, outpatient services have slightly decreased, and other factors besides health policies and health insurance plans may promote the use of medical services, Outpatient clinics in China after 2004(Li et al., 2018).

The multivariate model shows a lower likelihood of utilization of outpatient services among middle-aged and elderly adults who age more than 65, those who are married. A possible explanation for these patterns is that never married individuals have a lower price elasticity of demand for healthcare than married individuals (Li et al., 2018).

Most of the regressions showed that significant impacts of health insurance coverage,

uninsured counterparts use less medical care than the populations covered by healthcare insurance programs. Li & Zhang found that compared the people with BMIUE and BMIUR, people without health insurance are less likely to use outpatient services (Li & Zhang, 2013). In addition, among those who visit outpatient care more than once, different insurance types do not make much difference in terms of the number of outpatient visits. Zhou et al. study indicates that BMIURR were more likely to receive outpatient services (Zhou et al., 2019). A study conducted by Wang et al. showed that the middle-aged and elderly adults with social health insurance were more likely to utilized outpatient services than individuals without social health insurance (L. Wang et al., 2017). Although, there are some positive impacts on the health care utilization to the health insurance programs, these impacts are still limited. Interestingly, there were still a part of regressions that found a statistically significant and negative impact on healthcare utilization (Henderson et al., 1994; Henderson et al., 1998; Huang & Gan, 2017; Liu & Tsegai, 2011; Yang, 2013). There were several explanations proposed. One study showed that the impact of outpatient care seeking with the coverage of health insurance was negatively presumably due to insufficient observations and thus was not a generalizable finding (Henderson et al., 1998). A study concluded that health insurance plans cover uninsured individuals, therefore uninsured individuals and other individuals with health insurance are a comparative group, which leads to the downward bias in estimating the impact of these plans (Liu & Tsegai, 2011). There is a study found that the health insurance reforms (e.g., BMIUR) increased the sharing the cost of health insurance through a combination of deductions, coinsurance, etc., which caused the demand of healthcare to decrease afterwards (Huang & Gan, 2017). Finally, it is also possible that

those covered by the NRCMS, and uninsured people were more likely to visit folk doctors compared with people who covered by other insurance programs.

Zhou et al. study also found that chronic diseases patients were more likely to receive outpatient services due with BMIUE and BMIURR, diabetes, hypertension and other diabetes are included in medical insurance outpatient reimbursement(Zhou et al., 2019).

Li et al. used the Logistic regression model to find that among Chinese adults, smokers are more likely to use outpatient services than non-smokers. Smokers are more likely to receive outpatient treatment than non-smokers. In contrast, people who drink regularly are less likely to use outpatient and hospital care than those who do not drink regularly(Li et al., 2020).

A study suggests that most outpatient visits from these well-known hospitals should be conducted in the context of primary healthcare. In a study, 84% of doctors stated that due to minor illnesses, patients typically bypass primary healthcare and head to top hospitals(Xian et al., 2019).

Zhang et al. study showed that the primary health care facilities provided more outpatient services than hospitals and the concentration of outpatient visits to hospitals towards the richer populations(L. Wang et al., 2017; Zhang et al., 2017).

Xian et al. presented outpatient rates for different level of hospitals under different health insurance schemes. Research has shown that there is a statistically significant difference in any outpatient service between BMIUE and BMIUR registered last year. In all types of hospitals, the proportion of BMIUE patients is significantly higher than that of outpatient patients. Participants in the BMIUE program have increased the use



of outpatient services. Therefore, patients with BMIUE are more likely to receive treatment in tertiary hospitals with primary healthcare.(Xian et al., 2019).

Shen's team carried out a study utilized a visit-level regressions showed that diabetes or hypertension patients may be more willing to improve the utilization of primary care(Shen et al., 2020). There was no different in other chronic diseases patients who used the utilization of chronic disease coverage healthcare. That was expected the most primary healthcare institutions are not equipped to treat these patients.

In general, most literature shows that female, elderly aged above 65 years old, people never married, those having higher level of education, individuals with higher level income, rural location residents, and patients with chronic diseases are more likely to use outpatient services. And people with BMIUE and BMIURR are more likely to use outpatient services than people without medical insurance. Although the medical insurance has had some positive effects on healthcare utilization, these effects remain limited. Primary health care facilities provide more outpatient services than secondary and tertiary hospitals, however, most patients choose to skip primary health care facilities and utilized outpatient services in secondary or tertiary hospitals. And utilization of outpatient service is concentrated in the affluent population. For diabetes patients, they may prefer to use outpatient services in primary health care facilities.

## CHAPTER 3: METHODOLOGY

### 3.1 Study Design

The design of this study is a cross-sectional Survey, using second-hand data from 2018 China Health and Retirement Longitudinal Survey (CHARLS).

### 3.2 Study Population

The study involved the Chinese residents over the age of 45.

### 3.3 Data source

This research uses the data from China Health and Retirement Longitudinal Survey (<http://charls.pku.edu.cn>). CHARLS is a large-scale longitudinal and interdisciplinary survey project that aims to collect high-quality micro-data representing middle-aged and elderly people aged 45 and over. The data collected from both households and individuals level in China to provide a more scientific basis for the formulation and improvement of relevant policies in China. The CHARLS national baseline survey was conducted in 2011. From 2011 to 2012, 28 counties, 150 counties, and 450 villages experienced the second wave of the epidemic, the third wave in 2015, and the fourth wave in 2018. Charles' basic survey includes one person and their wife from each family

aged 45 or above, with a total of 17708 people, as well as 10257 households residing in 450 villages/urban communities. (Zhao, Strauss et al. 2013, Zhao, Hu et al. 2014). By the time of the nationwide interview in 2018, its sample covered 23,000 respondents from 12,400 households. In this paper, data from the 2018 National Tracking Survey database were used to analyze the impact of medical insurance on the healthcare utilization of patients with chronic diseases. The third routine follow-up survey of the national baseline sample from July to August 2018.

This study involved a total of 20,813 samples. Due to death, unwillingness to continue to participate in follow-up investigation and other reasons, the unqualified samples were excluded, and 19,305 samples were collected.

Six classes of training took place at Peking University from February to July in 2018. Finally, 564 persons passed training examinations and went to the field. In the end of 2018 September, most of the fieldwork was completed.

There are 76 teams organized by 564 interviewers in 2018. In most cases, a team interviewed all respondents from 6 villages/communities in two provinces, including those who moved to the area from other places. Two members from each team serve as the senior team responsible for updating the interviewer's contact information to quickly identify driving factors and reassign issues. They also organized the logistics work of the team and conducted investigations at the community and district levels. Other team members include the Team leader and the interviewer, who are responsible for carrying out all follow-up procedures and conducting individual interviews.

### **3.4 Sampling Method of CHARLS**

A stratified (by per capita GDP of urban districts and rural counties) multi-stage (county/district-village/community- household) PPS random sampling strategy was adopted.

### 3.5 Data screening criteria

All the original data of the 2018 national tracking survey data have been obtained from the CHARLS database. To obtain the data suitable for the research of this model, the inclusion criterias shown as following:

- 1) The residents aged 45 years and elder.
- 2) The patients in the database for chronic disease diagnosis and treatment were screened, including the diabetes, other Choric disease and diabetes also have other choric disease.

The exclusion criteria for this study as following:

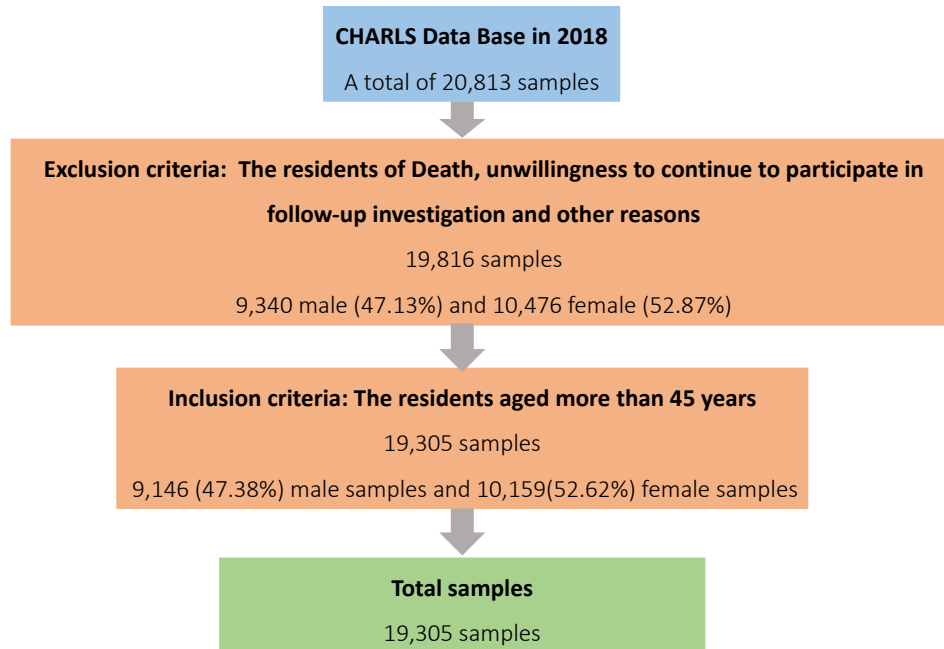
- 1) The residents aged less than 45 years old.
- 2) The residents of death, unwillingness to continue to participate in follow-up investigation.

Although the sample size of this study will not use the entire 2018 CHARLS sample, the results are representative of the country as the CHARLS data provide an updated estimate of the basic middle-aged and elderly population and health indicators in mainland China.

This study involved a total of 20,813 samples. Due to death, unwillingness to continue to participate in follow-up investigation and other reasons, 997 samples were excluded.

Due to age less than 45 years old, 511 samples were excluded, and 19,305 samples were

collected.



### 3.6 Data Cleaning Process

According to CHARLS website (<http://charls.pku.edu.cn/index/en.html>), respondents due to different reasons such as death may quit the study. Meanwhile, this study also incorporated into new respondents. Therefore, to ensure the representativeness of the samples, this study treated the CHARLS data as the unbalanced panel data. As a secondary data, Excel and STATA 15.1 were used in this study for data consolidation and statistical analysis in terms of data cleaning and collation.

A total of 20,813 samples were involved in this study. Due to death, unwillingness to continue to participate in the follow-up investigation and other reasons, a total of 19,305 samples were collected, including 9,146 (47.38%) male samples and 10,159(52.62%) female samples. There were 8,599 chronic disease patients, accounting for 44.54% of the

sample size. Among that the number of diabetes patients is 1,033, only 5.35% of the database.

### 3.7 Data Analysis

According to CHARLS website (<http://charls.pku.edu.cn/index/en.html>), respondents due to different factors, or death may quit the study, will also be incorporated into new respondents. Therefore, to ensure the representativeness of the samples, this study treated the CHARLS data as the unbalanced panel data.

The data analysis of this study was performed using Stata 15.1 software.

#### 3.7.1 Study variables

The dependent variable is the types of hospital.

According to previous literature, the independent variables followed:

- Predisposing factors: Gender, Age, Education level, Location, Marital status, Income, BMI
- Enabling factors: Medical insurance status, Health Insurance type
- Need factors: Smoking, Drinking, Health care utilization, Suffers from other chronic diseases with diabetes

The main variables and their assignments are shown in Table 12.

Table 12: Definitions of Variables

Variable	Variable Assignment	Reference variable
<b>Independent variable</b>		
<input type="checkbox"/> <b>Gender</b>	1 if the individual is male 0 for female	Female is the reference variable
<input type="checkbox"/> <b>Age</b>	1 if the individual is 45-54 years old 2 if the individual is 55-64 years old 3 if the individual is $\geq 65$ years old	45-54 years old is the reference variable
<input type="checkbox"/> <b>Education level</b>	1 if the individual is illiterate 2 if the individual attends primary school 3 if the individual graduates from middle school 4 if the individual graduates from high school 5 if the individual graduates from above high school	Illiterate is the reference variable
<input type="checkbox"/> <b>Location</b>	1 if the individual is urban resident; 0 for rural resident	Rural resident is the reference variable
<input type="checkbox"/> <b>Marital status</b>	1 if the individual married 0 for never married	Never married is the reference variable
<input type="checkbox"/> <b>Income</b>	1 if the individual's income between 0-18,000 2 if the individual's income=0	The individual's income between 0-18,000 is the reference variable

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	3 if the individual's income>18,000	
□□ <b>BMI</b>	1 if the individual's BMI between 18.5-22.9 2 if the individual's BMI<18.5 3 if the individual's BMI between 23.0-27.5 4 if the individual's BMI>27.5	The individual's BMI between 18.5-22.9 is the reference variable
□□ <b>Medical insurance</b>	1 if the individual does not have medical insurance 2 if the individual enrolls BMIUE 3 if the individual enrolls BMIURR 4 if the individual enrolls other medical insurance	The individual does not have medical insurance is the reference variable
□□ <b>Smoking</b>	1 if the individual who had smoking 0 for never smoking	Never Smoking is the reference variable
□□□ <b>Drinking</b>	1 if the individual who had Drinking 0 for never drinking	Never Drinking is the reference variable
□□□ <b>Diabetes</b>	1 if the individual who had Diabetes 0 for the individual who don't have diabetes	The individual who don't have diabetes is the reference variable

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□□□	<b>Other chronic diseases</b>	1 if the individual who had Other chronic diseases without diabetes 0 for otherwise (No chronic diseases or diabetes)	The individual who don't have chronic diseases or diabetes is the reference variable
□□□	<b>Cross term</b>	1 if the individual who only had Diabetes 2 if the individual who had Other chronic diseases without diabetes 3 for the diabetes is associated with other chronic diseases	The individual who only had Diabetes is the reference variable
<b>Dependent variable</b>			
□□	<b>Healthcare utilization</b>	1 if the individual used outpatient in the last two weeks 0 for the individual didn't use outpatient in the last two weeks	The individual didn't use outpatient in the last two weeks is the reference variable
□□	<b>Types of Hospital</b>	1 if the individual used outpatient in primary health care 2 for the individual used outpatient in high level hospital (tertiary general hospitals and secondary hospital)	The individual used outpatient in primary health care is the reference variable

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### 3.7.2 Descriptive Analysis

Descriptive analysis was used to describe the dependent variables which are Healthcare utilization and Types of Hospital; and the independent variables which consisting of predisposing, enabling, need factors. Since all variables are categorical, data were

presented in the frequency distribution and percentages.

The consumer price index is used to adjust for inflation. To make the results more comparable to other published studies, we uniformly converted the total annual expenditure per capita of households into US dollars (US \$1 = 6.8785 yuan) based on December 2018 exchange rates.

Take Anderson Model as the theoretical basis. Since all variables are categorical, data were presented in the frequency distribution and percentages.

### **3.7.3 Bivariate Analysis**

Two simple Logistic regression analysis variables were used to analyze the relationship between each independent variable and sequence variable tested. In further analysis, variables at the  $p < 0.05$  level were included.

### **3.7.4 Logistic regression analysis**

The logistic regression analysis used Binary logistic regression model to assess the association between dependent variables and independent variables. This type of analysis was used because the dependent variables are binary outcome. Therefore, the following model was used to evaluate whether patients with diabetes choose primary health care institutions. If the odds ratio is lower than one, it is a protective factor for the use of outpatient service and primary health care institutions utilization. If the odds ratio is equal to one, the variables have no association with the use of outpatient service and primary health care institutions utilization. And if the odds ratio is more than one, the variables is a risk factor of the use of outpatient service and primary health care

institutions utilization. This study used significant value at  $p < 0.05$ ,  $p < 0.01$ , and  $p < 0.001$ .

In the experimental study, the Logistic regression was used. The location indicates whether chronic disease patients are in primary health facilities. When the local value is 1, it indicates that the patient is receiving treatment in public hospitals (including public hospitals, specialized hospitals, and traditional Chinese medicine hospitals). When the local value is 0, it indicates that the patient is receiving treatment in public hospitals. Community medical centers, urban hospitals, medical centers, rural clinics/private clinics, nursing homes, etc.

$$\text{Logit}(P) = P(\text{Local} = 1) = a_0 + \sum a_i \text{Enable}_i + a_1 \text{Demand} + \sum a_j \text{Control}_j + k$$

Authorization represents the authorization of variables, including income, medical insurance participation, medical insurance type, and medical assistance.

Demand is a demand variable. Like other chronic diabetes diseases, it needs to be taken (smoking, drinking, clinical conditions, diabetes treatment)

Control is the control of variables, including age, gender, marital status, education level, residential area, and body mass index.

### **3.8 Ethical Consideration**

In 2018, the Institutional review board of Peking University approved all moral approvals of CHARLS wage. The IRB approval number for the main household survey, including anthropometrics, is IRB00001052-11015; the IRB approval number for biomarker collection, was IRB00001052-11014. All participants provided a written

informed consent prior interview. This study has obtained the permission to download the dataset from the China Health and Retirement Longitudinal Survey, CHARLS. (<http://charls.pku.edu.cn/>)



## CHAPTER 4: RESULTS

This analysis is based on a sample of 19,305 respondents aged above 45 and more who participated in the CHARLS database survey in 2018.

### 4.1 Descriptive analysis

In order to get a better understanding of the results, it is important to know the main characteristics of the sample used in the research. It provides a brief description of the sample in terms of different criteria as follow. The grouped into three factors, which are predisposing factors, enabling factors, and need factors.

#### 4.1.1 Predisposing factors

In this study, there were 9,146 males (47.38%) and 10,159 females (52.62%). In terms of age, most respondents were aged between 45 and 65, and 38.44% (7,421) of the respondents were 65 years old or older. The respondents covered different educational levels, with 43.05% having graduated from primary school. More than half (78.98%) of the respondents lived in rural areas. For marital status, most respondents (85.38%) were married while only 14.62% never married. In terms of income, 29.11% respondents have no income, and a quarter of respondents have a higher income level, most respondents' income level are in the middle that account for 45.17%. According to BMI, 764 cases (3.96%) were underweight, 5,326 cases (27.59%) were healthy weight, 10,880 cases (56.36%) were overweight, and 2,335 cases (12.10%) were obese.

Table 13: Descriptive of Predisposing factors in Independent Variables (N=19,305)

Independent Variables (Predisposing factors)	N	%
<b>Gender</b>		
Female	10,159	52.62%
Male	9,146	47.38%
<b>Age</b>		
45-54	5,581	28.91%
55-64	6,303	32.65%
65+	7,421	38.44%

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<b>Education group</b>		
Illiterate	4,278	22.16%
Primary School	8,310	43.05%
Middle School	4,252	22.03%
High School	1,583	8.20%
Above High School	882	4.57%
<b>Married</b>		
Never married	2,823	14.62%
Have a partner	16,482	85.38%
<b>Location</b>		
Urban	4,058	21.02%
Rural	15,244	78.98%
<b>Income level</b>		
Income=0	5,619	29.11%
0<income<18000	8,721	45.17%
18000<=income	4,965	25.72%
<b>BMI group</b>		
18.50<=BMI<23.00	5,326	27.59%
18.50<=BMI	764	3.96%
23<=BMI<27.50	10,880	56.36%
27.5<=BMI	2,335	12.10%

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#### 4.1.2 Enabling factors

The medical insurance coverage rate was 95.23%, with only 548 people (2.84%) uninsured and 364 people (1.94%) choosing other insurance.

A whopping 80.96% of respondents were covered by BMIURR, and 2,754 people (14.27%) were covered by BMIUE.

Table 14: Descriptive of Enabling factors in Independent Variables (N=19,305)

Independent Variables (Enabling factors)	N	%
<b>Insurance</b>		
No insurance	548	2.84%
BMIUE	2,754	14.27%
BMIURR	15,629	80.96%
Other insurance	374	1.94%

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#### 4.1.3 Need factors

Most of the sample did not smoke, with only 24.54% of respondents reporting smoking.

The 18,964 respondents did not drink alcohol or drank less than once a month. Of all respondents, only 1,033 (5.35%) had diabetes. Among all the samples included in this study, 8,235 cases (42.66%) had chronic diseases, among those with chronic disease, 5.35% patients have diabetes.

Table 15: Descriptive of Need factors in Independent Variables (N=19,305)

<b>Independent Variables</b>	<b>N</b>	<b>%</b>
<b>(Need factors)</b>		
<b>Smoking</b>		
No	14,568	75.46%
Yes	4,737	24.54%
<b>Drinking</b>		
No	18,964	98.23%
Yes	341	1.77%
<b>Other chronic diseases</b>		
No	11,070	57.34%
Yes	8,235	42.66%
<b>Diabetes</b>		
Yes	1,033	5.35%
No	18,272	94.65%

#### 4.1.4 Utilization of healthcare services

Of the samples included in this study, a number of 3,181(16.48%) received outpatient services, including 1,479 (46.49%) who used outpatient services at tertiary health care facilities.

Table 16: Descriptive of Dependent Variables (N=19,305)

<b>Dependent Variable</b>	<b>N</b>	<b>%</b>
<b>Healthcare utilization (outpatient services)</b>		



No	16,124	83.52%
Yes	3,181	16.48%
<b>Secondary and Tertiary health care facilities</b>		
No	1,702	53.51%
Yes	1,479	46.49%

## 4.2 Single factor analysis

The Chi-square test was selected for single factor analysis in this paper. The Chi-square test is a statistical method to test whether two categorical variables are independent of each other (whether there is a correlation). The basic idea of the test is as follows: first, the null hypothesis is proposed, that is, the two classification variables are not correlated, and the Chi-square value is calculated based on this premise. Then, under false assumptions, based on the distribution and degrees of freedom of the Kai square, the likelihood of obtaining the current statistical data and the most extreme case can be determined. If the P value is very small, it indicates strong correlation between the two variables, and the null hypothesis should be rejected, indicating significant correlation between the two variables. Otherwise, the null hypothesis cannot be rejected, and the actual situation represented by the sample cannot be different from the theoretical hypothesis. In other words, in terms of the use of outpatient services, if Pearson's test showed that the P value less than 0.05, indicating a significant difference between the independent variable and the use of outpatient services.

### 4.2.1 Single factor analysis in utilization of outpatient services

#### a) Predisposing factors

According to Table 17, sample size is 19,305 that is much more than 40, in this paper, is suitable for Pearson chi-square test. As shown in the table, the P value of gender is less than 0.05, that is a significant difference between the proportion of males using outpatient services and females using outpatient services. There is no significant difference in the proportion among different age groups. As The P value of age was  $0.230 > 0.05$ , we do not reject the null hypothesis.

The P value of the education group was  $0.014 < 0.05$ , indicating that we rejected the null hypothesis, there is a significant difference between educational background and the use of outpatient services. Among those who use outpatient services, the proportion of illiterate people using outpatient medical services was only 22.16 percent, 43.05 percent of respondents with Primary and Middle School education and 22.03 percent of respondents with High School education, and only 8.20 percent of respondents with High School education.

There is a significant difference in the proportion of respondents with a partner using outpatient services compared with those without a partner, because the table shows that the P value of marital statuses less than 0.05 (0.029).

The P value of location is more than 0.05, indicating that there is no significant difference in the proportion between different regions (urban or rural).

In terms of the Income level group, the p value is  $0.013 < 0.05$ , indicating that there is a significant difference between income level and whether outpatient service is used or not, and the difference is real and non-statistical error. In other words, only 29.11% of the respondents without income used outpatient medical services, 45.17% of the

respondents with  $0 < \text{income} < 18000$ , and only 25.72% of the respondents with High income ( $18000 \leq \text{income}$ ).

For BMI group, the p value is 0.034, shown that the difference between people with BMI score and the use of outpatient services is not caused by random error. The proportion of underweight respondents was only 3.96%. The proportion of respondents with BMI of healthy weight and overweight was 27.59% and 56.36% respectively, while the proportion of those with BMI of obese was only 12.10%.

Table 17: Chi-square test between Predisposing factors and utilization of outpatient services (N=19,305)

Independent Variables (Predisposing factors)		N (%)	Pearson chi2	P value	Sig
<b>Gender</b>	Female	10,159(52.62%)	46.7863	0.000	***
	Male	9,146(47.38%)			
<b>Age</b>	45-54	5,581(28.91%)	2.9384	0.230	
	55-64	6,303(32.65%)			
	65+	7,421(38.44%)			
<b>Education group</b>	Illiterate	4,278(22.16%)	12.5538	0.014	**
	Primary School	8,310(43.05%)			
	Middle School	4,252(22.03%)			
	High School	1,583(8.20%)			
	Above High	882(4.57%)			

	School				
<b>Married</b>	Never married	2,823(14.62%)	4.7845	0.029	**
	Have a partner	16,482(85.38%)			
<b>Location</b>	Urban	4,058(21.02%)	2.8145	0.093	*
	Rural	15,244(78.98%)			
<b>Income level</b>	Income=0	5,619(29.11%)	8.7281	0.013	**
	0<income<18000	8,721(45.17%)			
	18000<=income	4,965(25.72%)			
<b>BMI group</b>	18.50<=BMI<23.00	5,326(27.59%)	8.6882	0.034	**
	18.50<=BMI	764(3.96%)			
	23<=BMI<27.50	10,880(56.36%)			
	27.5<=BMI	2,335(12.10%)			

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

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#### b) Enabling factors

The P value of medical insurance is 0.024, which demonstrate that there is a significant difference between different types of medical insurance and whether to use outpatient services, and the difference is real and non-statistical error.

Table 18: Chi-square test between Enabling factors and utilization of outpatient services (N=19,305)

Independent Variables	N (%)	Pearson chi2	P	Sig
-----------------------	-------	--------------	---	-----

(Enabling factors)		value			
<b>Insurance</b>	No insurance	548(2.84%)	9.4386	0.024	**
	BMIUE	2,754(14.27%)			
	BMIURR	15,629(80.96%)			
	Other	374(1.94%)			
	insurance				

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

### c) Need factors

The proportion of smokers using outpatient services was significantly different from that of non-smokers.

There is no significant difference between Drinking and non-drinking, we do not reject the null hypothesis.

The P value of patients with Diabetes alone is less than 0.05, that is, patients with Diabetes using outpatient services was significantly different from that of non-diabetic patients. Meanwhile, there was a significant difference between the proportion of patients with other chronic diseases using outpatient services and that of patients without other chronic diseases using outpatient services, and the difference was real and non-statistical error.

Table 19: Chi-square test between Need factors and utilization of outpatient services (N=19,305)

Independent Variables	N (%)	Pearson chi2	P value	Sig
-----------------------	-------	--------------	---------	-----

<b>(Need factors)</b>					
<b>Smoking</b>	No	14,568(75.46%)	76.9315	0.000	***
	Yes	4,737(24.54%)			
<b>Drinking</b>	No	18,964(98.23%)	0.2205	0.639	
	Yes	341(1.77%)			
<b>Diabetes</b>	Yes	1,033(5.35%)	12.3628	0.000	***
	No	18,272(94.65%)			
<b>Other chronic diseases</b>	No	11,070(57.34%)	267.6575	0.000	***
	Yes	8,235(42.66%)			

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

The results showed significant differences between the use of outpatient care and gender, education level, marital status, income, BMI, health insurance coverage, smoking, diabetes, and other chronic diseases.

#### **4.2.2 Single factor analysis in utilization of outpatient services in secondary and tertiary hospitals**

##### **a) Predisposing factors**

According to Table 20, sample size is 3,181 that much more than 40, of which is suitable for Pearson chi-square test. This table provides the information on the choice of visiting secondary and tertiary health care facilities.

The result shows that there was a significant difference between the proportion of males and females in tertiary medical institutions as well as different age group. In terms of

education level, there is a significant difference between educational background and the choice of using secondary and tertiary health care facilities according to the result. The proportion of illiterate people attending tertiary or higher medical institutions was only 21.82%, 43.89% and 20.87% of respondents with Primary School education and Middle School education respectively, and only 7.83% of respondents with High School education. The P value of Married was  $0.000 < 0.05$ , which meant that there was a significant difference between the proportion of respondents with partners who visited tertiary medical institutions and those without partners. There are significant differences in the proportion between different regions (urban or rural). For income level, Table 17 indicates that there is a significant difference between income level and the choice of utilizing secondary and tertiary health care facilities outpatient services, and the difference is real and non-statistical error. In other words, 31.09% of the respondents with no income visited tertiary medical institutions, 44.70% of the respondents with  $0 < \text{income} < 18000$ , and only 24.21% of the respondents with High income ( $18000 \leq \text{income}$ ). The result demonstrates that there is a significant difference between BMI and patients in tertiary medical institutions. The proportion of people with obesity was only 4.56%. The proportion of people with BMI were 25.87% and 56.93% respectively. The proportion of people with BMI was only 12.64%.

Table 20: Chi-square test between Predisposing factors and utilization of outpatient services in secondary and tertiary hospitals (N=3,181)

Independent Variables (Predisposing factors)	N (%)	Pearson chi2	P value	Sig
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<b>Gender</b>	Female	1,850(58.16%)	6.7878	0.009	**
	Male	1,331(41.84%)			
<b>Age</b>	45-54	926(29.11%)	21.9991	0.000	***
	55-64	999(31.41%)			
	65+	1,256(39.48%)			
<b>Education group</b>	Illiterate	694(21.82%)	143.6469	0.000	***
	Primary School	1,396(43.89%)			
	Middle School	664(20.87%)			
	High School	249 (7.83%)			
	Above High School	178(5.60%)			
	Never married	505(15.88%)	12.8131	0.000	***
<b>Married</b>	Have a partner	2,676(84.12%)			
	Urban	704(22.13%)	162.0874	0.000	***
<b>Location</b>	Rural	2,477(77.87%)			
	<b>Income level</b>	Income=0	989(31.09%)	150.8998	0.000
0<income<18000		1,422(44.70%)			
18000<=income		770(24.21%)			
<b>BMI group</b>	18.50<=BMI<23.00	145(4.56%)	28.5570	0.000	***
	18.50<=BMI	823(25.87%)			
	23<=BMI<27.50	1,811(56.93%)			



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27.5<=BMI                      402(12.64%)

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\*\*\* $p<0.01$ , \*\* $p<0.05$ , \* $p<0.1$

### b) Enabling factors

In terms of the variable that mainly focused on in this study, there is a significant difference between different types of medical insurance and the choice of choosing secondary and tertiary health care facilities.

Table 21: Chi-square test between Enabling factors and utilization of outpatient services in secondary and tertiary hospitals (N=3,181)

Independent Variables (Enabling factors)		N (%)	Pearson chi2	P value	Sig
<b>Insurance</b>	No insurance	67(2.11%)	179.0505	0.000	***
	BMIUE	472(14.84%)			
	BMIURR	2,572(80.86%)			
	Other	70(2.20%)			
insurance					

\*\*\* $p<0.01$ , \*\* $p<0.05$ , \* $p<0.1$

### c) Need factors

There is a significant difference between the proportion of Smoking patients in secondary and tertiary health facilities and that of non-smoking patients in tertiary medical institutions, while there was no significant difference between Drinking and

non-drinking. In terms of the choice among diabetes patients, there is no significant difference between the proportion of patients with diabetes and those without diabetes.

So do the patients with other chronic diseases.

Table 22: Chi-square test between Need factors and utilization of outpatient services in secondary and tertiary hospitals (N=3,181)

Independent Variables (Need factors)		N (%)	Pearson chi2	P value	Sig
<b>Smoking</b>	No	2,595(81.58%)	6.8106	0.009	**
	Yes	586(18.42%)			
<b>Drinking</b>	No	3,128(98.33%)	0.0318	0.858	
	Yes	53(1.67%)			
<b>Diabetes</b>	Yes	2,970(93.37%)	0.7093	0.400	
	No	211(6.63%)			
<b>Other chronic diseases</b>	No	1,407(44.23%)	1.8850	0.170	
	Yes	1,774(55.77%)			

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The results showed that there were significant differences between utilization of secondary and tertiary hospitals outpatient services and variables such as gender, age, income, BMI, education level, marital status, smoking and medical insurance coverage.

### 4.3 Binomial logistic regression analysis

This article uses a bilinear logistic regression model to analyze the factors that affect the utilization rate of outpatient services and the factors that affect the selection of respondents in medical institutions.

Table 23 shows the results on the association between independent variables and outpatient services utilization.

#### a) Predisposing factors

For gender, males (AOR 0.852, 95%CI: 0.776 -- 0.936) were 14.8% less likely to use outpatient services.

Among different items of education levels, the illiteracy was used as a reference. The increasing education level is positively associated with the outpatient services utilization. The sample included in this study with primary school level educational status is 1.157 times more likely to use outpatient care compared to those illiteracy. Moreover, the high school education or above level of respondents (AOR 1.524, 95%CI: 1.222 -- 1.901) were likelihood to utilize outpatient services, which is 1.524 times more than illiteracy.

The different age group of respondents (AOR 0.954, 95%CI:0.861--1.056; AOR 1.001, 95%CI:0.893--1.121), and the respondents' martial status (AOR 0.924, 95%CI: 0.826 -- 1.034), and the living location of respondents (AOR 0.984, 95%CI: 0.866 -- 1.118) are not risk factors affecting the utilization of outpatient services.

In items of income groups, respondents without income (AOR 1.126, 95%CI: 1.017 -- 1.245) are likelihood took outpatient services utilization, 1.126 times more than

respondents with normal income.

For BMI scores of respondents, the utilization of outpatient services in underweight people are 1.27 times more than the normal weight respondents (AOR 1.27, 95%CI: 1.041 -- 1.548).

### **b) Enabling factors**

As for health insurance, the participants of BMIURR (AOR 1.389, 95% CI: 1.069-1.806) and BMIUE (AOR 1.444, 95% CI: 1.069-1.952) are positively related to the use of outpatient services. In other words, there are Compared to people without medical insurance, health insurance can benefit more from outpatient services.

### **c) Need factors**

Diabetes patients (AOR 1.407, 95%CI: 1.063 -- 1.863) are 1.407 times more likelihood to utilize outpatient services than those without diabetes, while respondents with other chronic diseases not including diabetes (AOR 1.88, 95%CI: 1.736 -- 2.037), the likelihood of utilization of outpatient services was 1.88 times higher than that of non-chronic disease patients.

The results indicate that patients with chronic diseases often benefit from outpatient services.

However, in terms of the cross-term, patients with both diabetes and other chronic diseases (AOR 0.114, 95%CI: 0.082 -- 0.159) are 88.6% less likely to utilize outpatient services than only diabetes patients. In addition, smoked respondents were less likely to

use outpatient services (AOR 0.738, 95%CI: 0.661 -- 0.825).

There is no correlation between whether the respondents drunk alcohol consumption (AOR 0.904, 95%CI: 0.67 -- 1.219) and the use of outpatient services.

Table 23: Association between independent values and utilization of outpatient services (N=19,305)

Utilization of Outpatient Services	Unadjusted OR	95% CI	Adjusted OR	95% CI
<b>Gender</b>				
Female	Ref.			
Male	0.765***	0.708-0.826	0.852***	0.776-0.936
<b>Age group</b>				
~54	Ref.			
55-64	0.947	0.859-1.044	0.954	0.861-1.056
65+	1.024	0.933-1.124	1.001	0.893-1.121
<b>Education group</b>				
Illiterate	Ref.			
Primary School	1.043	0.944-1.152	1.157**	1.041-1.287
Middle School	0.956	0.851-1.073	1.119*	0.981-1.276
High School	0.964	0.823-1.129	1.174*	0.983-1.402
Above High School	1.306**	1.087-1.569	1.524***	1.222-1.901
<b>Married</b>				
Never married	Ref.			

Have a partner	0.890**	0.801-0.988	0.924	0.826-1.034
<b>Location</b>				
Urban	Ref.			
Rural	0.924	0.843-1.013	0.984	0.866-1.118
<b>Smoking</b>				
No	Ref.			
Yes	0.651***	0.592-0.717	0.738***	0.661-0.825
<b>Drinking</b>				
No	Ref.			
Yes	0.932	0.693-1.252	0.904	0.670-1.219
<b>Income level</b>				
0<income<18000	Ref.			
income=0	1.096**	1.003-1.199	1.126**	1.017-1.245
18000<=income	0.942	0.856-1.037	0.912	0.805-1.034
<b>BMI group</b>				
18.50<=BMI<23.00	Ref.			
18.50<=BMI	1.282**	1.054-1.558	1.27**	1.041-1.548
23<=BMI<27.50	1.093*	0.999-1.195	1.003	0.914-1.100
27.5<=BMI	1.138*	0.999-1.297	0.993	0.868-1.136
<b>Insurance</b>				
No insurance	Ref.			
BMIUE	1.485**	1.129-1.953	1.444**	1.069-1.952

BMIURR	1.414**	1.091-1.832	1.389**	1.069-1.806
Other insurance	1.653**	1.148-2.380	1.544**	1.056-2.257
<b>Diabetes</b>				
No	Ref.			
Yes	1.429**	1.081-1.889	1.407**	1.063-1.863
<b>Other chronic diseases</b>				
No	Ref.			
Yes	1.904***	1.759-2.061	1.88***	1.736-2.037
<b>Cross term</b>				
Only Diabetes	Ref.			
Only other chronic diseases	0.733*	0.523-1.028	0.735*	0.524-1.032
Diabetes is associated with other chronic diseases	0.144***	0.136-0.152	0.128***	0.093-0.177

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

Table 24 describes the results on the association between independent variables and the choice of healthcare facilities utilization.

#### a) Predisposing factors

Among respondents willing to utilize outpatient services, older respondents are less reluctant to utilize secondary and tertiary health care facilities, especially aged 65 and above respondents (AOR 0.699, 95%CI: 0.564 -- 0.866) are 3.7% less likely to utilize

secondary and tertiary health care facilities than those aged 45.

Among different educational status levels, the respondents of primary school are not associated with choosing secondary and tertiary health care facilities. The increase of education level is positively associated to use secondary and tertiary health care facilities. Especially, the high school and above educational respondents (AOR 1.843, 95%CI: 1.179 -- 2.881) were more likely to utilize secondary and tertiary health care facilities, which was 1.843 times of the reference items.

The gender of respondents (AOR 1.113, 95%CI: 0.931 -- 1.33), and the respondents who have a partner (AOR 1.16, 95%CI: 0.937 -- 1.436) are not the risk factors affecting the use of secondary and tertiary health care facilities.

For respondents' living location (AOR 0.615, 95%CI: 0.487 -- 0.778), rural residents are 38.5% less likely to use secondary and tertiary hospitals. And respondents who smoked (AOR 0.735, 95%CI: 0.592 -- 0.912) were less likely to use secondary and tertiary hospitals.

In terms of different income levels, the higher income group (AOR 1.378, 95%CI: 1.082 -- 1.756) are 37.8% more likelihood to utilizations of secondary and tertiary health care facilities than normal income group.

There is no correlation between BMI scores of health status and secondary and tertiary health care facilities utilization.

#### **b) Enabling factors**

In terms of health insurance status, the respondents participating in BMIUE (AOR 2.298,



95%CI: 1.264 -- 4.178) and other medical insurance (AOR 2.952, 95%CI: 1.378 -- 6.324) are positively associated with using secondary and tertiary health care facilities. In other words, people with health insurance except for BMIURR (AOR 1.323, 95%CI: 0.784 -- 2.231) are more likely to use high level health care facilities compared to those without medical insurance.

### c) Need factors

Certainly, diabetes respondents (AOR 1.354, 95%CI: 0.792 -- 2.316) and the other chronic diseases not including diabetes patients (AOR 1.152, 95%CI: 0.988 -- 1.343) are not the risk factors affecting the utilization of secondary and tertiary health care institutions.

There is no correlation between respondents with diabetes and other chronic diseases (AOR 0.636, 95%CI: 0.331--1.223) and secondary and tertiary hospitals utilization. In addition, whether the respondents drank alcohol (AOR 0.747, 95%CI: 0.415 -- 1.345) is not the risk factors affecting the secondary and tertiary health care facilities utilization.

Table 24: Association between independent values and utilization of outpatient services in secondary and tertiary hospitals (N=3,181)

<b>Tertiary general hospitals</b>	<b>Unadjusted OR</b>	<b>95% CI</b>	<b>Adjusted OR</b>	<b>95% CI</b>
<b>Gender</b>				
Female	Ref.			
Male	1.206*	1.048-1.390	1.113	0.931-1.330
<b>Age group</b>				

~54	Ref.			
55-64		0.763**	0.638-0.913	0.736** 0.608-0.892
65+		0.667***	0.562-0.791	0.699*** 0.564-0.866
<b>Education group</b>				
Illiterate	Ref.			
Primary School		1.350**	1.118-1.630	1.096 0.894-1.342
Middle School		2.184***	1.756-2.716	1.413** 1.099-1.816
High School		2.748***	2.041-3.700	1.549** 1.102-2.176
Above High School		5.972***	4.086-8.728	1.843** 1.179-2.881
<b>Married</b>				
Never married	Ref.			
Have a partner		1.424***	1.173-1.729	1.16 0.937-1.436
<b>Location</b>				
Urban	Ref.			
Rural		0.326***	0.273-0.389	0.615*** 0.487-0.778
<b>Smoking</b>				
No	Ref.			
Yes		0.786*	0.655-0.942	0.735** 0.592-0.912
<b>Drinking</b>				
No	Ref.			
Yes		0.952	0.552-1.642	0.747 0.415-1.345

<b>Income level</b>				
0<income<18000	Ref.			
income=0		1.275**	1.081-1.504	1.084 0.898-1.309
18000<=income		3.041***	2.533-3.651	1.378** 1.082-1.756
<b>BMI group</b>				
18.50<=BMI<23.00	Ref.			
18.50<=BMI		0.843	0.586-1.213	1.009 0.693-1.469
23<=BMI<27.50		1.451***	1.228-1.714	1.183* 0.992-1.412
27.5<=BMI		1.041	0.817-1.326	0.913 0.708-1.179
<b>Insurance</b>				
No insurance	Ref.			
BMIUE		5.087***	2.954-8.759	2.298** 1.264-4.178
BMIURR		1.348	0.809-2.245	1.323 0.784-2.231
Other insurance		4.783***	2.320-9.858	2.952** 1.378-6.324
<b>Diabetes</b>				
No	Ref.			
Yes		1.227	0.737-2.042	1.354 0.792-2.316
<b>Other chronic diseases</b>				
No	Ref.			
Yes		1.108	0.958-1.280	1.152* 0.988-1.343
<b>Cross term</b>				
Only Diabetes	Ref.			

Only other chronic diseases	0.868	0.471-1.596	0.729	0.383-1.386
Diabetes is associated with other chronic diseases	0.815***	0.732-0.908	0.636	0.331-1.223

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$



## CHAPTER 5: DISCUSSION

This study assessed the socio-demographic factors and medical insurance scheme affect the decision to utilize outpatient services and conditioning on use the choice among primary and higher level which are secondary and tertiary health care facilities utilized by diabetic in China using an unbalanced panel data set. According to Andersen's

behavioral model of health care utilization theory (Andersen & Newman, 1973), predisposing factors refer to individual's factors to health services utility, enabling factors refer to resources which could accommodate access to health services, and the need factors refer to potential needs of the use of health service.

## **5.1 Association between predisposing, enabling, and need factors toward utilization of outpatient services**

### **5.1.1 Predisposing factors**

This study aims to assess the impact of socioeconomic-demographic factors on the use of outpatient service for diabetic.

In predisposing factors, it is reported that the better-educated individuals tend to use more outpatient services. The individuals with high education will be more care of their healthcare and preventive services. In addition, high education will bring the thought about the important of medical insurance. Even though, in this study education level were not significant related to utilization of medical insurance, but other findings showed that people who had high education were likely to use outpatient services. It is similar with findings in Liu & Zhao and Zhou et al (Liu & Zhao, 2012; Zhou et al., 2020).

The income level was a significant factor in this study. The individuals with a higher economic status tended to receive more use secondary and tertiary health care facilities, vice versa, which aligned with the study conducted in Zhang et al (Zhang et al., 2019).

The studies illustrated that the total amount of healthcare utilization for outpatient services was increased in the highest income groups, that means that high level income

groups were more likely to receive outpatient services in secondary and tertiary health care facilities. However, the low-income individuals use more outpatient services compared to high-income individuals (Milcent & Jin, 2010; Wang et al., 2018).

The present study showed that among Chinese middle-aged and elder, healthy weight people decreased the likelihood of outpatient care utilization than underweight people.

Moreover, the Li et al. and the research shows that the compared to healthy weight people, obese people more likely to use outpatient and inpatient care (Li & Yang, 2021).

However, for gender, males were 14.8% less likely to use outpatient services. A possible explanation for these patterns is that male have a higher price elasticity of demand for healthcare than female, whereas women with specific physiological conditions (e.g., pregnancy) have a lower elasticity of demand for healthcare (Zhou et al., 2020)

### **5.1.2 Enabling factors**

This study aims to assess the impact of different medial insurance schemes on the use of outpatient service for diabetic.

In enabling factors, the result show that the population covered by medical insurances were higher chance to get a good utilization of the outpatient services. It is similar with the founding of Wang et al. which the middle-aged and elderly adults with social health insurance were more likely to utilized outpatient services than individuals without social health insurance (Lim et al., 2017; Yaogang Wang et al., 2017).

### **5.1.3 Need factors**

In need factors, the middle aged and elderly adults in China, people who regularly

smoking are less likely to use outpatient care than never smoked. Although, the population apply for the healthy lifestyle today, smoker in such a situation may be related to Nicotine tolerance, or maybe had the higher risk-tolerant individuals.

There are three possible reasons may explain the inverse relationship between regular smoking and healthcare utilization:

Firstly, people who regularly smoking may not care about their health status or maybe risk-tolerant individuals. Secondly, the adverse health consequence of smoking may appear several years later. Lastly, smoking is frequently used when population feel the depressed. That same as the Wang & Pornchaiwiseskul's found (Wang & Pornchaiwiseskul, 2014).

It illustrates that it is better to improve the mechanism for chronic disease prevention and management which allowed the patients to better access the healthcare services. It is better to improve the propaganda dynamics for primary facilities and the quality of the primary healthcare services which allowed the patients to better access the healthcare services.

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## **5.2 Association between predisposing, enabling, and need factors toward utilization of outpatient services in secondary and tertiary hospitals**

In the study, age, highest education level, residents living location and income, also are the risk factors of the using of secondary and tertiary health care facilities outpatient.

### **5.2.1 Predisposing factors**

This study aims to assess the effect of socioeconomic-demographic factors on the choice of three-tiered health care facilities among diabetic who use outpatient services.

In reviewed studies founded that the likelihood of individuals to increased the using of healthcare as they become elder, but the elder decreased the likelihood of the utilization of secondary and tertiary health care facilities outpatient than compared to the reference group (YQ Wang et al., 2017).

In the study, the respondents living rural areas were less likely to receive outpatient services in secondary and tertiary health care hospitals among elderly adults who age more than 55. Li et al. 's study showed that during 1993-2011, most patients in rural areas chose outpatient clinics as their primary treatment option (Li et al., 2018; Zhou et al., 2020).

It is similar with other low and middle-income countries that the using of outpatient serves in secondary and tertiary health care hospitals in the rural area is lower than in the urban area (Huang & Gan, 2017; Kalantzi et al., 2015).

The result showed that the using of outpatient service in secondary and tertiary health care facilities is concentrated in the affluent population (Jenkins & O'Higgins, 1989; Li et al., 2019).

Inequity between regions, rich- poor, and urban-rural characterize the health care situation in Indonesia. The big cities in China have higher density of health facilities and health workers (Li et al., 2018). Moreover, the richest and living in urban settings have bigger propensity to access secondary and tertiary health facilities than the poor parts (WHO et al., 2015).

In addition, the research shows that the middle school education level respondents and above education level respondents are in a high-risk group for utilization of secondary and tertiary health care hospitals outpatient service.



### 5.2.2 Enabling factors

This study aims to assess the effect of different health insurance schemes on the choice of primary and higher level (secondary and tertiary) health care hospitals among diabetic who use outpatient services.

In enabling factors, any outpatient visits of BMIUE enrollees and BMIURR enrollees were statistically different. Among all hospital types, BMIUE enrollees had significantly higher outpatient visit in secondary and tertiary level hospitals rates than BMIURR enrollees (Xian et al., 2019).

However, BMIUE and BMIURR cover all outpatient services, but the different proportions of insurance payments can partially explain why BMIURR receive more benefits and higher repayment rates than BMIUE. (Li & Zhang, 2013; L. Wang et al., 2017; Zhang et al., 2017).

### 5.2.3 Need factors

In need factors, the patients who only have diabetes, patients with other chronic disease and diabetes patients with other chronic diseases are not the risk factor for the patients of the choice to use secondary and tertiary health care facilities.

The logistic regression models found that among Chinese adults, never smoked inhabitants were more likely to use outpatient care in secondary and tertiary health care facilities compared to those who smoked (Castiglioni et al., 2020; Li et al., 2020; Shen et al., 2020).



## CHAPTER 6: CONCLUSIONS

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### 6.1 Conclusions

The study researched the predisposing factors, enabling factors and perceived factors which association the choices of health insurance and the using of health care. The healthcare utilization was classified into primary facilities and secondary and tertiary health care hospitals in conformity with the type of health care facilities visited by database. This study gets data from 2018 CHARLS database. A total of 20,813 samples were collected, after clearing up the data and keeping observations with complete information, the sample size become 19,305 populations.

The purpose of this study is to empirically examine the relationship between choosing health insurance and diabetes patients' access to medical care in China.

The empirical findings suggest that among age of 45 and above Chinese adults, women are more likely to have access to healthcare than men. In education level projects, people with secondary or higher education benefit from outpatient services, which means that those with higher education have higher health awareness and are more likely to be more active in outpatient services. Disease prevention and use of outpatient services for diagnosis and treatment of diseases. Smokers were more likely to use outpatient services compared to those who never smoked. In addition, underweight population were more likely to use outpatient care than healthy weight. Interestingly, people who regularly drank alcohol were less likely to use outpatient care service than never drinking population. Moreover, no income people increased the likelihood of utilization of outpatient services than middle income population. And the BMIUE and BMIURR are more likely to use outpatient services compared to those who do not have insurance and within other insurance scheme. That means that with the health insurance coverage expand, the population inequity used outpatient services is reduction. In addition, health insurance payments also include chronic diseases that lead to diabetes, as well as other chronic disease patients who have easier access to outpatient services. This may have a significant impact on the government's support for formulating medical resource allocation policies.

Regarding elderly people in China who bypass primary hospitals to receive care from higher institutions. In urban areas, 61.5% of rural patients use outpatient services in secondary and tertiary medical institutions. And the population with higher aging are

using the high-level hospitals outpatient services. Current research suggests that the relative increase in smoking increases the likelihood of bypassing primary healthcare institutions. Current research has found that the relative increase in smoking may exceed that of primary health care. High income individuals may benefit from using secondary and tertiary medical hospitals. On the other hand, intermediate respondents are more likely to use outpatient services in secondary and tertiary medical hospitals. On the other hand, patients with diabetes and other chronic diseases are unlikely to benefit from outpatient services in secondary and tertiary hospitals.

This study uses binomial logit regression analysis to analyze the factors which influenced the utilization of outpatient services and the choice health care facilities of respondents.

For the predisposing factors, this study found that female will use more formal outpatient care compared to reference group, but the male would like to utilize the secondary and tertiary health care facilities. The group of aged 65 and above will use more formal outpatient care and the utilization of secondary and tertiary health care facilities compare to reference group. While people who without education level will decrease the use of formal outpatient care compared to those who have high education level, the group of middle school education level especial choosing secondary and tertiary health care facilities. Among those people without income and the BMI scores of underweight people will increase the probability of using outpatient services. The people have partner will choosing utilization of secondary and tertiary health care facilities. However, location, smoking, and drinking did not have a significant impact either on the decision to use outpatient services nor the utilization of healthcare facilities. Being in the highest income group will increase the probability of using secondary and

tertiary health care facilities.

In term of enabling factors, that have no medical insurance group will reduce the probability of using outpatient services. While medical insurance did not significant in utilization of secondary and tertiary health care facilities.

For perceived need factors, people with diabetes and the other chronic disease without diabetes will increase the use of formal outpatient care and secondary and tertiary health care facilities. Being in the group which both have diabetes and other choric disease will reduce the probability of using normal outpatient care.

## **6.2 Recommendation**

Now, the overcrowding is the biggest health system problem in China, especially in the utilization of secondary and tertiary healthcare institutions outpatient services. Based on basic results in the study, reducing the using of secondary and tertiary healthcare institutions outpatient services in China need to improve the service quality of people's hospitals and the utilization rate of people's medical institutions. Awareness services focused on screening for serious and chronic diseases, as well as preventing chronic diseases, will increase access to basic medical services.

With the chronic diseases raised prevalence, improving the basic medical insurance system, and guarantying the ability of the medical security level for chronic diseases patients, promoting the timely treatment, improving the quality of healthcare, and effectively reducing the economic risk of disease is more important. In this regard, it is recommended that:

### **6.2.1 Recommendation for Residents**

- **Improved the health literacy in prevent chronic disease**

Having adequate health literacy is significantly associated with the education level to use outpatient services in secondary and tertiary hospital. The basic medical education support from Health commission propaganda gives a big impact in use improved the health literacy in prevent chronic disease and the dietary balance. That means that have the knowledge of how to prevent chronic disease and the dietary balance will reduce the states of unhealthy weight and unhealth behavior. Therefore, effective health education and health promotion strategies must be formulated to implement multifaceted health literacy interventions and improve rural residents' health literacy levels (Wei, 2011).

### **6.2.2 Policy Recommendation**

#### **a) Promoting the hierarchical diagnosis and treatment system**

The Chinese healthcare system categorizes patients based on disease severity and treatment difficulty, enabling medical institutions at all levels to withstand diagnostic and treatment capabilities. Transfer routine outpatient, rehabilitation, and nursing services provided by large and medium-sized medical institutions to the basic level of medical institutions, and form a system of “primary diagnosis, two-way referral, rapid division and treatment, and up and down linkage” (Shen et al., 2019; Yaogang Wang et al., 2017).

- **Executing the functional orientation of health care institutions and perform reasonable regional health planning**

The German government divides medical regions into hundreds of “regional hospital service systems” throughout the country. Four levels of health care were established on

a standard basis to provide different levels of care, with referrals being transferred from lower to higher levels. In 1948, Japan promulgated the first medical law, which set up three medical circles according to various factors such as population, geography and transportation, providing convenient outpatient service and advanced inpatient service respectively from one to three times.

China will continue to carry out regional medical classification to reduce cross-regional medical treatment for diseases that have a high mortality rate, a heavy disease burden, a high number of patients who are transferred abroad for medical treatment, and those that seriously harm people's health. We will further improve the pilot medical and health care service system and establish a high-quality, efficient, and integrated medical and health care service system.

● **Improving the capacity of community-level medical and health services**

The key to effectively improve basic medical and health service capacity is to improve the medical service capacity of basic medical staff. General practitioner is a mainstay of the basic medical and health services, general practitioner training in our country at present is mainly job-transfer training and standardized training, it can temporarily solve the problem of lack of talent, but in the long run, should be established as soon as possible, record of formal schooling education, standardization of combination of education and continuing education general practitioner training system, at the same time should improve general practitioners' incentive mechanism, Build a stable and high-quality team for grassroots medical and health services. In addition, strengthening the supporting facilities of primary medical institutions, increasing the number and types of drugs and promoting the vertical flow of high-quality medical resources

through information construction are all effective measures to improve the capacity of primary medical and health services.

In addition to the mandatory role of laws and medical insurance policies, the quality of foreign primary medical service is also the main reason why patients are willing to choose primary medical treatment. The quality of the service is mainly reflected in the qualification of general practitioners. The training cycle of general practitioners in the UK, THE US, Germany, Australia and other countries is close to 10 years, and they still need to complete the continuing education 2-2 after obtaining the qualification. Medical and powerful country in economy is not developed in Cuba, as early as 1983 specially formulated the gp syllabus, all medical university graduates need to two-year family doctor business training, after training to pass the exam in order to become a family doctor, become a family doctor needs to have a half day a week after 34 concentrated study or training. In addition, the hardware facilities of primary health institutions in some countries are also very advanced. For example, in the United States, nearly 4% of polyclinics have magnetic resonance imaging equipment (MRI). More than 30% of clinics have clinical laboratories and radiology departments.

**b) Establishing medical partnerships to promote effective cooperation and coordination among various medical institutions**

- **Establish a medical alliance, improve the quality of medical resources, and achieve medical quality, resource allocation and Vertical integration**

In Germany, outpatient and inpatient services follow a strict "dual track" system, with the physicians' association responsible for organizing and managing outpatient medical services, and doctors practicing independently and signing medical insurance contracts with local physicians' associations responsible for providing outpatient services, while



institutions only provide inpatient treatment and generally do not perform outpatient services. In addition, in the tertiary medical community in Japan, there is little outpatient service except for referrals.

However, in China, it is impossible to achieve complete separation of outpatient service and inpatient service in a short time. However, by reducing outpatient rates in high-level institutions, treatment time and quality can be ensured. Reduce resource waste caused by duplicate testing and encourage senior institutions to transfer rehabilitation patients to primary healthcare institutions.

- **Improving dual referral**

We should improve the two-way referral system, focus on unimpeded downward referral channels, clarify referral standards and procedures, promptly refer patients to lower-level medical institutions, and explore a service model that combines community-level medical and health institutions with medical care for the elderly, home beds, and home-based care.

The National Health Service Act was promulgated in 1946. It is clearly stipulated that patients generally need to go through a general practitioner to access secondary care facilities. Germany's "Health insurance Law" also clearly stipulates the implementation of family doctor first visit system. The United States is a typical market-oriented country, and medical insurance is mainly provided by private medical insurance institutions. Health Maintenance Organizations (HMO) in private medical insurance clearly stipulate that resident must appoint a family doctor. Referral to a specialist is required by a family doctor. In addition to mandatory referrals by patients, many countries have also adopted

measures to regulate referrals by medical service providers. The German Disease Foundation, for example, has a budget cap. After the patient's condition stabilizes, the hospital will promptly transfer the patient for treatment and rehabilitation.

**c) Improve health insurances system**

● **Adjust the policies of insurance compensation and increasing leverage**

Modifying the health insurance compensation policy and improving the utilization rate of health insurance can effectively prevent patients from seeking health care. At present, the main approach is to increase the repayment rate of patients in basic medical institutions and guide them towards basic levels, but such a gap is not enough to change patients' medical behavior in China. In the design of the health insurance compensation system, it can be effectively combined with the family doctor system, endows family doctors with more financial authority and specialized resources, further enlarging the reimbursement difference between different levels of medical institutions, and makes mandatory referral regulations in the form of laws if possible. At present, medical insurance in many regions in China has begun to pilot the DRGs payment system, and the implementation of DRGs on the basis of effective information provides an opportunity for high level institutions to actively refer patients and standardize the referral process.

● **Developing commercial health insurance and social medical insurance**

The commercial health insurance model is operated independently by commercial companies in accordance with market rules, and citizens voluntarily apply for insurance. The government does not need to spend much energy on planning and operation. Moreover, the influx of capital is conducive to the development of medical and health undertakings and can also meet the needs of different groups for high-level medical and

health services.

The United States operates a commercial medical insurance model. However, due to the high insurance cost, only people with certain economic strength can enjoy better medical insurance services with poor fairness. Second, the price is determined according to the law of the market. The improvement of the level of economic development and the constant change of the market lead to the rapid increase of costs. Third, the insured is unstable. The profit-seeking characteristics of businessmen make public welfare insufficient, which is easy to breed corruption, resulting in various adverse selection and moral damage of the insured (Rong, 2007; Wenbin, 2011).

Therefore, it is very important for China to find a balance between the national medical insurance model and the commercial medical insurance model.

The Medical Insurance Bureau may consider using commercial medical insurance to participate in the handling of part of the basic medical insurance system in an administrative manner, and conduct operations in a unified and coordinated manner, to gradually expand the use of commercial insurance in medical insurance. Social medical insurance is to guarantee the basic needs of residents' medical services. It not only can individuals get medical security, but also the social insurance becomes more professional and systematic, promoting the quality of its service, but also effectively reducing the management cost of medical and health resources, to relieve the pressure of residents.

- **Actively promoting the integration of the health insurance system to adapt to the of "universal medical insurance".**

The development of "universal health insurance" is not only the design of universal

medical insurance system coverage, but also the coverage of operation equity. The heterogeneous influence of medical insurance for urban and rural residents and medical insurance for urban employees on medical equity is due to the segmented and unframed management mode of medical insurance and the segmented property of territorial management, which leads to the lack of equity and equality of the system and prominent problems such as financing, medical service utilization and treatment equity. The main way to solve the existing problems in the reform of the medical insurance system is to improve the integrated system, establish a "comprehensive unity", and ensure equal opportunities for urban and rural medical services by integrating national funds. The goal is to achieve truly fair healthcare (Jun, 2018).

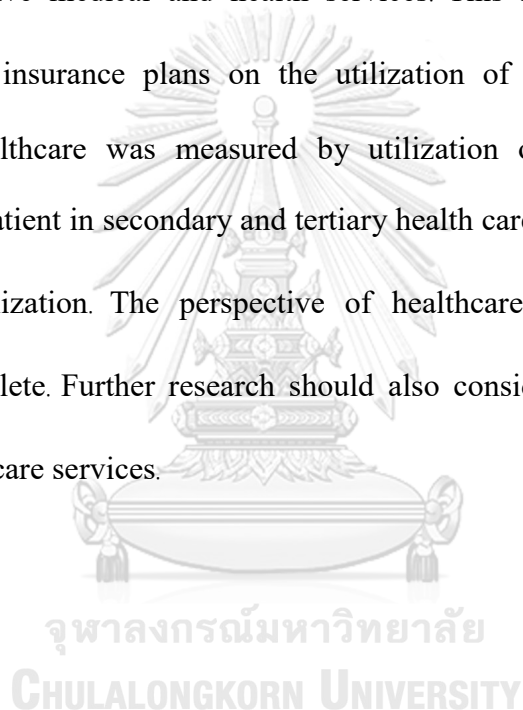
### **6.2.3 Recommendation for Future Studies**

Regarding the topic, future studies should emphasis and explore more related to the disparity of socio-demographic factors and health insurance scheme affect the decision to use outpatient services and conditioning on bypass the primary health care facilities which the utilization of secondary and tertiary health care facilities by diabetic in China. In addition, qualitative study also can be an appropriate method in order to gain a deeper understanding of why chronic disease patients bypassing primary health care.

### **6.3 Limitations**

In this study has some limitations. The choice of outpatient utilization is self-reported by residents according to their economic situation, time arrangement, personal preference, and other factors, so it inevitably shows deviation. In addition, during the time of data used in the study which the policy of the different type of medical insurance

have changed. For example, in 2016, the medical insurance for urban residents and the new rural cooperative medical insurance were merged into the basic medical insurance for urban and rural residents. In June 2020, the National Medical Insurance Administration issued a joint document to provide residents with full insurance coverage, reduce the medical burden, dynamically adjust, and optimize the medical insurance drug list, and strengthen fund supervision to ensure that residents can enjoy timely and effective medical and health services. This may affect the impact of difference health insurance plans on the utilization of healthcare. Moreover, the utilization of healthcare was measured by utilization of outpatient service and utilization of outpatient in secondary and tertiary health care facilities. The perspective of healthcare utilization. The perspective of healthcare utilization evaluation is somewhat incomplete. Further research should also consider indicators such as the intensity of healthcare services.



## **Ethical Approval**

Ethical approval for all the CHARLS waves was granted from the Institutional Review Board at Peking University. The IRB approval number for the main household survey, including anthropometrics, is IRB00001052-11015; the IRB approval number for biomarker collection, was IRB00001052-11014.

During the fieldwork, each respondent who agreed to participate in the survey was asked to sign two copies of the informed consent, and one copy was kept in the CHARLS office, which was also scanned and saved in PDF format. Four separate consents were obtained: one for the main fieldwork, one for the non-blood biomarkers and one for the taking of the blood samples, and another for storage of blood for future analyses.

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