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FACULTY OF BUSINESS AND LAW
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MODELLING LONG-TERM CARE FOR OLDER PEOPLE IN CHINA

by

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ABSTRACT

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YAJIE NIE

This report outlines an Operational Research (OR) model to plan long-term care (LTC) provision for older people in urban and rural China. Many countries in both the developing and the developed world have been experiencing a marked demographic shift towards an ageing population. An ageing society can present challenges, such as addressing the high demand for health and social care amongst older people, particularly in the latter part of the life course. Planning, delivering and financing such LTC provision for older people can be a challenge for local and national governments. This research is part of the EPSRC Care Life Cycle (CLC) research project at the University of Southampton, which aims to build and use a suite of simulation models to assist UK policy makers at the national and local levels in planning health and social care provision more effectively for future cohorts of older people, both in the UK and globally. The model outlined in this report is a contribution to this body of work.

This research involves the development and use of a discrete event simulation (DES) model (which is named as 'SIMCARE-CHINA' model) to display the different pathways for using alternative LTC services among older people in China: informal, institutional, community-based, private, and voluntary services. The number of people who do not need care or who have unmet needs is also included in the model. This model is applied to different areas/levels – urban areas and rural areas –to consider the different LTC demand projections. The main dataset used to make the projection is composed of the Chinese Health and Retirement Longitudinal Study (CHARLS) and the Chinese Longitudinal

Healthy Longevity Survey (CLHLS). Data from other sources and previous studies are also used. SIMCARE-CHINA model can be used to test alternative scenarios and policy reforms and to evaluate their performance in terms of the LTC needs met amongst older people in urban and rural China, from the perspective of both the government and individuals. Thus, such modelling can offer researchers and policy makers an opportunity to understand the LTC system better and explore the outcomes and effects of different policies and reforms through simulation, with the aim of making recommendations for future improvements.

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DECLARATION OF AUTHORSHIP

I, Yajie Nie declare that the thesis entitled “Modelling long term care for older people in China” and the work presented in it are my own and has been generated by me as the result of my own original research. I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission.

Signed: .....

Date: .....

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Definitions and Abbreviations

ADL	Activities of Daily Living
BHPS	The British Household Panel Survey
CCP	Chinese Communist Party
CLC	Care Life Cycle
CLHLS	The Chinese Longitudinal Healthy Longevity Survey
CHARLS	The Chinese Health and Retirement Longitudinal Study
CPDRC	Population and Development Research Centre
DES	Discrete-Event Simulation
ELSA	English Longitudinal Study of Ageing
EPSRC	Engineering and Physical Science research Council
Five-Guarantee' services	Guarantee to provide clothing, shelter, medication, food, and funeral
GAD	Government Actuary's Department
GHS	General Household Survey
HCC	Hampshire County Council
HES	Hospital Episode Statistics
IADL	Instrumental Activities of Daily Living
KPIs	Key performance Indicators
LAs	Local Authorities
LTC	Long-Term Care
LOS	Length of Stay
NGO	Non-governmental organisations
NHS	National Health Service
ONS	Office for National Statistics
OR	Operational Research
PSSRU	Personal Social Services Research Unit
SAGE	The Study on Global Ageing and Adult Health
SD	System Dynamics
TFR	Total Fertility Rate
Three No	No relatives, no income and no physical ability to work
VL	Visual Logic
VBA	Visual Basic for Applications
WHO	World Health Organization

Chapter 1: Introduction

The research outlined in this thesis focuses on long-term care (LTC) for older people in China. This chapter begins with a definition and explanation of the concept of LTC in general, followed by an introduction to the LTC system in China and some useful comparisons with the UK system, to help understand its elements. The chapter also discusses the recent demographic changes in China, their implications for LTC and associated policy challenges. A discussion of the overall research objective and the thesis research questions follows. The chapter ends with an outline of the structure of the thesis.

1.1 Long-term care for older people

The concept of LTC is one that can have slightly different meanings in the context of different countries, with regard to the type of care provided, the providers of such care and the way in which it is funded (Phillips, Ajrouch & Hillcoat-Nalletamby, 2010). Individuals in need of LTC usually have a disability or chronic condition, and as a result they are unable to carry out activities of daily living (ADLs), such as walking, bathing, dressing, getting in/out of bed or cooking. The assessment of an individual's need is often based on establishing their functional ability in performing such ADLs. The broad aim of LTC is to support individuals in functioning in their daily lives so they can maintain as normal and integrated a lifestyle as possible (Stone, 2006). There is no single definition of LTC; however, the World Health Organization's (WHO) broad definition encompasses care and support from different sources and is used internationally (Gu & Vlosky, 2008). The WHO defines LTC as '*a system of activities undertaken by informal caregivers (family, friends and/or neighbours) and/or professional (health, social, and others) to ensure that a person who is not fully capable of self-care can maintain the highest possible quality of life, according to his or her individual preference, with the highest possible degree of independence, autonomy, participation, personal fulfilment, and human dignity*'

(World Health Organization, 2000:p.6). Colombo et al. (2011:p.11) defined LTC as '*a range of services required by persons with a reduced degree of functional capacity, physical or cognitive, and who are consequently dependent for an extended period of time on help with basic activities of daily living (ADL). This "personal care" component is frequently provided in combination with help with basic medical services such as "nursing care" (help with wound dressing, pain management, medication, health monitoring), as well as prevention, rehabilitation or services of palliative care*'.

Beyond this definition, however, the academic literature has further specified aspects of the concept in greater detail. Nies, Leichsenring & Mak (2013) note that LTC is located at the interface between health care and social care, and that LTC services can be divided between different providers, including formal and informal providers (Nies, Leichsenring & Mak, 2013).

Formal care: this includes all services that are provided by formal caregivers, professionals and auxiliaries, such as health, social and other workers, and by volunteers.

Informal care: this includes all services that are provided by informal caregivers, such as family, friends and neighbours.

LTC also can be classified according to the setting (i.e. the place where service users live), into home-based care and institutional care (Colombo et al., 2011).

Home care: this is mainly provided for people living in their own homes (Colombo et al., 2011; Nies, Leichsenring & Mak, 2013). Home care is sometimes termed 'domiciliary care'; where a carer visits an older person in their own home and helps with daily activities.

Institutional care: this provides accommodation (such as a private bedroom, but shared living and dining room, or a flat or house), as well as LTC services to people who require care due to chronic impairments and a

reduced degree of independence in performing ADLs. Care staffs are on duty day and night. Residential care homes fall into this category. Nursing homes are also classified as an institutional service, but in this case the residential facilities also provide nursing care. Nursing home care is distinct from hospital care (Colombo et al., 2011). These institutional services are especially designed for people with moderate to severe functional restrictions. Local authorities (LAs) have the right to determine the level of such restrictions (Wiener, 2011).

In terms of funding, LTC can be publicly (state) funded, privately funded or funded through a combination of public and private sources (Leichsenring, Billings & Nies, 2013). It can be delivered by different sectors or agencies: public (state) bodies, private for-profit bodies, non-profit providers (e.g. the voluntary sector) or family.

In reality, the composition of LTC, management and finance, the functional and financial assessments conducted, the eligibility criteria applied in different regions and who provides the care, are complex issues and dependent on the country context, the type of welfare model in operation and the historical period under study (Phillips, Ajrouch & Hillcoat-Nalletamby, 2010). For example, the welfare model in operation could include lesser or greater involvement of the private sector in the provision of LTC. In England, for example, local authorities/social services and hospitals traditionally ran care homes before the 1980s, but the number of private for-profit facilities increased during the 1980s and 1990s, leaving government facilities accounting for less than 10% of all care homes (Phillips, Ajrouch & Hillcoat-Nalletamby, 2010; Wiener, 2011).

The aim of this research is to make projections for LTC services for older people in China, and this requires an introduction to such services. The LTC system in China emerged in the 1990s and is still underdeveloped and incomplete (Gu & Vlosky, 2008; Du & Yang, 2009). Studies examining China's LTC and its related issues are relatively rare (Gu &Vlosky, 2008). By contrast,

the UK had one of the earliest formal welfare states, and its LTC system is more developed than that of China (Wang & Qin, 2010). Research concerning the LTC system in the UK is also abundant (Gu & Vlosky, 2008). An examination of UK studies in this area allows us to gain a better understanding of elements of LTC provision in the developed world, and can therefore be useful for understanding the future development of LTC in China. Before LTC in China is introduced, the LTC system in the UK is explained briefly in the next section.

1.2 The LTC system in the UK

LTC services in the UK are provided by voluntary organisations, local councils, health authorities and private agencies. There are three broad types of institutional care in the UK: residential care homes, nursing homes and long-stay provision (Colombo et al., 2011). Only about 10% of residential homes are provided by LAs and the majority of residential care homes are located in the independent sector (either for profit or non-profit) (Wiener, 2011; Colombo et al., 2011).

Elderly individuals within the UK system are assessed by professionals (e.g. social workers, occupational therapists and care managers within a LA) in terms of their functional capacity (e.g. ADLs and cognitive impairment) and, if deemed eligible, they are offered a range of local services and care from different providers. At the same time, older people are assessed financially and the level and type of LTC services to be offered are determined, depending on their level of income, savings and wealth (Glasby, 2012; Rodrigues & Nies, 2013). Individuals who are above the threshold of the means test have to self-fund their services, and the price charged for some services may be the full market price (e.g. the hourly rate of pay for home help) (Rodrigues & Nies, 2013).

The public funding of LTC services comes from general taxation (Glendinning, 2013), as well as from charges for services to users who are not eligible to receive support for LTC. Within the context of LTC provision, most residential and home-based social care is financed and managed by LAs, which represent the state sector, however this results in variations in the level of funding and provision of LTC between different LA areas (Glendinning, 2013). LAs receive funds and can decide how to allocate the overall budget, as well as who is eligible to receive care, what type of cost sharing is available, and which services the beneficiaries receive (Colombo et al., 2011). For example, an LA can cover the cost of home-based care offered to eligible older people, but it can also charge the full market price of the hourly cost of home help offered to non-eligible individuals.

LTC in the UK is also supported by health care services, such as nursing homes, which are organised and financed separately from social services, through the National Health Service (NHS), a tax-financed system of physicians and hospitals. LTC services that are listed under health services are free (Wiener, 2011; Colombo et al., 2011).

Within the UK as a whole, England, Wales, Scotland and Northern Ireland also manage their LTC systems separately (Colombo et al., 2011). For example, in England, access to the LTC service is means-tested (Glasby, 2012; Rodrigues & Nies, 2013). The means test only takes account of an elderly person's income and assets, and the income and assets of spouses, children and other relatives are not taken into account. Individuals with assets below a certain level will receive subsidies or other types of help to cover LTC costs. In Scotland, there is no means test for home care for older people in residential care and nursing homes. The key elements of LTC provision in China will be discussed in detail in Chapter 2, and the next section introduces the key issues relating to LTC in China.

1.3 Long-term care issues in China

1.3.1 The increased need for LTC

China is experiencing dramatic demographic change in terms of population ageing. According to the United Nations' estimation (United Nations Population Division, 2015), in 2014 China's population included about 131 million people who were aged 65 and over, accounting for nearly 22% of the world's population aged 65 and over and 8.24% of the total population of China. The ageing population in China can be characterised by the following three factors.

Firstly, it is large in size. Figure 1.1 shows the population aged 65 and over from 1950 to 2015 and the population projection from 2016 to 2060. It shows that in 1950, when the modern state of China was established, the population aged 65 and over was about 25 million; in 2010, this population increased to over 100 million; in 2026, it is expected to reach over 400 million. The ratio of the population aged 65 and over to the population for the whole of China from 1950 to 2060 is presented in Figure 1.2. In 1955, nearly 5% of the entire population of China were aged 65 and over; in 2010, this proportion increased to almost 7.5%. By 2023, this proportion is projected to increase to over 14%; to reach over 30% in 2060, which means that in 2060, 1/3 of the whole population in China will be aged 65 and over.

Figure1.1 Population of people aged 65 and over in China from 1950 to 2060 (millions)

Source: The United Nations Population Division (2015)

Note: The population estimation from 2015 to 2060 are projections

Figure1.2 Proportion of the population aged 65 and over in the whole population of China (%)

Source: The United Nations Population Division (2015)

Note: The population estimation from 2015 to 2060 are projections

Secondly, the ageing population has grown extremely rapidly: in many developed countries, it took more than 50 years for the proportion of the population aged 65 and over to increase from 7% to 14%. For example, it took 130 years in France, 85 years in Sweden and about 79 years and 69 years for Australia and the USA respectively (Kinsella & He, 2009). It is expected to take China only 25 years to change from an 'ageing' to an 'aged' society (China National Report, 2012).

Population ageing entails an increasing proportion of older persons in the population and is a consequence of decreased fertility and improved life expectancy (United Nations Population Division, 2015). The implementation of the 'one-child policy' in 1979 contributed to the fertility rate dropping rapidly in China over the last 30 years. According to UN data (United Nations Population Division, 2015), the fertility rate in China fell from 6.11 children per female in 1950–1955 to 2.69 children in 1980–1985. The fertility rate has remained constant at 1.60 children per female since 2005–2010. At the same time, the average life expectancy at birth for both females and males in 1950–1955 was 45 years, and it reached 76 years for females and 74 years for males in 2010–2015 (United Nations Population Division, 2015). With a declining fertility rate and increasing life expectancy, China can be described as having become an ageing society in 2000, which means that the share of the population aged 60 and over reached 14% of the total population (Du & Yang, 2009).

Population ageing has created both opportunities and challenges for individuals and policy makers. On the one hand, people now live longer than before, on average, however, although the overall life expectancy for both men and women has been increasing, the number of years that they can expect to spend with a limiting illness or disability has also been increasing (Vlachantoni et al., 2011; Zhan, Luo & Chen, 2012). Such changes in life expectancy are expected to increase the number of older people needing help to carry out their daily activities, leading to an increased need for LTC (Wong & Leung, 2012; Glassa, Gao & Luo, 2013). Although the need for LTC is increasing, the supply of LTC is

decreasing, due to the reduction in the availability of family care and the lack of a developed state support system for old age (Li, et al., 2012; Zhao et al., 2013). In the next section, these two causes are explained further.

1.3.2 The reduced supply of LTC

The reduction in the availability of informal care

Within the Chinese tradition, older people live with their family, usually with their adult children, who take on the main responsibility for caring for older dependent relatives (Du & Yang, 2009; Zhou & Liu, 2013; Shen & Li, 2014). In 1979, however, the Chinese Communist Party (CCP) implemented the 'one-child policy' to control the rapidly rising fertility rate (Zhan, Luo & Chen, 2012; Glass, Gao & Luo, 2013; Shen & Li, 2014). Although its introduction resulted in a significant reduction in the birth rate across China, challenges arose when the members of the one-child cohort reached maturity and their parents entered older age and needed social care, but the numbers of living children who could provide care for their older relatives was reduced (Du & Yang, 2009; Glass, Gao & Luo, 2013). Many Chinese families currently have a '4-2-1' family structure; that is, every adult child is faced with the potential future care of 2 parents and 4 grandparents (Zhan, Luo & Chen, 2012). The decreased number of older people living with children and the legacy of the one-child policy means that families, mainly adult children, may be less able to provide sufficient social care in the future for their older relatives, as single children become adults and a marked imbalance (or 'inverted pyramid') is created between the number of young adults and the number of their elderly relatives who may require care.

At the same time, there is an urban-rural disparity in care needs: the proportion of older people in rural areas is 1.6 % higher on average than in urban areas (Du & Yang, 2009), and the majority of this population rely on their children (Zhou & Liu, 2013). Urban-run differences also exist in the provision of care by

children (Zhou & Liu, 2013). As a consequence of urbanisation, more and more young and middle-aged workers from rural areas are moving to cities to find employment (Song & Li, 2008; Du & Yang, 2009; Luo, 2012). By the end of 2008, there were approximately 140 million rural to urban migrant workers and this number increased to 160 million in 2014 (Ao, Jiang,& Zhao, 2015). This has caused the number of elderly people 'left behind' in so-called 'empty-nest' households to increase sharply, from 17.9 million in 2000 to about 40 million in 2011 (Zhou, 2006; Sun, 2008; Ao, Jiang,& Zhao, 2015). The increase in female participation in the labour market may also have further reduced the potential supply of carers to look after older relatives in urban areas, as women have traditionally been more likely to provide informal care than men (Luo, 2012). The imbalance between the need for care and the provision of care by children could result in older people in rural areas being more vulnerable than older people in urban areas (Du & Yang, 2009; Zhou & Liu, 2013). This has implications for the planning and financing of social care services, particularly in rural areas in China, and for determining how best to address the likely needs of future cohorts of older people.

Another characteristic of the ageing population in China is that it has grown during a period when China's economy is still underdeveloped, which has meant that providing affordable and accessible LTC services for older people has become an issue for the government (Du & Yang, 2009; Wong & Leung, 2012; Glass, Gao & Luo, 2013). This issue is discussed further in the next section.

The lack of a developed state support system for old age

Most developed countries around the world experienced ageing after modernisation. However, China became an ageing society before it had sufficient resources to establish adequate health and social care systems for its ageing population, while the social security system is still incomplete (Du & Yang, 2009; Chen & Powell, 2012; Zheng & Guo, 2012). Due to rapid

population ageing and diminishing family support, increased demand for public services and support for older people has become inevitable. However, due to a lack of resources, older people in China currently face shortages of public services and support, formal care facilities and professional nurses, and a lack of regulation in the care system. This has meant that the so-called 'care burden' of LTC has been pushed back onto individual families (Du & Yang, 2009; Zhou & Liu, 2013).

In addition to LTC facilities, financial support for older people with care needs is limited (Wong & Leung, 2012; Glass, Gao and Luo, 2013). In urban areas, although the public pension system guaranteed sufficient income for elderly people, less than 18% of older people with care needs rely on their pension, and nearly 65% receive financial support from their children; by contrast, more than three-quarters of older people in rural areas receive financial support from their children when they need care (Du & Yang, 2009; Zhou & Liu, 2013). In terms of health care, although the health services remain largely publicly provided, they are increasingly self-funded (Hurd, Hu, & Koen, 2010), as in both urban and rural areas, the health care insurance programme is more reliant on fee payments, the initial cost is high and the percentage of reimbursement is low (Du & Yang, 2009). Thus, even older people with health insurance programmes may find the cost of care unaffordable (Wong & Leung, 2012; Glass, Gao & Luo, 2013). All of these issues have led to inadequate financial support for LTC for older people. The Chinese government has also implemented a series of policies and recognised legal rights to address concerns about older people's need for care, however these programmes still do not address the emerging need for care among older people (Du & Yang, 2009; Zhan, Luo & Chen, 2012). The LTC system, including LTC facilities and the financial support for older people, remains undeveloped.

In summary, the combined effect of increasing need for LTC among older people, potentially fewer family members in geographical proximity who may be available to provide informal care, and the lack of public support for formal care,

raises concerns about how LTC will be planned, financed and delivered in China. How will the LTC needs of older people in China be met today and in the future? The position of older people in rural areas is a particular challenge. Working towards a strategy for improving LTC provision is thus critical to policy makers as well as researchers. More specifically, it is important to consider the future organisation of home services, as this is the major type of social care relied on by Chinese families. Data from the China National Committee on Ageing (2007) indicated that only 16% of the urban older population and 15% of older people in rural areas intend to live in institutional services, however, informal social care in China may be threatened in the future due to the demographic changes noted earlier in this chapter. It is thus likely that an increasing number of older people in China will have to rely on LTC support provided by alternative sectors, such as state social care, the voluntary sector, or the private sector. Such services are still underdeveloped due to a lack of government investment (Wong & Leung, 2012).

1.4 The research objective and research questions

Wong and Leung (2012) have also indicated that the provision of LTC services in China is currently still based on a service user's financial situation or their ability to pay market fees, rather than an assessment of need arising from age-related functional impairment, and a more objective and accurate assessment or projection of the future needs of different types of LTC services is greatly needed. Despite the urgent need to consider the future of LTC in China, little research has been conducted in this field. Researching into the literature in the LTC field, makes it apparent that there is a large body of international literature on LTC services for older people; however, the majority of this research has focused on the developed world (Gu & Vlosky, 2008). By contrast, the majority of research in this area conducted within China is qualitative, and has focused on emphasising the severity of the issues for older people and for the government, and on the urgency of developing LTC policies (Tian, 2005; Xu & Tang, 2007; Zhu et al., 2009; Zeng & Zhou, 2010; Zhu & Guo, 2010). Currently,

there are only eight published papers based on research that has used applied quantitative modelling methods to project and analyse the need for, and provision of, LTC in later life in China: Chan, Li and Fong (2004) Gu and Vlosky (2008), Chung et al. (2009), Rong (2009), Rong, Li and Qun (2010), Huang and Wu (2012), Hu, Li and Zhang (2015) and Zeng et al. (2015) (more details of these studies can be found in Section 3.2). None of these studies, however, made projections for different categories of LTC services, and therefore, this research aims to address this gap by building a model of LTC for older people in China that could be used as a policy tool to estimate the future needs for different categories of LTC services. A model is developed that represents all the possible LTC pathways, however the geographical spread of China is quite large, and the demographic and socioeconomic characteristics of individuals vary in urban and rural areas, as do their needs. As a result, the projection of future LTC needs is made for rural and urban China separately, instead of China as a whole in this research. The main objective of this research is to employ an Operational Research (OR) modelling approach to make projections of the likely requirements for different types of LTC for older people and then, based on the projections, to investigate different strategies for alternative LTC services for older people in urban and rural China. The results of such a model have the potential to offer policy makers in China a policy tool to better understand the LTC system and to explore the effects of alternative scenarios and LTC policies. Such a policy tool could also more effectively facilitate the planning of LTC support services for older people by policy makers in the future, and thus improve the quality of life of older people in urban and rural China, as well as that of their family members. This objective is specified in the following research questions:

1. What are the future LTC needs for older people in China, for the next ten years, starting from 2015 to 2024? More specifically:

    a) What is the number and proportion of older people aged 65 and over in China who will not need LTC, and what are the equivalent numbers/ proportions for those who will need LTC?

b) For older people who will need care, what is the number and proportion who will require different types of LTC services (including informal care, institutional services, community-based service, private service and voluntary service) (these terms are explained in Chapter 2), and what is the number and proportion who will not receive any care from any source from 2015 to 2024?

As discussed in Section 1.4, a significant rise in the ageing population does not necessarily mean that the requirements for LTC will rise dramatically or rapidly, as not all older people require care. In order to be in a better position to meet the needs of the older population, it is critical for researchers and policy makers to estimate the population of people who do not need LTC services and the population of people who do need LTC, as well as the need for different types of LTC services. Such an understanding can contribute to both an effective LTC system and the efficient use of limited resources, such as financial resources. LTC includes a number of different types of provision, such as community-based care, private care and voluntary care. Although voluntary care is rare in China at present, as the Chinese LTC system develops, such care support is expected to expand and become integrated into a broader concept of the LTC system (Fu & Xue, 2003). The need for voluntary care is therefore also included in this research. One important measure of the efficiency of LTC provision is the reduction of the proportion of older individuals who are in need of care but do not receive any at all. As part of this research, understanding the extent of ‘unmet need’ among older people can contribute to a more effective design of LTC in the future in the context of an ageing population. The projection result of the baseline scenario in Chapter 6 is addressed by the following research question:

2. How will the following changes influence the needs of older people in China?

a) the changes in disability prevalence rates;

b) the reduction in informal services which are provided by living children;

c) the change in the disability prevalence rates that are accompanied by a reduction in informal care provided by living children.

As discussed later, in Section 4.5.4, future LTC needs will depend on individual disability status, however, the future trend of disability is unknown and relatively difficult to estimate (Gu & Zeng, 2004; Robine & Michel, 2004). Given such uncertainties, this research aims to capture the possible need for LTC for older people in future years. The projection result in Scenario 2 in Chapter 7 is used to determine how the disability prevalence rate of older individuals will affect future LTC need. As discussed in Section 1.3.2, family members are the main carers for older people in China; however, as the traditional family structure is changing and urbanisation is taking place, family members, mainly live-in children, may be less able to provide care, meaning that the informal care that is provided by live-in children may decrease in the future. It is thus likely that an increasing number of people in China will have to rely on LTC support provided by alternative sectors. In order to allocate resources more effectively and to design and deliver LTC to people in a more effective manner in the future, it is therefore important for policy makers to understand how the need for other categories of LTC services will change, as well as how the number of people who do not need care and who have unmet care needs changes, as the provision of informal care that is provided by children changes. In order to eliminate the impact of reduced informal care, policy-makers also plan to provide more community-based services (Wong and Leung, 2012; Xu and Chow, 2011; Glassa, Gao and Luo, 2013). Understanding the impact of such a plan is critical (Liu, 2009), and this issue will be explored in Chapter 7 through the projection result in Scenario 3. Future changes in the disability prevalence rates and the reduction in informal services provided by live-in children are likely to happen at the same time, and therefore, it is also important for policy makers to identify the impact of this combined change on the future LTC need. The projection result in Scenario 4 in Chapter 6 is used to tackle this problem.

3. How could an Operational Research (OR) modelling approach to the LTC system in China benefit policy-makers in planning LTC services?

Building a model of LTC in China to estimate the future LTC need, and exploring the performance of potential LTC policies that can effectively help policy makers to improve the LTC provision for older people, are the ultimate aims of the research. In fact, the thesis as a whole and the construction of the scenario tests were undertaken to achieve this aim.

1.5 The structure of the thesis

This thesis contains eight chapters and is organised as follows. Chapter 1 provided an introduction to the background of LTC, including a general definition; discussed the LTC system in the UK; and presented a brief description of LTC services in China. The chapter outlined the aim and context of this research as well as the research questions to be addressed.

Chapter 2 provides a detailed description of the LTC services in China in terms of their provision, delivery and financing; and LTC policies in China are discussed. To offer a better understanding of LTC services in China, health care and social care are also introduced.

Chapter 3 critically reviews applications of LTC modelling (including a non-OR modelling review and an OR modelling review) in developed countries. The main aim of this chapter is to present research that has been conducted within developed countries so as to learn lessons regarding the application of a modelling approach in the design of an LTC in China. The chapter discusses the key issues within the LTC modelling literature, the major contributions made by such models, the weaknesses and gaps that remain, the challenges that need to be addressed in planning LTC and the modelling approaches that have been used to address these challenges. This chapter outlines the methodology

followed in Chapter 4, and identifies the research gaps in LTC research in China that are addressed in this research.

Chapter 4 discusses the methodology for this research, in particular justifying the use of the discrete event simulation (DES) modelling approach, outlining the modelling framework and discussing the model building.

Chapter 5 outlines the data sources for the input data for the model. The procedures used (the software and statistical techniques used for the data analysis) to estimate the input to the model are discussed in this chapter.

Chapter 6 presents the results of the projection of the future LTC needs, at the baseline scenario. Research Question 1 is addressed in this chapter.

Chapter 7 examines the projections of the three other scenarios. Research Question 2 is addressed in this chapter. Research Question 3 is also tackled using this model to make the projections.

A summary of the main results is presented in Chapter 8, which highlights the key findings and their policy implications, and discusses the contribution of this research to the body of knowledge within this field of work as well as its limitations. It also considers areas for potential future work.

1.6 Summary

In summary, there is no unique definition for LTC, and LTC services are different in different countries, in terms of the provider, delivery and funding. In the UK, the LTC system is well developed, whereas in China it is still in its

infancy. The increased need for LTC and reduced provision raises concerns about how to best plan future LTC for older people in China. The aim of this research is to employ an Operational Research (OR) modelling approach to make projections of the likely need for LTC, and to explore the impact and performance of potential LTC policies. The results of such a model have the potential to offer policy-makers in China a policy tool, which could facilitate the planning of LTC support services for older people in the future more effectively. This in turn could improve the quality of life of older people in China, as well as that of their family members. The next chapter, discusses the LTC services for older people in China.

Chapter 2: Long-Term Care in China

2.1 Demographic changes in China

Before explaining the demographic changes in China, a brief introduction of China is given. China's official full name is the People's Republic of China (PRC). It was established in 1949. It covers approximately 9.6 million square kilometres and contains 22 provinces, five autonomous regions (Xinjiang Uyghur Autonomous Region, Inner Mongolia Autonomous Region, Tibet Autonomous Region, Ningxia Hui Autonomous Region and Guangxi Zhuang Autonomous Region), four directly controlled municipalities (Beijing, Shanghai, Tianjin and Chongqing), two self-governing special administrative regions (Hong Kong and Macao) and Taiwan Province. The capital city is Beijing. Figure 2.1 is a map of China.

Figure 2.1 Map of China

Source: Borwein (2016)

Figure 2.2 The absolute population size for China from 1960 to 2014

Source: The World Bank (2015a)

Figure 2.2 presents the population size of China from 1960 to 2014. In 1960, there were nearly 0.7 billion people in China. This number increased dramatically by 1982 to over 1 billion. In 2014, the population was almost double the size of the population in 1960. Not only has the total population in China risen dramatically, the older population has also expanded, as Section 1.3 showed. In addition to this dramatic increase in the total population and the older population, a reduction in the total fertility rate has been another demographic change in China.

The total fertility rate (TFR) per female for China from 1960 to 2014 is presented in Figure 2.3. It shows that there were two significant decreases since 1960. The TFR is defined as following:

'*Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year*' (The World Bank, 2015b).

Figure 2.3 The total fertility rate per woman for China from 1960 to 2014

Source: World Bank (2015a)

Between 1959 and 1961, one of the largest famines took place in China, known as the Three Years of Great Chinese Famine, and killed about 45 million individuals, most of them living in rural areas (Cai & Feng 2010). A fall in aggregate food production in 1959, followed by high government procurement from rural areas were the key factors in this famine (Meng, Qian & Yared, 2015). The famine also resulted in a major fall in the fertility rate. In 1957, the TFR was 6.4 children per woman, but it fell to below 6 between 1958 and 1961 (Ashton et al.,1984; Yan & Yin, 1994). After 1962, China began to recover and the TFR began to increase (Ashton et al., 1984; Peng, 1987), however, as shown in Figure 2.3, the TFR started to decline again in the early1970s, falling from 6.4 children per woman in 1966 to below 6 children in 1973. This was caused by family planning in the early 1970s. With the goal of limiting the population, the Chinese government began the first national birth control campaign with the slogan 'later – longer –fewer' (Wan Xi Shao), which means later marriage, longer time intervals between children and fewer children (Lavely & Freedman, 1990, p. 357). In 1979, the 'one-child policy' was launched, aiming to continue limiting the population (Zhan, Luo & Chen, 2012; Glass, Gao & Luo, 2013; Shen & Li, 2014). As shown in Figure 2.3, there was thus no further sharp fluctuation in the TFR since 1979, and it began to fall in

the late 1980s.

The increase in life expectancy is another demographic change in China, causing the increase in the ageing population (Peng &Yang, 2009; Li & Zhang, 2015). Figure 2.4 shows life expectancy at birth for China from 1960 to 2014 in total, and for males and females. It shows that the life expectancy at birth for the total population, and for males and females has increased gradually in China.

Figure 2.4 Life expectancy at birth for China from 1960 to 2014

Source: World Bank (2015a)

The demographic changes concerning the ageing population are one of the important drivers of the increased need for LTC, and the reductions in the availability of family care and the lack of a developed state support system for old age are the other two main reasons (Du & Yang, 2009; Wong & Leung 2012; Zhou and Liu, 2012). These issues were discussed in detail in Section 1.3. The focus of this study is on projecting the future LTC needs of older people in China and considering how the government can better plan for the increased LTC needs of the future. In order to understand the model that is used to predict future LTC needs, it is therefore important to understand the LTC services in China. In Section 2.2 below, the available LTC services are

introduced.

2.2 LTC services in China

In China, the family is the main source of care for older people (Gu & Vlosky, 2008). LTC in China is a relatively new concept. It has not been separated from social care and health care, and there is some fragmentation between health care and social care in terms of budgets, and services provision (Fu & Xue, 2003). An introduction to health care and social care is therefore provided in Section 2.2.1, and then the provision, financing, pathway and development of LTC are explained in Section 2.2.2, 2.2.3, 2.2.4 and 2.2.5 separately.

2.2.1 Health care and social care in China

Health care

The health care system in China has three vertical tiers: the primary tier, secondary tier and tertiary tier (Wagstaff et al. 2009). The primary tier is provided mainly by community health service centres in urban China, township health centres and/or village health centres in rural China. The services provided in these facilities include health examinations, ambulatory care, home visits, home bed care, health consultations, health education, maternal and child health care, elderly care, chronic disease care, mental health, and injections (Fu & Xue, 2003).

The secondary tier of the health system is provided mainly by district-level hospitals and clinics in urban areas, while third-tier services are provided by provincial or municipal/city-level hospitals. The services that are provided by these two tiers are similar, for example outpatient and inpatient services for

patients with more complex illnesses and emergency care. Most hospitals in the second and third tiers are general hospitals, but the physicians are specialists and specialised care, such as maternal and child health, mental health, paediatrics and oral or thoracic surgical care, is provided, and almost all of these hospitals are teaching hospitals. The quality and quantity of health services provided in second-tier hospitals are not as good as those provided by the third tier (Fu & Xue, 2003). Urban residents have always had better access to healthcare than rural residents in China. In 2014, urban areas had 22.8 hospitals per million people, and 70.6 doctors and 7.8 hospital beds per 1,000 people; whereas in rural China, the corresponding numbers were 8.1 hospitals, 21.4 doctors and 3.6 beds (National Bureau of Statistics of China, 2015)

Fu & Xue (2003) indicated that, with the central government's established policies for financing and operating the health institutions, health care services are provided by:

- *The government (central and local governments on the provincial and country levels)*
- *State-owned enterprises, which are quasi-governmental entities with substantial autonomy (SOEs)*
- *Collective economy organisations (non-governmental organisations, NGOs), including township health centres, village health posts in rural areas, and health community centres in urban areas*
- *Private for-profit entities, including individual providers and an increasing number of hospitals.*

In fact, the central government owns and runs only a few health care institutions. Most health services are provided by the latter three entities, which raise funds and run independently, with small amounts of subsidies from central and local governments (Fu & Xue, 2003).

The Ministry of Finance controls the central government's budget for health and finances the medical insurance scheme. Local government provides financial subsidies for public health services, and local governments in different areas have the power to decide the amount of the subsidies (Fu & Xue, 2003). Since the 1980s, and market liberalisation in China, the central government has reduced its subsidies for health care institutions. As the health care financing system has shifted from mainly government subsidies to market mechanisms, health care institutions have three methods of raising funds: government subsidies, which account for less than 10% of the total income for the institutions; providing health care services; and selling medication. Thus, health care services in China are mainly operated on a fee-for-service basis (Du & Yang, 2009; Hurd, Hu, & Koen, 2010).

Given the large disparity in socioeconomic development between rural China and urban China (Li, Long, & Essex, 2012; Glass, Gao, & Luo, 2013), health care and is typically more accessible and with better quality in urban rather than rural regions (Zimmer, Kaneda, & Spess, 2007). The financial support for health care services is provided to cover the fees for health care services as a medical insurance scheme, which differs for urban and rural areas (Fu & Xue, 2003). From the 1950s to the 1980s, the government covered 100% of medical costs for the majority of employees in urban China, and 50% of the medical costs of their relatives. In rural China people were covered by the Cooperative Medical Scheme (CMS), which was provided and financed by the local community. Under this scheme, seeing a doctor was free and was reimbursed through feeds for medicine and hospitalisation, for almost all rural residents (Lin both urban and rural China was reformed. In urban China the financial burden was shared by the government, employers and employees, by combining pooled funds and individual medical saving accounts; the basic medical insurance system was established in 1998. In rural China the service shifted to a fee-for-service system, which meant that many residents in rural areas had to pay for medical services themselves (Wagstaff et al. 2009; Li & Zhang, 2015). In 2003, the New Cooperative Medical Scheme (NCMS) was launched, targeting rural residents, and the government intended to cover all rural

residents by 2008 (Wu, Mao & Xu, 2008). This scheme was financed by individual contributions and subsidies from local government with the aim of reducing the out-of-pocket expenses for inpatient care. People in rural areas joined the scheme on a voluntary basis. The benefit of this new system is very limited and it only covers minor diseases (Luo, 2012; Li & Zhang 2015). In 2007 urban China improved the basic medical insurance system, aiming to cover all urban residents rather than only employees, including students, elderly persons and other people who need social aid (Wagstaff et al. 2009; Li & Zhang, 2015).

Social care

When health care system was initiated, in the 1950s, the government also began to establish social services. In the 1950s the government provided an institutional service, which was called 'social welfare homes for aged people', which targeted older people who were classified as belonging to the 'Three No' category (no relatives, no income and no physical ability to work) or 'Di Bao' category (whose income was below a certain level). This was the earliest institutional service (Gu & Vlosky, 2008; Wong & Leung, 2012). By the 1980s, with market liberalisation, welfare homes for aged people had experienced dramatic changes: since then, all institutional services have operated on a fee-for-service basis, and thus older individuals who could afford to pay the fees were now allowed to live in institutional care (Wong & Leung, 2012). Those individuals in the 'Three No' or 'Di Bao' category can still use the service for free (Zhan, et al. 2014). A private institutional service was established to supplement the state institutional service in the 1980s.It was operated by enterprise units, including private enterprises, and individuals (Aspalter, 2007; Wong & Leung, 2012). In the 1990s, the private institutional service began to expand and non-governmental organisations (NGOs) started to provide the service (Fu & Xue, 2003; Aspalter, 2007; Wong & Leung, 2012).

Although state institutional care services are owned by the state, they are funded by a range of sources, including the national budget, public donations

and through individual payments by service users. The maintenance of facilities is paid for by the income generated from providing the service. Private institutional services are mainly funded by private funds, service user payments and a government subsidy, but the government subsidy is usually a small amount (Wong & Leung, 2012), and therefore, the income from payment by service users is the main funding source, and is invested in the maintenance of facilities and improvements in the quality of the service. The state institutional service usually provides better facilities and a higher quality of services than private institutional services, because the state institutional service normally has sufficient funds. Most institutional services are owned by the state/government. Until 2006 only 10% of institutional care services were operated by private owners, and these were typically located in urban areas (Zhan, Liu & Bai, 2006).

Since 2001, in order to prompt the development of a new social services programme and improve social services provision and delivery for older people, community-based services, such as community kitchens, day care and day visiting, have begun to be established in China, especially in urban China (more details of residential home/house-and community-based services will be explained in Section 2.2.2). These services are provided by the local government, non-government organisations, the private for-profit sector and voluntary teams. These services are not free to use. Financial support is available, but it is based on means-tests (Fu & Xue, 2003). The funding for these services is from state funds through the government, as well as fees from the users; a few cities in China have issued a social welfare lottery and its income is also used to fund the services (Wong & Leung, 2012). China's Ministry of Civil Affairs launched the Star Light project in 2001, in order to strengthen the community-based service (Leung & Wong, 2002; Wong & Leung, 2012). Between 2001 and 2004, the Chinese government invested a total of 13.4 billion Yuan (about US1.9 billion dollars), from the income of the welfare lottery, to build 32,000 Star Light Centres for older people, including home visits, emergency aid, day care programmes, health and wellness clinics, and recreational activities (State Council of the People's Republic of China,

2006).

Based on Wong and Leung (2012) and Zhan et al. (2014), the summary of institutional and community services in China, including development, the main characteristics, provision of institutional services, and its funding, are presented in Table 2.1.

Table 2.1 Summary of institutional and community service in China

Year	Major Features	Service Provision	Funding
1949 to 1980s	Limited institutional service is very limited, and mainly targeted the 'Three No' and 'Di Bao' category older people, i.e. the services are free of charge for 'Three No' older people.	Local governments are the sole service provider.	They were financed by the central and local governments and
1980s to 1990s	Private institutional service was established	Government, semi-government and private sector were the providers.	Government allocation; public donation and fee-charging.
Since 1990s	The emergence of the private institutional service	In addition to the previous attempts, some local governments started outsourcing some of their services to NGO.	Funding by themselves (usually the fee-charging), plus a small scale of unstable funding from local governments.
Since 2001	Introduction of community-based services (such as Star Light Project).	The MCA (Ministry of Civil Affairs) assisted local governments in setting up community-based service.	Subsidies from the government; fee-charging; and income from welfare lottery, but only for some cities.

Sources: Wong and Leung (2012) and Zhan, et al. (2014)

Pension is another form of social support for older people in urban areas. In urban China, the retirement age for females is 55 and for males is 60 (Glass,

Gao & Luo, 2013). After retirement, the elderly receive a pension. It is one source of income for older people and can be used to pay the expenses of daily living, and can pay the fees for social services when they are used. (Gu and Vlosky, 2008; Peng & Yang 2009). The funding for pensions is from three sources: government allocation/budget, employee contributions and employer contributions (at different contribution rates of an employee's wages) (Farid and Cozzarin, 2009). In 2008, some 50%–60% of urban residents had a pension (Glass, Gao & Luo, 2013), however, rural residents had to rely on themselves or their family, mainly their children (Zhou & Liu, 2013).

The Chinese government also provides social aid, such as a minimum life guarantee system, which is means-tested, to provide financial support/cash benefit for 'Three No' and 'Di Bao' older people in urban and rural China (Fu & Xue, 2003). In 2014 about 18.77 million older people in urban China received a minimum life guarantee from central and local governments. In rural China 52.07 million people received a minimum life guarantee, and 5.29 million 'Three No' older people received social aid from central government (Ministry of Civil Affairs of the People's Republic of China, 2015).

As mentioned earlier, health care and social care combine in China to provide LTC services. Section 2.2.2 focuses on the LTC services that are provided by health care and social care.

2.2.2 Provision of LTC in China

As mentioned in Section 1.1, LTC services can be classified by the setting in which care is provided, such as home-based services and institutional services, as well as according to their providers, such as informal care, and formal care (Colombo. et al., 2011; Nies, Leichsenring & Mak, 2013). In China, three core components are included in the LTC services: home care, community-based care and institutional services (Du, 2015). According to the Ministry of Civil

Affairs (MCA) (2010:p.1), the overall LTC policy is 'Home care is the foundation, community care provides the necessary support, and residential care is supplementary'. Within home care, informal care is distinguished from private care and voluntary care. In the following, these three types of services are explained in detail.

Home care

Home care includes daily care, household assistance, and health care support.

Informal care

Family members perform the most important role in home care. Due to China's traditional respect for older people, LTC is mainly provided by family members (Zhou & Liu, 2013; Zhan et al. 2014). Within this type of care, which is referred to as informal care, people live at home and daily activities are facilitated exclusively by family members, neighbours or friends or a combination of these. The CLHLS indicates that the main caregivers in China are spouses, sons, daughters-in-law, daughters, grandchildren, live-in non-family members and private or paid caregivers (Zhou & Liu, 2013).

Private care

Private care is another option for LTC in China, which facilitates older individuals to live at home. Older people themselves or their family members can hire care workers or paid caregivers/carers to provide assistance with daily living through exchange service centres or agencies. The costs are paid by family members and/or older people themselves through their personal savings. The duties of the care worker and the frequency the care worker visits are based on the requirements of the older person (Fu & Xue, 2003).

Voluntary care

Volunteers and work organised by NGOs, such as disabled and voluntary teams, also provide door-to-door services to improve the quality of life for older people who need LTC, for example day visiting, shopping and accompanied visits to hospital. Voluntary care is not popular in China, however (Fu & Xue, 2003).

As question E6.1 in the CLHLS (which can be found in Appendix 4) provides information on the utilization of LTC services, the variable in this question is used to project future LTC needs (more information about this variable and the associated data is provided in Chapter 4 and Chapter 5 respectively). Therefore, the terms 'informal care', private care' and 'voluntary services' rather than 'home care' are used in the model. A detailed explanation of the model is given in Chapter 4.

Community-based care

Since families have become smaller and family members are now less able to provide care for older family members, the Chinese government has developed community-based services delivered to their home, which allow older people to continue living at home. The service targets older people without family caregivers or with family caregivers who do not have the capacity to care for them. The main providers of community-based services are the government at different levels (including quasi-governmental entities), and also NGOs and the private sector (Fu & Xue, 2003). Community-based services are financed from different sources including public funding or government budget, resources donated by individuals, private funding (such as investment from local business owners, private service providers and organizations) and co-payment by service users themselves (Xu & Chow, 2011).

The community-based services which are funded solely by the government are free or with minimal fees (Xu & Chow, 2011). For example, the community-based health services provide care such as free basic medical care, health education and chronic disease treatment, which can be easily accessed by older residents (Fu et al., 2003). However, services which are funded by other sources with or without government public funding, such as day care centres, personal care, household care, and the meal service, are not free to use. These services are mainly used by people who can afford to pay for the services (Xu & Chow, 2011). Payment for these services comes from the service users and/or their family members' personal savings, plus some financial support from government, such as economic subsidies or service vouchers, but this financial support is means-tested. More details of financial support are provided in section 2.2.3. In some cities, the costs are covered by medical insurance (Fu & Xue, 2003). In 2013, the Beijing city government had constructed 4,240 meal service centres and 4.397 day care centres. They also provided financial support for community-based care, such as monthly service vouchers, to old people aged 80 and over and for older persons with disabilities. By the end of 2013, the total value of these service vouchers was £45 million, and 11,000 service providers were providing voucher-based community care services (CNCA, 2013).

The provision and delivery of community-based services varies between urban and rural areas, and between government districts. The number and quality of these services vary significantly depending on the needs of residents, the local government funding, the resources and their capacity to deliver services (Xu & Chow, 2012). In general, in rural areas the facilities of the services are poorer than those in urban areas, and there are fewer professional doctors in rural areas (Glass, Gao & Luo, 2013).

Institutional care

Institutional care has a supplementary role in the Chinese LTC system (Du, 2015). The institutions include residential homes/houses, nursing homes and psychiatric hospitals, and they provide personal care, health care, mental health care, nursing care and hospice care (Zhan, Luo & Chen, 2012). Currently, China has two systems which provide institutional care for older people: social care system and health care system. These two systems are run by separate agencies that have separate funding mechanisms and policies and draw their workforce from separate sources (Wu, Mao & Zhong, 2009).There are both public and private institutions available for older people. Public institutions mainly provide care for the most vulnerable people who are poor, disabled, the oldest-old (older than 85) or have no children. Those individuals in the 'Three No' or 'Di Bao' category can still use the public institutions for free (Zhan, et al. 2014). Private institutions can provide diverse care for all older people who can afford to pay for it, according to their different needs. Older people who could afford to pay the fees were originally allowed to live in public institutions (Wong & Leung, 2012). However, currently, some policies have been issued to promote reform of the public institutions as institutions that accept older persons who are severely disabled are generally private sector operated; public institutions, on the contrary, are more inclined to accept healthy and older people without disabilities (Du, 2015).

Although public institutional care services are owned by the state, they are funded by a range of sources, including the national budget, public donations and through individual payments by service users. Private institutions are mainly funded by private funds, service user payments and a government subsidy, but the government subsidy is usually small (Wong & Leung, 2012). Institutional care has grown rapidly in China, but the proportion of older people who receive this type of care remains small compared to the number who need it, as institutional care is expensive and very few older people or their families can afford it (Xu & Chow, 2011).

2.2.3 Financial support for LTC in China

The government at all levels provides financial support for LTC in three ways (Du, 2015):

- Direct financial support, such as the provision of economic subsidies/allowances/vouchers to older people who need LTC;
- Indirect support, where the government purchases LTC services for older people who use these services for free; and offering financial support for family members;
- Developing policies for LTC services, such as the policy for the subsidised supply of land, tax incentives/exemption and financial subsidies for providing LTC services.

However, this governmental financial support is very limited and the family is still the main funding source for LTC in China, although the cost of LTC is also covered by medical insurance to varying degrees.

2.2.4 Pathways into LTC in China

At the time of writing, the LTC system in China is still developing. Informal care by family members is the main form of LTC, and the second most widely used form is private care at home (Fu & Xue, 2003). Due to the lack of an established LTC system and limited financial support, older people have to pay for services (Xu & Chow 2011), and therefore (apart from the very small number of 'Three No' people) only the wealthy are able to access and receive care (Wong & Leung, 2012). Therefore, it is currently difficult for older people to access and receive community-based and institutional services (Fu & Xue, 2003; Du, 2015).

Some Chinese cities are carrying out pilot projects to establish a standardised assessment mechanism for accessing and receiving a specific level of care subsidies and services. Shanghai was the first city to do this (Du, 2015). Since 2001, older people in Shanghai have been classified into different classes according to a wide range of factors, such as age, ADL status, health status, health condition, cognitive capacity, visual capability, emotional and other behavioural status, and special needs. Each class is provided with different levels of institutional or community-based services and different levels of care subsidy, which promotes the standardisation of the institutional care or community-based services. In 2014, all of Shanghai's existing assessment standards and policies were integrated into a practical Standardised Assessment Mechanism for LTC services. This assessment is carried out by a third party and a waiting list should be prepared. This comprehensive assessment covers most LTC services, including community-based care and institutional services and the level of financial support. Other regions in China including Zhejiang provincial government and Beijing city government have also carried out a pilot assessment mechanism for receiving different levels of institutional services. The Harbin city government has also introduced an assessment mechanism to determine the subsidy levels of the LTC service (Du, 2015).

In addition, due to the lack of a comprehensive LTC system, the major sources of LTC provision do not coordinate with one other. They often operate in a segmented manner: older people are free to move between these services according to their personal preference, such as their health status, available family support and financial status (Fu & Xue, 2003). Providers of LTC services, such as families, the health care system and the social care system are still segmented, which hinders effective cooperation and further impedes effective LTC development (Du, 2015). For example, nursing homes are provided by the health care system as well as by the social care system, and thus some services overlap, such as residential homes, nursing homes, mental health hospitals and psychiatric service centres (Gu & Vlosky, 2008).

2.2.5 The development of LTC in China

The ageing population in China has had a significant impact on the development of policies and public services, and LTC is an important issue to consider in this context. Ongoing debates are taking place about the formulation of policies to improve LTC support and services for older people, both in academia and in the government in China (Du & Yang, 2009; Song, 2009; Zeng & Zhou, 2010). One of the key issues found by writers such as Du and Yang (2009) to be associated with an ageing population in China is pressure on LTC services and the LTC policy formulation. To remedy the shortage of informal care, the Chinese central government has attempted to promote institutional care for older people. As a result, private institutional services began to expand with government subsidies, in the 1990s (Xu & Chow, 2012). Despite the recent increase in institutional services, compared with the number of older people who need them, the proportion who live in them remains small. He (2001), indicated that, at the end of 2000, approximately 12.0% of China's older people reported that they would prefer to live in an institutional care home, however, only approximately 0.8% of those who would prefer to live in an institutional care home were able to do so. Zhan, Liu and Bai (2006) discussed several factors which are probable causes:

- not enough affordable care institutions;
- institutional care is more expensive than family care and less accessible than family care;
- concerns about the quality of care provided by institutions;
- family feeling of responsibility to look after their relatives.

Wong and Leung (2012) also argued that the lack of a more objective and accurate projection of the future needs for different types of LTC care, is another issue for developing the different types of LTC services.

Since the 1990s the Chinese government has also enacted a series of policies to develop community-based services for older people, such as the 'Star Light Project' in 2001, launched by China's Ministry of Civil Affairs, which aimed to build more community-based service infrastructures in the next three years (Leung & Wong, 2002; Fu & Xue, 2003). Later, in 2010, the government implemented a LTC policy – 'Home care is the foundation, community care provides the necessary support, and residential care is supplementary' (MCA) (2010:p.1). Meanwhile, more and more studies have indicated the importance of community-based care as part of LTC services. Brodsky et al. (2003), have predicted that community-based care will become the main provider of LTC services in the future. Fu & Xue (2003) noted that community-based care could have a great influence on the LTC system and that it will become the main type of LTC service in the future. Xu and Chow (2012) also commented that due to the weakening of traditional family caregiving and a lack of adequate affordable institutions, community-based care is an appealing option. China's community-based care is therefore designed to care for people in a wide range of situations and needs. Wong and Leung (2012) also recently illustrated that the development of home-based community care services needs to give high priority to older people.

2.3 A summary of LTC services in China

The development of the LTC service system has made considerable progress, although it is still in its infancy (Du, 2015). In summary, LTC services for older individuals are provided by health care and social care services. Quasi-governmental entities, non-governmental organisations and the private sector all play important roles in providing such services, that is, the LTC services are

available in the formal sector and delivered via community-based services and institutional services. The informal sector, such as children, friends and neighbours, also provides LTC support. Figure 2.5 summarises the available sectors (formal and informal) and the providers (in each sector) who provide LTC services and support for older people in China.

Figure 2.5 LTC for older people in China

Sources: author's work

However, due to the lack of a comprehensive LTC system, the major sources of LTC provision (home care, including informal care, private care and voluntary care, community-based care and institutional services) do not coordinate with each other. They often operate in a segmented manner, further impeding effective LTC development. The provider of LTC services, such as individual families, health care system and social care system are still segmented, which hinders effective cooperation among different departments (Du, 2015). For

example, nursing homes are provided by the health care system as well as by the social care system, and thus some services overlap, such as residential homes, nursing homes, mental health hospitals and psychiatric service centres (Gu & Vlosky, 2008).

The available LTC services based on the CLHLS (2008) and Ministry of Civil Affairs of the People's Republic of China (2013) are presented in Table 2.2. LTC services and their providers are shown in Table 2.3.

Table 2.2 Available formal LTC services for older people in China

Types of LTC services	LTC services
Community-based services	Day and night care centres, meals to door services, canteen for elderly, voluntary services, elderly service centres, communities' residential services for aged and disabled people, local community health care service centres, township/village health centres and home-bed medical services
Institutional services	Residential services including residential services for aged and disabled people social welfare homes, homes for disabled veterans, convalescent hospitals for honourable military veterans and sanatoriums for ex-servicemen
	Residential services for mental illnesses, including nursing homes for elderly with mental illness, and mental hospitals for ex-servicemen
	Other institutional services, including palliative and terminal care and end-of-life services

Sources: CLHLS (2008) and MCA (2013)

Table 2.3 LTC services and their providers

Service source	Providers			Fee-based or free
	State or state-owned enterprise, i.e. quasi-governmental	Non-governmental organisations	Private sector	
Health services	State health care, e.g. state hospitals and nursing homes	These are very limited, e.g. local community health	Private health care, e.g. private hospitals	Fee-based. Even for state health services and non-governmental health service, medical insurance can only cover the costs to a varying degree and this also differs by city.
Social services	State social care, e.g. state residential homes/institutions and day care centres	Volunteer services, e.g. day visiting and shopping Nursing homes, which are provided by the Association of the Disabled	Private social care, e.g. private residential homes/houses and (formal) paid caregivers	Free for three no older people. Fee-based for others. In some cities they are covered by the medicine insurance system. The amount varies by city.
Informal services	Not available	Neighbours and friends	Live-in non-family members, paid caregivers	Free or fee-based

Sources: author's work

Although academics and policy makers in China have promoted community-based care and previous studies, Xu and Chow (2012) have also indicated that at the moment no one knows the consequence of this LTC policy and it is too early to evaluate this type of LTC service. The scenario test in the thesis of this research is therefore used to explore the performance of community-based LTC policies, that is, to explore how increased community-based care will influence

future LTC needs, a topic that is discussed in Chapter 7. This research could potentially help policy makers to better plan the future LTC services in China, so as to meet the needs of older individuals.

This chapter explains the LTC services in China, and also looks at the issues and development of LTC services in China. In the next chapter, how academia deal with the LTC issues in developed countries and in China are discussed.

Chapter 3: Long-Term Care Models

This chapter reviews previous studies in the area of LTC models, which are used to assist policy makers in their decisions by making projections of the future LTC demand/need and the associated cost, as well as examining the potential LTC policies with the purpose of meeting the increased LTC demand/need. Studies conducted in developed countries and in China are reviewed. The literature review identifies research gaps in the area of the prediction of future LTC need. It also helps to choose the technique used to address the research questions. Nies, Leichsenring and Mak (2013) indicated that LTC in general remains a fragmented area. As discussed in Chapter 1, LTC is complex, and incorporates support from formal services (e.g. from the state and the private sector) as well as from family, friends and the voluntary sector. It incorporates both social care and health care elements. This chapter thus discusses the construction and use of the existing models within the published literature and how the research has been or can be used for policy, which in turn can help to improve the social care support and health care services available to older people. The LTC models in developed countries are reviewed first.

3.1 Long-term care models in developed countries

3.1.1 Introduction

In developed countries policy makers planning LTC support are faced with complex challenges, which can be addressed through modelling approaches. A model was described by Pidd (2010a:p.10) as ‘an external and explicit representation of a part of reality as seen by the people who wish to use that model to understand, to change, to manage and to control that part of reality’. Although employing a modelling approach can enable policy makers to deal

with a variety of issues, and there are many studies in this field, only the previous LTC modelling literature falling within the areas of projecting LTC demand, the associated cost and examining the potential provision of LTC policies to satisfy the increased LTC demand are reviewed. The LTC demand models in social science and in operation research are reviewed in Sections 3.1.2 and 3.1.3, respectively.

3.1.2 Long-term care models in social science

When policy makers design and assess LTC policies, they are often faced with two key issues: the likely level of demand for LTC support in different scenarios, and the costs associated with meeting the expected demand for LTC (Wittenberg et al., 1998). The different LTC demand models that are used to deal with these projections are discussed in the following sections.

Macrosimulation models

Macrosimulation models are also called cell-based models. They are built in a spreadsheet and are a fairly straightforward approach (Wittenberg et al., 1998). The models divide the population into cells according to their characteristics, such as age, gender and disability. These characteristics are some of the main characteristics of older people when predicting the demand for LTC. Each of these cells is assigned the probability of a certain event taking place, such as an individual receiving LTC, to make a projection of the number of older people who are likely to receive LTC care, from which the expenditure is then calculated. It assumes that the members of the population sharing the same characteristics or the same cell have the same probability of experiencing a certain event. This approach does not consider individuals; rather, it considers sub-groups of individuals with the same characteristics, such as age, gender and marital status (Wittenberg et al., 1998).

The Personal Social Services Research Unit (PSSRU) at the London School of Economics produced a group of macrosimulation models with the purpose of making projections of future LTC demand and estimating the associated costs for older people in the UK. The original PSSRU model was developed by Wittenberg et al. (1998). The overall aims of this model were to make projections of likely LTC demand for older people to the year 2030 in different scenarios, and to explore the likely impacts of different policies and approaches when funding LTC for older people. More specifically, this model enabled the following projections to be made for England to 2031.

- *The numbers of dependent elderly people, by age, gender and household type, on the basis of official population projections and assumptions about future rates of dependency;*

- The volumes of long-term care services on the basis of the projected numbers of dependent elderly people and the current levels and patterns of care or specified alternatives

- *The long-term care expenditures by health and social services on the basis of the projected volumes of services, assumed rises in real care costs and the current funding system or specified alternatives.*

In this study the authors divided older people into cells or groups according to their characteristics, such as age, gender, dependency, marital status and living arrangements. People in the same cell or group had the same characteristics, and they were assumed to have the same probability of receiving LTC. The predicted values from the multivariate analysis, mainly logistic regressions, were then used in the model as the estimated probabilities of those in each cell receiving each type of LTC: informal care, publicly funded care and privately funded paid care. This method, which is used in the research in this thesis, is to estimate the type-dependent allocation probabilities for different categories of care and the probabilities of being disabled (more details of these probabilities are provided in Section 5.2). Various national data sets were used in this model,

such as the 1996-based population projections for England produced by the Office for National Statistics (ONS) and the Government Actuary's Department (GAD). The projections were made for several scenarios to explore the uncertainties of the main drivers of future LTC demand. The results show the importance of conducting scenario tests for making projections of future LTC demand, and indicate that the disability rate is a key factor. Two scenarios concerning disability rates will therefore be investigated in this thesis (these two scenarios will be discussed in more detail in Chapter 7). This study indicated that it is important to distinguish between the needs for different types of care, so the LTC was divided into three types: informal care by family members and friends, public social care and privately funded care. LTC categories are also taken into account in this research to make projections of the future LTC needs of older people in China.

The original model was revised and improved by the PSSRU, with a new technique and updated data in an attempt to make more precise projections. For example, to improve the accuracy of the projections, Wittenberg et al. (2001) modelled the institutional population as a subset of the population with severe dependency rather than as a separate dependency group in the original model. The research team also used updated data sets to produce the projections, and the subsequent models were published in a series of journal articles (Comas-Herrera et al., 2003a; Comas-Herrera et al., 2003b; Wittenberg et al., 2006; Wittenberg et al., 2008a; Wittenberg et al., 2008b; Pickard, 2015). These studies showed that the PSSRU models are useful for modelling LTC and produce reliable results for the future LTC demand.

Apart from producing projections of demand for LTC for older people in the UK, the PSSRU models have frequently been used to produce projections of demand within specific contexts. For example, Pickard et al. (2000) and Pickard (2008) projected the demand for informal care for older people in the UK to the years 2031 and 2041 separately, while Malley et al. (2005) estimated the number of older people with different levels of disability to 2022 in the UK.

Pickard et al. (2012) made projections of informal care received by older people with disabilities from spouses and (adult) children to 2032 in England. The PSSRU models have also been used to project the likely demand for LTC for older people in specific areas of the UK, such as Wales. Comas-Herrera, Wittenberg and Pickard (2003) developed a macrosimulation based on the PSSRU model to project the demand for nursing home care, residential care and home-based care for older people in Wales from 2010 to 2020. Later, Comas-Herrera et al. (2005) repeated the study, making projections to 2030. The PSSRU models have also been applied internationally; for instance, Comas-Herrera et al. (2003a), Comas-Herrera et al. (2006) and Pickard et al. (2007) calculated projections for the demand for LTC in Germany, Spain, Italy and the UK. These studies showed the PSSRU models to be a potentially useful way to address the issues related to LTC demand.

Macrosimulation has proven to be an effective way to produce projections of what is likely to happen in the future under a series of assumptions. It plays an important role in public and policy debates concerning LTC policy reform for older people in the UK. Lessons can be learned from these studies. Firstly, they indicated many important factors associated with the demand for LTC, such as age, gender, level of dependency (i.e. disability status), ability to provide informal care and living arrangements (Wittenberg et al., 1998; Comas-Herrera, Wittenberg & Pickard, 2003). Some of these factors are considered in this research. Secondly, these studies showed the importance of running various different ‘what-if’ scenarios to make projections for future LTC, which allow the exploration of the impact of a variety of uncertainties on the key drivers of future demand for LTC. Scenario tests are therefore run in this research. Thirdly, Wittenberg et al. (1998) commented that events occurring in older people’s lifetimes are not taken into account in this approach, such as information about the incidence of dependency (i.e. disability) and transitions between dependency states. Macrosimulation therefore produces less accurate projections. As a result, in order to produce a more precise projection of future LTC demand, information on the events occurring over individual lifetimes is considered in this research. The studies by PSSRU showed that the projection

of future LTC demand is sensitive to assumptions about the relevant trends, especially concerning dependency. This consideration is also taken into account in the scenario tests in this research.

Microsimulation models

Microsimulation is a general term that is used in the field of social science for modelling the behaviour or life course events and interactions of micro units (such as persons, households, firms, etc.) the effect of changes on each of these units (Rutter, Zaslavsky & Feuer, 2011). For detailed analyses of behavioural patterns and complex family kinship relationships, a microsimulation approach may be more appropriate (Zeng and Wang, 2014). Models such as the Markov model and the discrete event simulation model (modelling approaches that are commonly used in the area of Operational Research and discussed in detail in Section 3.1.3) all belong to the category of microsimulation models. Microsimulation models can be static or dynamic. The static microsimulation model provides a snapshot of the impacts of possible policies. It can be used to show the immediate impacts of policy changes, in terms of how individuals change their behaviour to response policy changes (Harding, 1996). The dynamic microsimulation model describes the life trajectory of individuals across their lifetime: it starts with the original data, and then it moves forward progressively. This is achieved by making the life events, such as marriage, migration, death, or the other events related to the research questions to be addressed, happen to each individual (Harding, 1996). Dynamic microsimulation models can even make predictions about the impact of policy change in the future, in terms of how individuals react to changes in policies. The use of static or dynamic models may be dependent on the research questions to be addressed and the availability of the data to be used. Both approaches have their uses as effective policy modelling tools to analyse the impact of policy changes on the target variables (Mitton, Sutherland & Weeks, 2000). Several programming language tools, such as C/C++, Java, Stata, SAS, R and the simulation packages AnyLogic or Modegen, are able to develop microsimulation models (Li, 2011). Harding (2007) defined microsimulation as a

useful technique to model complex real life events by simulating the actions, and/or impact, of policy change on the individual units (micro units) that make up the system where the events occur.

Although Harding (1996) and Zaidi and Rake (2001) indicated that dynamic microsimulation is an indispensable tool in policy making, and despite its wide application in the area of pension reform, the number of studies applying the technique to LTC and social care have been limited. Hancock (2000), from the Nuffield Community Care Studies Unit (NCCSU), developed the CARESIM model using microsimulation to investigate LTC charges under different charging regimes. It simulated the incomes and assets of future cohorts of older people and their ability to pay care home fees or the costs of home-based care. Forder (2007) proposed a microsimulation model to calculate the level of unmet social care needs for people aged 65 and over who self-fund their social care, both currently and in future.

Compared to the scarcity of studies on modelling LTC and social care, microsimulation models have been increasingly used to provide information to guide health care policy decisions (Rutter, Zaslavsky & Feuer, 2011). In this area microsimulation is used to predict health trends in disease incidence and/or mortality under alternative health policy scenarios or to compare the effectiveness and cost-effectiveness of treatments, and health care costs/spending are predicted based on health trends or changes in health. With this aim, Goldman et al. (2004) developed the Population Health Model (POHEM); Goldman et al. (2005) developed the Future Elderly Model (FEM); Meijgaard, Fielding and Kominski (2009) developed the Population Health-Forecasting Model; and Boshuizen et al. (2012) developed the Disease Prevalence Model.

The microsimulation models provide detailed projections and impacts of potential policies over a long time period, since this approach tracks an

individual's life trajectory, such as the transitions between different health states and the length of time spent in the different health states. Such an approach can therefore provide a more detailed projection than macrosimulation (Wittenberg et al., 1998). It is also able to construct 'what-if' scenarios to test uncertainties about future trends and to explore the performance of potential policies (Rutter, Zaslavsky & Feuer, 2011).

Several studies, such as those by Zaidi and Rake (2001), Caldwell (2006), Harding (2007) and Li (2011), have agreed that constructing a reliable microsimulation model, especially one of a dynamic nature, is a very demanding task. They indicated that longitudinal data sets of reliable quality are required to construct a microsimulation model. As a result, high-quality longitudinal data sets are used in this research. They also advised modellers to try to keep their dynamic microsimulation models as simple as possible. This research takes this into account as well.

Linking macrosimulation with microsimulation models

Several studies have suggested linking macrosimulation and microsimulation models to examine a range of funding options for LTC in the UK. For example, Hancock et al. (2003) proposed a linked model to make projections for public and private expenditure on LTC in the UK to 2051 under different funding arrangements, which included the current means-tested funding system and a free personal care policy. Later, Hancock et al. (2007) used the same model structure to test a number of different versions of a policy for free personal care in Scotland and to examine the distributional impact of the different funding options, which included the free personal care policy and the current means-tested funding both in residential and in non-residential care settings. Wittenberg et al. (2011) made projections of the demand for and costs of social care for older people in England from 2010 to 2030 under the current and alternative funding systems. Hancock et al. (2013) used two linked simulation models to make projections for public spending on older people in care homes

for a base year (2007) and for 20 years from then. In such studies macrosimulation and microsimulation are still two separate models, with the output of the macrosimulation model providing input for the microsimulation model. These studies contributed useful information to the debate on the costs of alternative ways to pay for care in the UK. The projections were made under many assumptions regarding the details of the policy reforms and exogenous factors, such demographic changes, and considered the possible effects of such reforms rather than forecasts of what would happen in reality. Although the linked model could provide a reliable projection, the process of the model was complex. The linked models in these studies were not real integrated models but remained separate.

3.1.3 Long-term care models in Operational Research

The following LTC models are from the field of Operational Research. These models are able to help policy makers to better understand the broader LTC system (encompassing the wide range of support and services from a range of sources and sectors) to examine the performance of potential policies in future and to support the planning of LTC services. These models are reviewed using different approaches. Worrall & Chaussalet (2015) indicated that Markov model and Simulation model were widely used to make projection of needs for LTC. The Markov models with the purpose of forecasting needs for LTC are reviewed in the next section.

Markov models

A Markov model is described as follows: there is a finite or a countable infinite set of discrete states, S=$\{S_1, S \ldots S_n\}$. The process starts in one of these states and moves from one state to another. If the process starts in state S_i (i ∈ n), then it moves to state S_j (j ∈ n) in the next timestep with probability$\mathrm{P_{i,j}}$,

$P_{i,j}$=Pr (move to other state j after one movement given that at state i at initial time)

The process can remain in its current state, and this occurs with probability $P_{i,i}$. The probabilities $P_{i,j}$ between two states in S for one time step are called the transition probabilities, which can be written in a transition matrix P:

$$P = \begin{pmatrix} P_{1,1} & P_{1,2} & \cdots & P_{1,j} \\ P_{2,1} & P_{2,2} & \cdots & P_{2,j} \\ \vdots & \vdots & \ddots & \vdots \\ P_{i,1} & P_{i,2} & \cdots & P_{i,j} \end{pmatrix}$$

Markov model belongs to a stochastic modelling methodology, and it can be used to model the behaviour of a stochastic process at discrete-time intervals (Worrall & Chaussalet., 2015). The key feature of the Markov model is the "Markov memoryless assumption" – the probability of transition from one state to another depends only on the current state and not on the previous trajectory or history (Fone et al., 2003). Although this is a severe limitation in many cases, Markov models have been widely applied when predicting future demand for, and funding of, LTC (Sato and Zouain, 2010). In many studies projections have been made based on the transitions between health and disability. In these studies the transition probabilities between different health/disability statuses are estimated first; then, the transition probabilities are applied to the population to give the number of people with different categories of health/disability status; and, finally, based on these numbers, the demand for future LTC/social care health care and the associated cost are calculated. Substantial literature has been published on Markov models for predicting the demand for LTC support and services. Most of the studies used a Markov model to describe the transitions between different health/disability statuses then estimated future LTC needs in terms of the number of people who are in poor health or have a severe disability based on the transition probabilities. For example, Nuttall et al. (1994) developed a Markov model to estimate the demand for LTC and the cost for the United Kingdom for the next forty years. This was the first rigorous report

estimating the future costs of LTC (Wittenberg et al., 1998). This model contained three states for individuals: a healthy state, a disabled state and being dead. National-level official data for prevalence rates and mortality were used to estimate the incidence rates. Based on the projections, the authors also examined the policy implications of the design of LTC, however, the recovery probability (that is, the transition from being disabled to being healthy) was assumed to be zero in this model. This is not true in reality. This research therefore takes recovery probability into account.

Czado and Rudolph (2002) constructed a Markov multiple-state model to estimate the health conditions of older people in Germany. In this model they used a Cox proportional hazard model to estimate the transition intensities, and then they used the transition intensities to make projections about future health status. The study by Rickayzen and Walsh (2002) is another example in this field. They proposed a Markov model to project the number of people who would be disabled in the UK over the next thirty-five years based on the transitions between different categories of disability status. Later, Leung (2003) constructed a model to project the number of people in Australia who were likely to require LTC to 2051 and the associated cost, adopting the same approach as Rickayzen and Walsh (2002). Karlsson et al. (2006) made a projection of the future need for LTC support and future costs for older people in the UK to 2050. In this study a twelve-state disability transition model was developed and formal care and informal care were projected separately. The other studies that fall into this domain are those by Stenberg, Manca and Silvestrov (2007), Olivieri and Pitacco (2009) and Levantesi and Menzietti (2012).

The Markov model can also be used to describe the transitions between different categories of care, such as home care and community care, to estimate the demand for different types of care. For example, Hare et al. (2009) used a Markov model to describe home and community care (HCC) services in British Columbia (BC). In this study, based on the transition probabilities of transitions between home and community, the authors predicted the future

number of older people who would use care services in Canada. This study provided a useful way to model a social care/LTC system. Cardoso et al. (2012) proposed a Markov cycle tree structure model to predict the annual number of individuals who need LTC (including formal and informal home-based, ambulatory and institutional services) for the years 2010–2015 in Lisbon; the resources for providing these services (including informal caregivers, domiciliary visits, consultations and beds) and the associated costs were also predicted.

To determine future LTC demand, the Markov model can be used to describe the process or stages of certain diseases, such as chronic diseases, which will influence the demand for LTC. Struijs et al. (2005) and Hoogenveen, Baal and Boshuizen (2010) constructed Markov multi-state models to identify the need for LTC in the Dutch ageing population based on future stroke incidence, prevalence and mortality. The future demand for LTC for the ageing population was predicted based on these.

In conclusion, these studies indicated that the Markov model is a useful technique when estimating future LTC need/demand. It has been proven to be an efficient way to model transitions. The structure of the model is flexible enough to model nearly every transition related to future LTC need/demand, including transitions between disability and health status, a certain disease and different categories of LTC services. A Markov model was therefore finally chosen to describe and calculate the probabilities of the transitions between different disability statuses and simultaneously the transitions between different categories of LTC services, including informal care, institutional, voluntary, private and community-based services, and those people whose needs are unmet. Except Markov model, Virtue., Chaussalet & Kelly (2013) indicated that in the UK, as demand for health and associated health cost increase against a backdrop of public spending cuts, there is a huge opportunity for simulation modelling to help achieve productivity (financial) savings. Therefore, in the next sections, studies which used system dynamics (SD) simulation and discrete event simulation (DES) model to project demand of health/social care and LTC

are reviewed. SD models are reviewed in the next section.

System dynamics simulation models

System dynamics (SD) is an analytical modelling approach invented by Jay Wright Forrester (Forrester, 1961) in the1960s. The aim of SD is to assist understanding of the overall behaviour of the system being investigated, and the relationship between different elements of this system. SD contains qualitative and quantitative aspects. The qualitative aspect involves the construction of causal loop or influence diagrams, which describe graphically how identified system components interact. The identified components are connected by arrows, and the direction of influence is indicated by the sign, either “+” (positive influence) or “-” (negative influence). The aim of the qualitative aspect of SD is to find feedback loops, which can be two types: balancing loops, which contain an odd number of “-” signs; or reinforcing loops or vicious circles, which contain an even numbers of “-” signs. Balancing loops keep the system in steady-state, whereas in reinforcing loops, the system spirals out of control. In order to determine the overall net effect, however, the quantitative aspect of SD modelling is required. In a quantitative SD model, the causal loop or influence diagram is converted into a stock-flow diagram. The stock is an accumulation, or a level or other terminology from different areas, the flow changes the amount in the stock. For example, water in a tank is a stock, the flow of water changes the stock; the patients occupying beds in a hospital is a stock, that is changed by the admissions and discharges of patients. The rate of flow is a set of ordinary differential equations representing the rates of change of the level of each stock. The stock-flow diagrams can be constructed by SD software, such as Vensim and Stella (Forrester, 1961; Sterman, 2001; Brailsford, 2008; Brailsford et al.,2011).

SD can be used to make numerical projections which assist decision makers by enhancing their understanding of the system and helping them with the process of strategic debate and/or decision making, rather than developing precise

forecasts (Wolstenholme, 1993). Three studies fall into this field. A study using an SD model for social policy formulation in social services was undertaken by Desai et al. in 2008. This study was a collaborative research project involving the University of Southampton and Hampshire County Council (HCC), the main aim of which was to explore the effects of different possible social care provision interventions by HCC. To achieve this goal, future demand for LTC was predicted and the impact of the different possible interventions on future demand for social care services was explored.

Kim and Goggi (2005) made a projection of the number of people who will use home- and community-based care and the associated cost before and after implementing a potential LTC policy, adding institutional care recipients. The projection was made until 2030. SD was used as a policy-supporting tool to explore the consequence of implementing institutional care recipients, with the aim of reducing the LTC cost. SD allowed the consideration of the age effect, however, due to insufficient data, the model was incomplete in that it lacked a validation process and did not include all the feedback loops relevant to the potential LTC policy.

The other example of the use of an SD model is that produced by Brailsford et al. in 2012. In this study an SD simulation was developed to explore how the different proportions of care provided by family, neighbours and friends influence future demand for social care. The different provisions of care provided by families, neighbours and friends are represented by a parameter of willingness and resources (WR). The key data sets for this study ranged from the national level to the local level, as well as taking into consideration the expert opinions of individual social workers. These data sets, including the opinions of experts or other related workers, can be considered for use in research when data is lacking.

Another example of such an approach is that by Wolstenholme (1993), who

designed a qualitative SD simulation model to investigate whether the provision of community care reduces public spending on social services. The main aim of this study was to illustrate how SD can be used to assist the process of strategic debate and planning in a complex situation rather than dealing with the real problem. It showed that SD was capable of exploring the insights of the complex system, which helped the decision makers by facilitating their understanding of the system, such as the consequences of changing a policy or strategy. In this case SD was a useful tool for assisting in the process of strategic debate and decision making.

These examples show that SD is a helpful tool for policy makers to understand a complex system, to explore how such a system reacts to a range of interventions and to investigate the implications of a policy change, rather than a technique to make a precise forecast (Brailsford et al., 2012). The advantages of SD are confirmed by these studies: it can be used to explore the consequences of a policy and to make a projection over a time period. It can also be useful to various stakeholders. The limitation of the model is obvious, however: although most SD software allows the use of probability distributions, SD models are deterministic and there is generally no variability or stochastic aspect in an SD model (Brailsford, 2008). To overcome this issue, in the thesis of this research, discrete event simulation (DES) (more details of DES are given in the next section) is used to implement an individual's pathway through the LTC services until they die. These transition probabilities are applied and placed in the process of an individual's LTC pathway where these probabilities are needed, rather than applying them to all individuals. The next section examines DES in detail.

Discrete event simulation models and discrete event simulation hybridised models

Discrete event simulation (DES) is a quantitative computer-based modelling technique. It describes items moving through a system (such as a production

line, airport, and health services) modelled as a network of queues and activities. The items in the system are distinct individuals. Each individual's state changes in the system at discrete points of time (Davies and Davies, 1995). It is a stochastic modelling approach and as such it is capable of dealing with the variability and uncertainty of real life. In a DES model, each individual possesses characteristics that determine what happens to that individual, and the activity durations can be sampled for each individual from probability distributions (Brailsford, Desai and Viana, 2010).

In the OR literature, there have been several applications of DES in the area of estimating LTC demand and the associated cost. Katsaliaki et al.' s (2005) study was a study that estimated future LTC need in terms of the capacity of the intermediate care service and the likely associated reimbursement costs for providing the service. The intermediate care service was a new service provided by the LTC care system for older people who are discharged from hospital. It was run jointly by health care services, which were provided by the NHS and social services. The DES model was used to replicate the patient flows within the potential care pathways for older people after they are discharged from hospital, including existing services and future planned services. The model was built using the Simul8 software, however, because intermediate care was a new service, there were no available data for estimating the parameters that were used in the DES model, so this model could not determine the care system capacities; alternative data from other sources was used to partially validate this model. Although this quantitative model analysis finally shifted to a more descriptive approach, the authors still strongly believed that DES was a suitable approach for examining the capacity of potential care pathways and that, if the required data was available, this model would have a wide range of uses, such as capacity planning for different social care services and health care services; testing more efficient patient care pathways; the introduction of new services for the LTC system; projecting expenses for health care and social care services and verifying the required funding. This study provided an empirical example of how to use DES to model social care and health care.

As mentioned earlier, in addition to making projections of LTC needs and associated costs, DES can be used to help decision makers or policy makers to examine the performance of potential LTC policies or services, such as whether a new service will reduce the financial burden. The study by Campbell, Karnon and Dowie (2001) is one example in this area. This study described a DES model to examine whether, from the viewpoint of the NHS and local authority social services, a new service – 'hospital-at-home' care service was cost-saving compared with conventional inpatient care. A 'hospital-at-home' care service is a service to treat patients with a variety of conditions in their home (Campbell, Karnon and Dowie, 2001). Prospective and retrospective observational data was collected on two groups of patients: an intervention group receiving hospital-at-home care and a comparison group receiving conventional inpatient care. The Simul8 software was used to implement the model, which simulated the different pathways linking the health services that might be experienced by patients in the 'hospital-at-home' care service and patients who received inpatient care in the comparator group during their treatment and follow-up phases.

Based on the model, three types of input data were needed. Firstly, patient pathway frequency distributions were incorporated, which can be calculated using the numbers of patients experiencing each of the health services. Secondly, the time (number of days) that each patient stayed in each health service was included; thirdly, the daily cost for each health service for each patient was taken into account. A baseline simulation to generate cost estimates and sensitivity analyses was performed to explore the uncertainties in the model, such as the choices of routes taken by patients through the model, their duration in particular health services and the daily cost for patients in the two patient groups. As this study used primary data, which was designed and collected for this study only and could be entered directly into the model, it avoided the need to transform the data or make assumptions about the distributions around individual parameters within the model. Although such factors as hospital overheads and costs of informal carers were not included in the model, overall it therefore provided useful and reliable estimated costs for

the ‘hospital-at-home’ care service and inpatient care service.

The DES model can be integrated with other modelling approaches to assist policy makers in developing LTC provision policy. Zhang et al. (2012) and Zhang and Puterman (2013) introduced a DES and optimisation programming technique to determine the minimal LTC capacity level required for each year to satisfy the target waiting time for a regional health authority in British Columbia, Canada. In these studies, given a capacity level each year, the DES model was used to determine the percentage of clients per annum who were placed in care within the target waiting time. Optimisation programming techniques were then integrated into the DES to decide the minimal capacity level required each year to meet the service level. In the DES model, reasonable assumptions, as well as demographic and survival analysis, were used to determine the input of the model, including the new arrival of each class of clients throughout a year and the length of stay (LOS) distributions for each class of clients. The numbers of new arrivals in each class of clients throughout a year were assumed to follow a Poisson process with a constant rate; the LOS distribution for each class of clients who have exited care followed Weibull distribution with two parameters. Because only limited data was available for estimating the LOS distributions and the data was right censored, survival analysis and in particular parametric models were used to estimate the parameters of the Weibull distribution. Information on the clients who were already using the services needed to be incorporated; specifically, the researchers needed to preload the model, including the client gender, age and LOS distribution. The LOS distribution for each of them was generated using a conditional LOS distribution for each class. Following this step, scenario tests were conducted to examine different circumstances in terms of the service levels, population growth rates, arrival rates and LOS distributions. Overall, these models provided a useful tool for LTC capacity planning, however, the process of model construction was complex. It required a wide range of skills, which included demographic and survival analysis, and programming skills for developing DES and optimisation techniques. In addition, due to the complex construction of the model, only the age and gender of the older population were considered; however, more

characteristics could be considered for future research.

Brailsford, Desai and Viana (2010) note that the idea of combining DES and SD into a single model has been a topic of debate in the Operational Research field for over a decade. Although many researchers within the OR community would agree that there are many potential benefits of such a model, studies combining DES and SD are rare. Brailsford, Desai and Viana (2010) have presented the only example thus far of the use of DES combined with SD to deal with social care issues. A combined SD and DES model for Hampshire County Council (HCC) was used to help them to estimate future LTC demand and plan the supply of LTC in Hampshire. An SD model was developed to project the number of older people who were likely to contact the centre, then this projection was fed into the DES model to determine the 'right size' for the new contact centre. The data that was used in the DES model was partly obtained from the current contact centre's historical records and partly obtained from observations and from interviews with staff. Although the model in this study still consisted of two separate models, and was not a real integrated model, it provided an informative attempt to model social care using combined SD and DES.

The two studies that used DES hybridised models showed that building a truly integrated model is challenging, often due to the lack of suitable software or skills. Integrated models might also introduce more uncertainty about the results due to the complexities of the model construction. More research is thus required to determine how to integrate SD with DES.

In conclusion, the various applications of DES models have shown that this is a potentially a good approach to modelling the LTC system to help policy makers in developing LTC policy or to estimating future LTC demand and associated cost. This technique was finally chosen for this research. The benefits can be described as follows: it provides an accurate result of future LTC demand

projection, since it is able to replicate the behaviour of individuals; it allows demographic changes, such as an increased ageing population, to be taken into account when making future LTC demand projection, and it permits the construction of 'what-if' scenarios to explore the impact of various uncertainties in the key drivers of demand on future demand for LTC and to examine the performance of the potential LTC policies. More details about why DES was chosen for this research are provided in Section 4.2. Besides Markov model, and simulation models, there are many other approaches are widely used to help policy makers to better plan LTC services.

Other modelling approaches

Computer spreadsheet model is another approach to make projection of future needs for LTC. The papers by Lagergren (2005a) and Lagergren (2005b) are two examples. Lagergren (2005a) developed a computer spread sheet model by combining different national and local data sources and described the development of the Swedish public system of care for older persons in terms of service provision and costs per need group. The model in this study presented the retrospective part of the service provision and the costs per need, covering the period 1985–2000. Lagergren (2005b) used the same model to make projections for the prospective part of the service provision and the associated costs, covering the period between 2005 and 2030. The models contained the following age groups: 65–74, 75–84 and 85+. The older population was further divided by three other characteristics: their gender, civil status and degree of ill health. The degree of ill health was subdivided by the number of hours of community care that individual's receive and whether the person is in a residential or nursing home rather than receiving ADL, IADL or/and mental health care. These characteristics can be seen as some of the main indicators when predicting demand for LTC.

Vrhovec & Tajnikar (2016) developed a model to explore the consequences of demographic ageing on health care demand in Slovenia for primary care,

secondary care, hospital day – care treatments and hospitalisations. This model calculated the influence of changes in the age structure on healthcare demand on the assumption that the demand by age will remain constant, in terms of projections of the total number of treatments of these services for each year for the period from 2015 until 2035. In this paper, they used the age-group projection method with the scenario approach. This model required age-specific healthcare demand and the population projections for Slovenia. Population projections used in the analysis were obtained from the EUROSTAT statistical office and the Slovenian Institute of Macroeconomic Analysis and Development. The data for the age-specific healthcare demand were obtained from the Slovenian National Institute for Public Health The results were presented for the cross-section years 2015, 2025 and 2035. The results showed that in the next 20 years, the health care system in Slovenia will face a major additional burden. The methods presented in this paper can help improve understanding of similar processes in other countries for total healthcare demand.

Mathematical programming is also widely used for planning LTC. It is a support tool for planning of LTC, such as LTC services capacity planning rather than make projection for LTC needs. The studies in this area are massive. Some studies, such as (Lin et al.,2012 and Zhang et al, 2012), looked at the capacity planning problem. Some studies were focus on where and when should new LTC services be located, such as (Shroff et.al,1998; Cinnamon, Schuurman & Crooks, 2009 and Kim and Kim, 2010). In addition, some studies looked at both capacity planning problem and location problems. Cardoso et al (2015) and Cardoso et al (2016) are papers in this area. In 2015, Cardoso et al developed a stochastic mixed integer linear programing model to explore how strategic health policy influence delivery of the LTC services including institutional, home-based and ambulatory services with consideration of uncertainty in demand and supply. The model aimed at minimizing expected costs while ensuring satisficing the attainment of equity of access, equity of utilization, socioeconomic equity and geographical equity. The results of proposed model provided planners with key information including when and where to locate services and with which capacity, how to distribute this capacity across services

and patient groups, and which changes to the network of care are needed over time. Later, in 2016, the model which developed in Cardoso et al (2015) were expanded. Cardoso et al (2016) proposed a multi-objective and multi-period model to support LTC services, in particular, to help planning the delivery of institutional LTC services in the medium-term, both in terms of location selection and capacity planning. This model did not only took three equity objectives including equity of access, geographical equity and socioeconomic equity in to account, but also took weights for each equity objective and cost into account. The applicability of models in Cardoso et al (2015) and Cardoso et al (2016) were demonstrated through applying to the Great Lisbon region in Portugal. The results showed that the developed models can assist planners in other countries with the similar issues. The next section provides a review of LTC and related studies in China.

3.2 LTC Models for Older People in Hong Kong and mainland China

A mentioned in Section 2.3, Wong and Leung (2012) argued that the lack of more objective and accurate assessments of the future need for different types of LTC is an issue for developing LTC in China, but to the best of the author's knowledge, very few studies have conducted projections of the future LTC need of an ageing population in China and the associated costs incurred in meeting that need through the development of an LTC policy using a quantitative modelling approach, and none have made projections for the different categories of LTC services. A detailed review of these studies is outlined in this section, which focuses on the LTC models for older people in Hong Kong and mainland China.

The earliest study was conducted by Chan, Li and Fong (2004), in which they used a dynamic Markov chain to make projections of the demand for LTC by older people (aged 65 and over) in Hong Kong and estimated the associated

future LTC expenditure that would be incurred by individuals. The US Health Insurance Portability and Accountability Act of 1996 (HIPAA) was used to define individuals in need of LTC for the study. Due to the lack of available data on the demographic and socioeconomic characteristics of individuals in Hong Kong, as well as information on LTC in Hong Kong, proxy information was used from the *US National Long-Term Care Survey* (NLTCS) to estimate the annual hazard matrix by analysing longitudinal data from 1982, 1984, 1989 and 1994. Using the matrix exponential method, these matrices were transformed into transition probabilities for transitions between the following five states: being active; reporting mild disability; receiving home and community-based (HCB) LTC; receiving institutional LTC; death. Finally, these transition probabilities were applied to the Hong Kong population projections for 2002–2031 to estimate future LTC demand and associated costs. Based on the projections, the authors recommended that a private insurance scheme could be used for funding LTC support and services for the older population. Although the research is innovative, the main disadvantage of this approach is that the results generated by this model may not reflect LTC need among older people in Hong Kong, as the trends in LTC (e.g. disability) may not match similar to the distribution in Hong Kong; the associated LTC costs to be incurred by individuals may thus be under- or overestimated. This study is very useful, however, in making a case for the relevant LTC, demographic and socioeconomic data to be collected for Hong Kong for future research and policy debates.

Chung et al. (2009) is another key study projecting the provision of LTC (as a percentage of the gross domestic product (GDP) for the older population in Hong Kong. The authors employed a macrosimulation model rather than a Markov model to estimate the demand for LTC among individuals aged 60 and over in Hong Kong and estimated the associated expenditure for providing such services up to 2036. The model followed the design of the UK PSSRU macrosimulation model. An individual's difficulty with ADLs, and with IADLs, such as getting in/out of bed, cooking or shopping) was used to measure the need for LTC support within this study. The data came from official demographic projections, which included the Domestic Household Survey 2004,

Hong Kong's Domestic Health Accounts and other relevant government departments, hospital authorities, and other LTC service providers. The projections of the demand and associated costs for LTC in this model covered all LTC support and services in Hong Kong, including institutional care, such as nursing homes, homes for the aged and long-stay hospices; non-institutional care, home care, day care, elderly health centre and hospice home care, and social allowances, such as higher old age allowance and general old age allowance. Sensitivity tests were conducted to deal with the uncertainties of an ageing population and the unit costs of LTC expenditure. A wide range of LTC expenditure, from 2.2% to 4.9% of the GDP, was estimated under these different sensitivity scenarios. They also found that demographic change, such as the increase in the ageing population, had the greatest impact on the overall spending on LTC. The other important drivers of expenditure were the availability of informal care, the setting of formal care, and the associated unit costs (Chung et al., 2009).

Few studies have been conducted in mainland China to estimate future demand for LTC. Gu and Vlosky (2008) employed multivariable logistic regressions to achieve the ultimate aim of identifying the factors associated with the receipt of LTC. They also predicted the number of people aged 65 and over who will require LTC and who will require LTC support but will not be able to access such care, as well as the associated costs for providing such services until 2050. LTC need was defined as a status in which a person has been disabled in any of six activities of daily living for more than 90 days. The authors employed the 2005 wave of the Chinese Longitudinal Healthy Longevity Survey (CLHLS) for their projections. They also made recommendations for LTC policy based on the research findings. They found that the care needs, costs, care provision and sources of payments varied across regions and between urban and rural areas, which are considered in this research – the prediction is made for urban China and rural China rather than China as a whole. This study also indicated that age, gender, disability status and family/social resources for individuals had an impact on LTC care needs, provision and finance. This study provided relatively rich and reliable information about the need for LTC in China, especially the

factors associated with the receipt of LTC, however, because the ultimate aim of this study was to identify the factors related to LTC need, it did not provide an accurate estimation of further LTC need, nor did not construct a 'what-if' scenario and therefore lacked discussion about the consequences of different potential LTC policies and/or the consequences of uncertainties about future trends. In conclusion, multivariable logistic regression is a powerful approach to identify the factors that determine future LTC need, rather than making projections for future LTC need in different scenarios, and to test the performance of potential LTC policies.

Other studies, including Rong (2009), Rong, Li and Qun (2010), Huang and Wu (2012), Hu, Li and Zhang (2015) and Zeng et al. (2015) all employed a Markov model to estimate the transitions between different health statuses. People who would need LTC services in future were then estimated by multiplying the relevant population, and the associated costs were estimated by multiplying the associated estimated costs per person.

Rong (2009) developed a Markov chain model to estimate the population aged sixty-five and over who will need LTC from 2005 to 2050 and the associated costs. There were seven states in this model: health; need an instrument, but no difficulty with ADLs; with difficulty in one to two in ADLs; with difficulty in three to four ADLs; with difficulty in five to six ADLs; living in a hospice; death. The author estimated two year transition probabilities between these seven states from the US National Long-Term Care Survey (NLTCS) and two other previous studies. To estimate the population needing an LTC service, these transition probabilities were assumed to be constant during the whole projection period. There were two limitations to this study: due to a lack of data, the transition probabilities were estimated based on the US data set, which did not properly represent the true transition probabilities for older people in China; and the author used two-year transition probabilities rather than one-year transition probabilities for the whole projection period, which were not precise enough.

Rong, Li and Qun (2010) estimated the yearly transition probabilities among self-rated general health statuses (i.e. very good, good, fair and poor) and death for Chinese people aged 80 and over by employing a Markov multi-state model. These transition probabilities were used to project future need for LTC from 2010 to 2050 based on changes in health status. Self-rated health data collected in the Chinese Longitudinal Healthy Longevity Survey (CLHLS) conducted in 1998, 2000 and 2002 was used to estimate the yearly self-rated health status transition probabilities. In spite of the detail in the transitions between health statuses, there were three limitations to this study. Self-rated general health status was used instead of an individual's difficulty with ADLs and IADLs to predict the LTC need, which may provide a relatively broad view of the health status of older people rather than their daily circumstances. It was also assumed that individuals with an 'unhealthy' status or poor health were the group in need of care, yet individuals may have arthritis or asthma but not need help with bathing, dressing or cooking, and therefore, the predicted level of need for LTC might be overestimated. Thirdly, they only estimated future LTC needs of people aged 80 and over.

Following a similar line of research, Huang and Wu (2012) proposed a continuous-time Markov model to estimate the transition probabilities of the older population between different health states, including health, low disability, high disability and death. The transition probabilities were then used to make projections of the number of older people within subgroups, which were divided by age and gender in each health state after each transition and the expected time that they would spend in each state. The projections were estimated up to 2016, and the difficulty of older individuals with ADLs and IADLs was used to measure the need for LTC support. The data set used was the Chinese Longitudinal Healthy Longevity Survey (CLHLS) 2005-2008. The authors projected that in 2016 the number of people aged 65 and over who would require LTC would total over 10 million, accounting for about 6.7% of the total population aged 65 and over in 2016 (Huang & Wu, 2012). In general, this research provided more reliable projections than the other models.

Following a similar approach, Hu, Li and Zhang (2015) used the most updated CLHLS data – CLHLS (2008–2011) – to estimate the transition probabilities between five statuses: heathy, low disability, middle disability, high disability and death. Based on these transition probabilities, they estimated the numbers of people with these five statuses and, finally, according to this population, they estimated the numbers of people who will need daily domestic services, health services and mental support and the associated costs for older people up to 2050.

These studies only considered the transitions between different health or disability statuses, however, and did not simultaneously consider the changes in other factors that influence need for future LTC, such as the family structures and the living arrangements of older adults. Zeng et al. (2015) developed a multi-state model to estimate home-based care needs and the associated costs by taking the family structure and ADL status transitions into account. This model contained four marital statuses (never married, currently married, divorced and widowed), two ADL statuses (active, disabled), six statuses of the number of co-residing children (0, 1, 2, 3, 4 and 5+), three statuses of the number of co-residing parents (0, 1, 2) and two statuses of living arrangement (in a private household or an institutional household). To avoid calculating 254,016 transition probabilities, which would be impossible, the authors used a two-step computational strategy to obtain these transition probabilities. Based on the micro-data file of the 2000 census and 2005 mini-census for 1% of the population, they estimated the distributions of rural/urban, single age, sex-specific occurrence/exposure (o/e) rates of first marriage and fertility by parity and age- and sex-specific net migration rates between rural and urban areas. The samples from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) 2002 and 2005 were used to calculate the average ADL status transition probabilities of the age groups in this study. Projections were made in four scenarios, which contained low, medium, high (a) and high (b) mortality and ADL status changes. The consequences of two different fertility policies were also explored. The results showed that, regardless of whether the ADL status change rates were assumed to improve or deteriorate over time and whether

the mortality rates decrease moderately or remarkably, home-based care needs and costs for older adults in China will increase substantially due to the inevitable trends of population ageing and extremely fast increases in the oldest elderly population. In this study the authors indicated that not only should transitions between health or disability statuses be taken into account, but that changes in other factors that influence the need for future LTC should be simultaneously considered. In this research the transitions between different LTC services are therefore considered. Again, Zeng et al. (2015) only focused on the need for home-based care and the related cost; they did not consider other LTC services. This study aims to fill this research gap.

3.3 Summary

This chapter reviewed the different models that are used to make projections of future LTC demand/need for LTC/social/health care and the associated costs in developed countries and in China; a summary of these models is presented in Appendix 1. Research gaps have been identified via the review, and lessons about how to model LTC services to make future LTC needs have been learned, which are explained below.

Although the projection of future demand for LTC and its associated costs has been attracting increasing attention in China, six of these studies – Chan, Li and Fong (2004); Rong (2009); Rong, Li and Qun (2010); Huang and Wu (2012); Hu, Li and Zhang (2015); Zeng et al. (2015) – employed Markov models to make their projection; Chung et al. (2009) proposed a macrosimulation model; Gu and Vlosky (2008) used logistic regression. However, there is no study has used DES to make projection of future demand for LTC. In developed countries, DES has been demonstrated as an efficient tool to estimate future LTC need (Lagergren, 2005a; Lagergren, 2005b). This study therefore fills this research gap – to employ DES to make a projection of the future LTC need of older people in China.

It is important to make a projection for small areas rather than only at the national level due to geographical variety (Cardoso et al., 2012). In China, Chan, Li and Fong (2004) and Chung et al. (2009) both made projections of future LTC demand for Hong Kong, but no study has made projections for the future LTC demand of older people at the lower local level for the mainland of China. This research therefore makes a projection of the LTC need of older people in urban and rural areas of China, rather than at the national level.

Thirdly, in making projections of future LTC demand in both developed countries and China, most of the studies estimated health trends using transition probabilities between disability statuses, and made a projection of LTC need, based on health trends such as Wittenberg et al. (1998), Rickayzen and Walsh (2002) and Hong and Wu (2012). Although Hare et al. (2009) indicated the importance of making projections for other categories of services, such as community-based services and home-based services, studies making projections of the need for different categories of LTC services, such as informal care, institutional, private, voluntary and community-based care, are rare; previous studies have also considered people who need LTC support and services, but no study has considered people who need an LTC service but do not receive any such support. This study fills this research gap by making a projection of future LTC need in terms of the number and percentages of people who do not need care, people who need care, people who require informal, community-based, institutional, private and voluntary care and people who have an unmet care need.

Compared with the studies in this area in developed countries, the research into LTC policy formulation in China that has been conducted has mostly tended to be descriptive, with a lack of research containing detailed analyses and empirical evidence to support the results or conclusions. For example, no detailed discussion has been undertaken to draw out the implications of projection results and how to use them to make LTC policy proposals; Zeng et al. (2015) proved that scenario testing to examine the possible effects of

potential LTC policies is particularly important for making future LTC projections, but most previous studies on future LTC need in China are not described in any detail. The main aim of creating further LTC need projections and their associated costs is to aid policy creation and ultimately to contribute to improving LTC support and services for the older population. Scenario tests for different potential LTC policies and detailed analyses of the consequences of the potential policy are thus essential and will be discussed in detail in this research.

Most studies have only considered transitions between disability, or health statuses between different stages of a certain disease or between different categories of LTC services, and the changes in other factors that influence the need for future LTC were not considered. Only Hare et al. (2009) considered predicted changes in the age structure in BC as well as the predicted changes in the relationship between age and health status, and Zhang (2015) considered the transition between disability statuses measured as ADLs as well as the family structure. Both these studies discussed the great importance of simultaneously considering changes in the factors that influence the need for future LTC for the further social care demand projection. Liu (2009) revealed that the estimation of future LTC need based on health status or transition probabilities is not precise enough. They indicated that the need for different services should also be taken into account. The transitions between disability statuses and the transitions between different categories of care are thus also considered in this research.

In addition, the disability rate and specifically how the level of disability of a population is incorporated into LTC models remains critical for demand forecasting purposes (Worrall. P and Chaussalet. T, 2015). As a result, the model should consider how the changes in the disability rate influence the projection.

Chapter 4: The DES Long-Term Care Model

This chapter presents the discrete event simulation (DES) model, which is named as 'SIMCARE-CHINA' model, that has been developed to estimate different categories of LTC needs in the next ten years, with the ultimate aim of providing a tool to assist policy makers in better planning LTC for older people in China. In reality, the LTC needs of people in different provinces are also different, since their demographic characteristics, socioeconomic characteristics and LTC service utilisation vary (Gu & Vlosky, 2008), however, due to a lack of data at the province level, and with only data at the urban/rural level available, therefore, this model makes projections of the LTC needs of people in rural China and urban China separately. The discussion in Chapter 4 includes justification for the choice of the modelling approach, the modelling framework, the model description and the validation and verification of the model.

4.1 Introduction

Modelling is an approach used to present and capture behaviour effectively within systems in the real world (Gunal & Pidd, 2010; Pidd, 2010b). At the same time, models need to be kept as simple as possible; simplicity is considered key to good modelling practice (Pidd, 2010b). The aim of this study is to provide a policy tool with which LTC policy makers in China can estimate the different types of LTC needs, and to explore the consequences of potential LTC policies, such as changes in the provision of community-based LTC services. To achieve this aim, the SIMCARE-CHINA model – a DES model was built using Simul8 to describe the flows of older people experiencing possible pathways of LTC receipt in China at the rural and urban levels. The justification for the choice of DES modelling is outlined in the next section.

4.2 The choice of modelling approach

Earlier in this thesis, Chapter 3 reviewed the models that can be used to study LTC, health care and social care policy. The literature review in Chapter 3 helped to inform the choice of the methodology. By reviewing such models, it was found that the main approaches used in previous studies to estimate future LTC need are macrosimulation (see Section 3.1.2), microsimulation (see Section 3.1.2) or DES (the same technique has different names in social science and Operational Research: see Section 3.1.3), system dynamics (SD) models (see Section 3.1.3) and Markov models (see Section 3.1.3). DES was employed in this investigation for the following reasons.

A key point is that DES is a stochastic modelling approach and as such it is capable of dealing with the variability and uncertainty of the real world. DES can also replicate the stochastic behaviour of individuals by using statistical distributions. Macrosimulation and SD are deterministic models that are more rigid in their structure (Lane, 2000).

Many previous studies, such as those by Campbell, Karnon and Dowie (2001) and Wittenberg et al. (2006), report that, when making future LTC demand/need projections, modelling should also allow for a variety of scenarios to be investigated so as to explore the potential LTC policies. Although all of the above methods can be used to make projections of future LTC demand/need, SD and DES have been proven to be good techniques to explore potential LTC policies. As mentioned earlier, in comparison with SD, DES is more suitable for modelling a stochastic process.

Most software for constructing DES models, such as Simul8, allows the model to be displayed in a graph; therefore, users can see how the system operates on screen, which facilitates their understanding of the whole system.

Spreadsheet models (macrosimulation and microsimulation) and Markov models do not have this feature. Last but not least, most software for constructing DES models, such as Simul8, can give the projections with confidence intervals which are chosen by the authors, however, the other modelling approaches can only provide deterministic results.

After considering the advantages detailed above, it was concluded that DES would be the most appropriate tool to handle the challenges associated with LTC policy design and policy making in this research. Nonetheless, DES does have its limitations, such as requiring data sets that may be unavailable or difficult to access (Viana et al., 2014). This research faces the same issue: the necessary length of time to receive different categories of LTC is unavailable. This issue is solved by using one year as the length of time spent receiving all of the different categories of LTC services, and the computer DES model was designed accordingly (more details of this can be found in Section 4.5.4).

4.3 The choice of software

Different software is available for constructing a DES model, such as VBA (Visual Basic for Applications), Simul8, Facsimile, Anylogic and Arena. The author was familiar with the functionality of Simul8, and, like most DES software, it provides a graphical interface to facilitate an understanding of the whole system. Simul8 was thus chosen to build the model.

4.4 The modelling framework

A graphical representation of the computer modelling framework is displayed in Figure 4.1, and a description of the modelling framework is provided below.

Figure 4.1 Modelling framework

Source: author's own work

The first stage of the modelling process is to construct a conceptual LTC model; this is presented in Figure 4.2 with a more detailed explanation in Section 4.5.1. Before designing the conceptual model, a review of the relevant literature was carried out to summarise the possible pathways of LTC support and services for people in China, which were used as the basis for the conceptual LTC model design.

The second stage is to develop the SIMCARE-CHINA model using the Simul8 software and to design within the model the flows of people for all possible LTC support types and services that are available in the LTC system according to the conceptual model. The required input for the model is also estimated from data sets that contain information on the demographic and socioeconomic characteristics of older individuals in the Chinese population, their health status

and their LTC care service utilisation. Certain indicators cannot be estimated from such data sets, however, for these, rational assumptions are used in the model. A further discussion about the input data is included in Chapter 5.

The third stage of the process is to verify and validate the SIMCARE-CHINA model. Verification is a process to make sure that there are no errors in the procedure of developing the simulation model (Anderson, Sweeney & Williams, 2003). By contrast, validation is a process aimed at ensuring that the model produces accurate results (Anderson, Sweeney & Williams, 2003). These are two important processes for the modelling task, and more detail is included in Section 4.6.

The final stage is to estimate the need for future LTC services for older people, including the number of people who will not need care, the number of people who will require different types of care and the number of people who have an unmet care need. Future LTC need in different scenarios, which represent uncertainties about the future (such as changes in the disability prevalence rate) and/or the potential LTC policies (such as a change in the provision of one category of LTC service) when informal care is reduced, are also predicted in order to explore how the uncertainties about the future and/or potential LTC policies will affect future LTC need. Analysing such performance as part of the evaluation of different policies could help policy makers to better understand the consequences of introducing LTC provision policies and could guide them to improve LTC support for the older population in China. More details can be found in Chapter 6.

4.5 The model description

4.5.1 The conceptual LTC model

The LTC system, consisting of LTC support and services for the population in China, is used as the basis for a conceptual model of the flows of older people on which the SIMCARE-CHINA model will be built. Figure 4.2 describes this conceptual model. The conceptual SIMCARE-CHINA model shows the flows of individuals who are aged 65 and over through all the possible LTC pathways until they die. There are eight states, which represent seven care-receiving states (informal care, institutional, community-based, private and voluntary services, no care need and unmet care need) and death (which is the absorbing state, meaning that once individuals enter this state, they will not leave it).

Figure 4.2 The Conceptual SIMCARE – CHINA Model

Source: author's own work

As shown in Figure 4.2, at time zero, all individuals who are aged 65 and over (i.e. the initial population) enter the model and are categorised into six broad groups or types by 10-year age band and gender:

- Young-old males (aged between 65 and 74 years)
- Mid-old males (aged between 75 and 84 years)
- Old-old males (aged 85 and over)
- Young-old females (aged between 65 and 74 years)
- Mid-old females (aged between 75 and 84 years)
- Old-old females (aged 85 and over).

They enter the model through six entry points, and each entry point is exclusively for one group or type of people. The model in this research assumes that:

Individuals who reach their sixty-fifth birthday (i.e. new arrivals or the incident population) arrive in the model monthly – this is Assumption 1 for this model.

New arrivals or the incident population therefore arrive each month; the new arrivals are categorised by their gender and enter the model through entry points for young-old males (aged between 65 and 74 years) and young-old females (aged between 65 and 74 years). The model assumes that:

Individuals who have the same demographic characteristics, that is, age, gender and disability status, in the thesis of this research (a detailed explanation of these three characteristics can be found in Section 4.5.2), belong to the same group and those people in the same group are more likely to have similar needs and utilisation in terms of LTC services – this is Assumption 2 for this model.

For modelling purposes, people are categorised into further sub-groups or sub-types according to their disability status: with disability and without disability. This model assumes that:

All individuals can only enter one state each time, that is, they can only receive one category of LTC as their main service or can only have one requirement – this is Assumption 3 for this model.

With such profiles in mind, based on their age, gender and disability status, individuals are then 'assigned' to one of the eight states. The probability of assignment to one of the eight states is estimated based on their type, which is classified by their characteristics (age, gender and disability status); this is the so-called 'type-dependent allocation probability' or 'care received distribution', however, the assignment process is carried out immediately after people enter the model, and no death occurs in such a short time; therefore, at the assignment stage, the probability of being assigned to the state of death is zero. After individuals have been assigned to one of the eight states, they will stay in this specific state for a while; the length of time spent in this one particular state is called the 'length of stay'. Data regarding the length of time spent receiving different categories of care is, however, unavailable, and therefore, in this model, an individual's care-receiving status is checked and updated once a year, that is, one year is used as the 'length of stay' in this model, so that once individuals have entered a specific state, they will stay in this state for one year. After one year, they will be reassigned to one of the eight states. Similar to the assignment process, the reassignment process is based on an individual's age, gender and disability status; therefore, before the reassignment process, the age and disability status of the elderly individuals are updated. The disability status is updated using the transition probabilities of transitions between different disability statuses or disability next distribution. The probability of reassignment to one of the states is called the 'type-dependent reallocation probability' or 'care received next distribution'. The coloured arrows in Figure 4.2 represent all possible reassignments at the stage of reassignment: people could be reassigned to a different state, the same state as before, or the state of death, which is represented as a grey box in Figure 4.2. People who are

reassigned to death exit the model. All survivors will stay in the state to which they are assigned for one year. After one year, they will be reassigned again according to the 'type-dependent reallocation probability', which is based on their updated age and disability status. This process is repeated again and again until the simulation is completed.

4.5.2 Labels and their associated distributions

Labels are very important in a Simul8 model. Labels are a modelling device in Simul8, attached to each individual to represent their attributes, and they can also be used to route individuals though different pathways in the simulation. In the SIMCARE-CHINA model, the labels can be broken down into two categories: 'personal' and 'transition'. Personal labels capture people's characteristics (age, gender, etc.), which influence the need for LTC services; and transition labels are used to route individuals as they move through the LTC system. The label 'most recent LTC service' represents the care-receiving status that older people have recently held, and the label 'the next LTC service' refers to the state that people will enter next. The full details of these labels are presented in Table 4.1. More information will be provided later.

Table 4.1 Label information

Sorts of labels	Labels	Types	Categories in the model
Personal	Age Group	Numerical	1=65-74 2=75-84 3=85+
	Updated age Group (age group before reassigning)	Numerical	1=65-74 Now 2=75-84 Now 3=85+ Now
	Age	Numerical	There are 21 categories for this label; each category from 1 to 21

			represents each individual age from 65 to 84, and 21 represents 85+, for example, 1=65, 2=66, 3=67, 4=68 ….. 21=85+
	Updated Age (age before reassigning)	Numerical	There are 21 categories for this label; each category from 1 to 21 represents each individual age from 65 to 84, and 21 represents 85+ after updating, for example, 1=65, 2=66, 3=67, 4=68 ….. 21=85+
	Gender	Numerical	1=Male 2=Female
	Initial disability status	Numerical	1=Without disability (with lower than 3 ADLs difficulties) 2=With disability (with 3 or more than 3 ADLs difficulties)
	Updated disability status (disability status before reassigning)	Numerical	1=Without disability Now (with lower than 3 ADLs difficulties) 2= With disability Now (with 3 or more than 3 ADLs difficulties)
Transition	The most recent received care	Numerical	1=No care needed 2=Informal care 3= Community-based service 4=Private service 5=Voluntary service 6=Institutional service 7=Unmet care need 8=death
	The next care	Numerical	1=No care needed 2=Informal service 3=Community-based service 4=Private service 5=Voluntary service 6=Institutional service 7=Unmet care need 8=Death

Source: author's own work

Each label belonging to the ‘personal’ category is broken down into different numerical values to represent its different categories. As shown in Table 4.1, the labels belonging to ‘personal’ represent three characteristics of individuals that influence future need for LTC: age (the labels ‘age group’, ‘updated age group’, ‘age’ and ‘updated age’), gender (the label ‘gender’) and disability status (the labels ‘initial disability status’ and ‘updated disability status’). The reasons for choosing these three characteristics are:

- Age

Previous studies, such as Gu and Vlosky (2008), Zhu and Jia (2009) and Huang and Wu (2012) and the studies that were produced by the PSSRU, such as Wittenberg et al. (1998), Wittenberg et al. (2001), Comas-Herrera et al. (2006) and Pickard et al. (2007), have revealed that the proportion of older people who receive LTC increases dramatically with age. Gu and Vlosky (2008) indicated that an increase in each additional year of age increases the risk of needing LTC. Age is therefore a crucial characteristic that is likely to influence the need for LTC services.

- Gender

Previous studies, such as Gu and Vlosky (2008), Huang and Wu (2012) and the studies that were produced by the PSSRU, such as Wittenberg et al. (1998), Commas-Herrera, Wittenberg and Pickard (2003) and Pickard et al. (2007), have indicated that gender is another factor that is associated with the need for LTC. Their research showed that there is greater demand for LTC among women aged 65 and over than men.

- Disability status

Most studies of the projection of LTC demand undertaken in the PSSRU, such as Wittenberg et al. (2001), Comas-Herrera et al. (2006), Hancock et al. (2007),

Harding (2007) and Pickard et al. (2007), illustrated that dependence or disability, which is measured in terms of difficulties with ADLs and IADLs, is a crucial driver of the need for LTC. Their research revealed that increased future rates of dependency have an impact on the increase in the need for LTC.

There are also some characteristics that are potentially related to the need for LTC, such as a person's self-rated health status. Some studies, such as Lee (2000), Hillen et al. (2003), Jylhä (2009) and Rong, Li and Qun (2010), have indicated that self-rated health provides a subjective view of a person's general health, allowing the researcher to measure a person's health in a different way from other dimensions of health relating to objective (physical) aspects of health, thus, self-reported health has been found to be a good predictor of future health and is useful for understanding how it affects a person's need for and use of LTC. Marital status is also an important characteristic. Gu and Vlosky (2008), as well as studies produced by the PSSRU, such as Commas-Herrera, Wittenberg and Pickard (2003) and Pickard et al. (2007), demonstrated that marital status has an influence on the need for LTC. These studies revealed that marriage promotes emotional support and a healthy lifestyle, which may benefit daily physical functioning, a finding that may have relevance in the Chinese context. The aim of the thesis for this research, however, is to make a projection for people who need care from aspects of physical disability rather than others, and therefore, at this stage, this research does not contain other factors which influence the need for LTC services, such as self-rated measures and marital status, and therefore they are not included in the model.

Seven personal labels are attached to individuals to represent the three characteristics. Four of these labels, 'age group', 'age', 'gender' and 'initial disability status', are assigned when people enter the model through Simul8. After individuals have been in a specific category of LTC services for the first year, and before they are reassigned to LTC services, their characteristics of age and disability status may have changed and therefore these characteristics require updating. The labels 'updated age group', 'updated age' and 'updated

disability status' are used to represent the updated age, updated age group and updated disability status of the individuals in the model.

Two transition labels represent people's pathways through the LTC system.

- The next care status

This label is used to denote all the possible states that people can enter as their next movement after being allocated to one category of care status. It consists of eight categories: informal care, institutional, community-based state, private and voluntary services, no need for care, unmet care need and death.

- The most recently received care

This label records the most recent LTC service that people have used or the most recent LTC requirement that people have had. There are eight categories in this label, which are the same as the categories used for the label 'the next place'.

In addition to the labels 'age group', 'gender', 'updated age group' and 'updated age', the other labels all contain 'distributions'. The 'distribution' is the term used in the SIMCARE-CHINA model to present the percentage of people who belong to each numerical value (which is used to represent each category) of each label. These distributions enable the model to allocate the correct percentage to each numerical value (or each category) of each label; for example, for a particular label, how many (in percentage terms) belong to each particular numerical value (or each category). There are 42 distributions in this model. The labels and their associated distributions are presented in Table 4.2. Visual logic (VL) (further explanation of VL can be found in Section 4.5.4) is used to import the distributions to the associated labels. These distributions are the required input for this model and they are estimated from the available data sets (further explanations of the estimation of these distributions can be found in Chapter 5).

Table 4.2 Labels and their associated distributions

Label	Distribution/ terms used in the SIMCARE-CHINA model	Terms used in this thesis	Depend on	Number of distributions required
Age	Age distribution	Age distribution	Age and gender	6
Initial disability status	Disability distribution	Disability prevalence rate	Age and gender	6
Updated disability status (disability status before reassignment)	Disability next distribution	Disability transition probability	Age and gender	6
The most recent revived care	Care received distribution	Type-dependent allocation probability	Age, gender and disability status	12
The next care	Care next distribution	Type-dependent reallocation probability	Age, gender and disability status	12

Source: author's own work

4.5.3 Variables

Variables are the items that can be used in the DES model to measure and control what is happening. This model includes thirteen 'numerical variables'. One of the thirteen numbered items is used to count the simulation time, which tells the user the current year in the simulation (there are ten years in total in this simulation); others are used to generate the random number streams that are used in the visual logic (VL). This model also contains twelve 'spreadsheet variables' (i.e. twelve pieces of internal spreadsheets), which are used to store the input data. Of these, six are used to store the schedule information, that is, the number of people who enter the model and when they enter it. The

remaining spreadsheets are used to store distributions. VL is used to import the input into the model when such input is required. With the internal spreadsheets and VL, users can operate the model effectively, especially when carrying out scenario tests for testing different scenarios that require different input data, when alternative input data can be easily changed in the internal spreadsheets by copying and pasting from the external spreadsheets rather than changing them in the VL code, since the amount of input data that need to be changed in the VL code is huge. More details of VL are given in the next section.

4.5.4 Visual Logic

In the SIMCARE-CHINA model, the usage of VL is varied. Table 4.3 provides information about where VL is used in the model, with a brief description of its purpose.

Table 4.3 Information about VL

Where VL is used	Purpose
Six entry points	To attach labels; To import 'age distributions' that are stored in the spreadsheets to the label of 'age'.
Care allocation centre (this is a dummy activity, which is a modelling device and not an actual place)	To import the 'care received distribution' for each type of people from internal spreadsheets to the label of 'the most recent received care'; To assign individuals to different LTC services or requirements, according to the 'care received distribution' or type-dependent allocation probability.
Each category of LTC service or requirement	To assign individuals to the care reallocation centre.
Care reallocation centre (this is a dummy activity)	To update people's age and disability status; To import the 'care next distribution' for each type of people from the internal spreadsheets to the label of 'the next care'; To assign individuals to different LTC services according to the 'care next distribution' or type-dependent reallocation probabilities.

Source: author's own work

4.5.5 Computer Simul8 model

The computer model is developed based on the conceptual model, which is shown in Figure 4.2, and it provides a graphical representation that allows the users to see all the possible LTC pathways consisting of eight states: seven represent seven categories of care-receiving status, and the remaining one represents the state of death. Figure 4.3 shows the graphical representation, which presents a snapshot of the model. The projection of future LTC need is made from 2015, however, this model needs to run for a few years before 2015 to make sure that it represents the real utilisation of LTC with the correct

number in each care category, that is, the population profile for the beginning of 2015, which is the ‘warm up’ or initialisation (for more details of the warm-up, see section 4.5.6).

As shown in Figure 4.3, in the SIMCARE-CHINA model, at time zero (i.e. at the beginning of the warm-up), the existing population of all people aged over sixty-five (i.e. the initial population) enters the model through six entry points. According to their age and gender, which are attached by ‘label’, individuals are first classified into six different sub-types or sub-groups. Each entry point is for one type or group of people who are in the same age group and of the same gender. Once individuals enter the model, they are classified further by their disability status.

After entering the model, the process of assignment and reassignment is carried out (more details of these two processes can be found in the conceptual model in Section 4.5.1.). In the Simul8 computer model, individuals are assigned to one of the eight states through the ‘care allocation centre’ and ‘care reallocation centre’ (they are dummy places). Several lines of code using visual logic (VL) (Section 4.5.4 gives more information on VL) are used to (re)assign people to one of the eight care receiving states. Before being reassigned in the ‘care reallocation centre’, an individual’s characteristics, including age and disability status, are updated. Their age is updated based on the time spent in the model; the unit of time is a year. VL is used to count the years. Disability status is updated based on the ‘disability next distribution’ or disability transition probability. This process is repeated until the warm-up is complete. Experiments are needed to identify the length of the warm-up period, experiments suggest that the required length of warm-up is two years (further explanation of the warm-up stage can be found in Section 4.5.6). After the two year warm-up period, at Time One, that is, January 2015, the model assumes that the members of the population who have reached their sixty-fifth birthday (i.e. the incidental population or new arrivals) arrive and enter monthly, which is more realistic than new arrivals entering the model yearly. From January 2015

onwards, therefore, the members of the population who have reached their sixty-fifth birthday gradually arrive in the model each month as time passes. These new arrivals enter the model through two points – ‘young-old male’ and ‘young-old female’. The incidental population, or new arrivals, then repeat the process of assignment and reassignment until they die or the simulation is over.

Figure 4.3 A snapshot of model

Source: author's own work

4.5.6 Warm-up

In this research the warm-up or initialisation phase is used to ensure that the model produces a population profile for the beginning of 2015 (or the end of 2014) with the right number of people in each care category. Without the warm-up, the model starts empty, that is, there is no one in any of the care categories at the beginning of 2015, which is not realistic. The warm-up is thus essential to make sure that the model settles down into a more realistic representation of the care categories at the beginning of 2015, then the projection for future LTC needs from 2015 to 2024 can be made based on this population profile. It is not known how long it will take the model to produce the population profile for the beginning of 2015, with the right number of people in each state, that is, the warm-up period, and therefore some experiments are necessary to identify it.

To identify the warm-up period, the 2014 population for rural/urban China enters the model through the six entry points of the SIMCARE-CHINA model; the model is run for different numbers of years starting with one year. The total population for rural/urban China at the end of each year and the numbers of people who need different types of LTC services and who have unmet needs for rural/urban China that are produced by the model are compared with the corresponding historical data for 2014. The number of years producing the results closest to the historical data is identified as the warm-up period. The historical population data for urban and rural China for 2014 is provided by the Population and Development Centre, Zhejiang University, China (more details about the population data are explained in Section 5.1). They report the number of people in urban and rural China in 2014 as 65,949,000 and 77,833,000, respectively, however, historical data on the numbers of people who require different types of services for 2014 for rural/urban China is not available; only the proportion of people who require institutional services for the whole of China is available. According to Mu (2012), the proportion of people in China who have required institutional services recently is about 1%. Wong and Leung (2012) suggested that the requirement for institutional services in urban China

is higher than that in rural China. The proportion of people who require institutional services for the whole of China is thus used to give general guidance to identify the warm-up period. Bearing this information in mind, it was found after many experiments that it takes two years for both urban and rural China for the model to produce the results that are the closest to the numbers in the real world. For urban China the model determined after two years that, at the end of 2014, the total population with 95% confidence is (65,562,000, 66,337,000), which includes 65,949,000 (i.e. historical data for population in urban China in 2024); for rural China the model shows that, at the end of 2014, the total population with 95% confidence is (77,625,000, 78,055,000), which includes 77,833,000 (i.e. historical data for the population in urban China in 2024). In terms of the proportions of people who will require institutional services in 2014 in urban and rural China, the model gives 1.7% and 0.61%, respectively, which are higher and lower than 1%. After a discussion with Dr Xiaoting Liu, an expert in research on LTC for older people in China, we agreed to accept these results.

4.5.7 Input for the SIMCARE-CHINA model

Table 4.4 provides a summary of the required input for the SIMCARE-CHINA model. All input data is stored in the internal spreadsheet. In addition to the initiation population and incident population, which are used to schedule and control the population entering the model directly through VL, the rest of the input data is used to import the distributions to the associated ‘labels’ through VL. Table 4.4 also provides information about where this input data is needed in this model, however, these input is not provided directly. It needs to be estimated from data based on reasonable assumptions. The data that is used to estimate the input is from different sources. Chapter 5 discusses the data sources and the method for estimating this input. The next section will explain the expected output of the SIMCARE-CHINA model.

Table 4.4 Input data for the SIMCARE-CHINA model

Label type	Process	Required input of model
No label related, use in the model directly	Before entering the LTC system in the model	Number of people aged 65 and over at the beginning of the simulation (in this thesis, they are called initiation population) (see section 5.1); Number of people who will reach their sixty-fifth birthday in each month during the simulation run (in this thesis, they are called incident population) (see section 5.1).
Personal	Entering the LTC system in the model	In each group of the initial population by 10-year age band and gender, how many of them belong to each single age category. In this thesis, it is named as age distribution (see section 5.1); For each sub-group of people by 10-year age and gender, the probability of being disabled/without disability, that is, the initial disability prevalence rate. In this thesis, it is named as disability distribution (see section 5.2).
	Updating characteristics of people before reassignment to LTC services	For each group of people by 10-year age band and gender, transition probabilities between different disability statuses. In this thesis, it is named as disability next distribution (see section 5.3).
Transition	Assigning people to LTC services	For each group of people by 10-year age band, gender and disability status, the probabilities of being assigned to each care-receiving status and death, that is, the type-dependent allocation probability. In this thesis, it is named as care received

		distribution (see section 5.2).
	Reassigning people to different LTC services	For each group of people by 10-year age band, gender and updated disability status, transitions probabilities for transitions between different care-receiving status. In this thesis, it is named as type-dependent reallocation probability. It is named as care next distribution (see section 5.3).

Source: author's own work

The projection of future LTC need is made for rural and urban China in this research, instead of for China as a whole. To achieve this, two sets of the required input data, as presented in Table 4.4, are estimated from the relative data sets (which are discussed in Chapter 5) to make the projection of future LTC need. When collecting the projection results, two identical models are run with the two data sets, which are used to represent the demographic characteristics and the utilisation of LTC in rural and urban China.

4.5.8 The expected output from the SIMCARE-CHINA model

The model, with different input data sets representing rural and urban China, is run for ten years from 2015 to 2024. At the end of each year, for each category of LTC service or requirement, the model will produce the key performance indicators (KPI) of the average number of people in the 'activity'. 'Activity' is the term used in Simul8 to represent each category of care-receiving status in the SIMCARE-CHINA model. The average number of people in the 'activity' is used to represent the average number of people who are in a particular category of care-receiving status at a particular time point (i.e. at the end of each year) in this DES model. The Simul8 trial calculator determines the number of runs needed to reach the different levels of precision for the confidence intervals; it

runs until the required level of precision is reached. In the SIMCARE-CHINA model, the upper and lower 95% confidence intervals for the average number of each ‘activity’ are achieved. The average numbers of people who have been in different categories of care-receiving status with at least 95% confidence at the end of each year during the projection period represents the average numbers of people who require different types of care (including informal care, institutional, private, community-based and voluntary services, those who do not need care and those who have an unmet need) for each year in the next ten years, which are the results of this research.

The SIMCARE-CHINA model run in a baseline scenario and alternative scenarios, which may be of interest to potential users, including changes in the disability rate and/or the reduction of informal care. The results obtained in the baseline scenario and different scenarios will help potential users to understand the likely impacts of changes in the disability rate, and/or the reduction of informal care, on the need for different types of LTC. The performances of potential policies that are used to deal with the reduction of informal care are also explored. With this information potential users can better plan LTC support and services to meet the changed need for different LTC services of older people in China, and it will allow them to allocate resources efficiently. Further details of the results achieved in the baseline scenario and other scenarios are presented in Chapter 6.

4.6 Validation and verification

This section describes the verification and validation process for the SIMCARE-CHINA model.

4.6.1 Verification

Verification is defined as '… *the process of determining that the simulation calculations is logically correct. Verification is largely a debugging task to make sure that no errors are in the computer procedure that implements the simulation*' (Anderson, Sweeney & Williams, 2003: p.610). Verification is an important stage of modelling. It is also applied to the DES model. It is a process that ensures that the constructed model matches the real system under investigation, and it is vital to make sure that the output generated by the model is accurate.

To verify the SIMCARE-CHINA model, the following checks were carried out, to find errors and correct them.

1. The conceptual SIMCARE-CHINA model, and all the assumptions that are used in the model was discussed with experts in LTC services for older people in China at the School of Public Administration, Zhejiang University, China: Dr Xiaoting Liu and Professor Wenjong He. This discussion enabled the author to ensure that the structure of the conceptual model captures the features of LTC support and services for older people in China and that the characteristics of older people used in the model – age, gender and disability status – are used correctly.

2. The input data that is estimated from the relevant data sets (more details of the input data can be found in Chapter 5), the methods and the procedure for generating them were discussed with Professor Wenjong He and Dr Xiaoting Liu, who are experts in the area of LTC services in China, to ascertain that the input data for the SIMCARE-CHINA model is correct. This considerably increases confidence in this model.

3. The code and logic of the model were checked with colleagues who are experts in Simul8, including all the distributions used in the model, to make sure that they were used at the right time; furthermore, all the

codes for importing data from Simul8 internal Excel sheets were checked to ensure that the data was imported correctly.

4. The Simul8 trial calculator was used to determine the number of runs in a trial. The output in this model achieved at least 5% accuracy, which is sufficiently accurate.

According to the checks described above, the model can be considered as achieving full verification. Validation is also an important part of modelling, and this is the focus of the next section.

4.6.2 Numerical validation

Validation is defined as '… *the process of ensuring that the simulation model provides an accurate representation of a real system. Validation requires an agreement among analysts and managers that the logic and assumptions used in the design of the simulation model accurately reflect how the real system operates'* (Anderson, Sweeney & Williams, 2003:p.619).

First, the proportions of people who need institutional services in urban and rural China as generated by the model are compared with the expected proportions, however, in reality only the recent proportion of people who require institutional services for the whole of China is available; this proportion is about 1% and is higher for urban China than rural China (Mu, 2012; Wong & Leung, 2012). Only the proportions of people who need institutional services for 2015 and 2016 are compared with the expected proportions in the real world. They compare well. The proportions from the model for urban and rural China for 2015 were 1.49% and 1.11%, respectively, and for 2016, were 1.46% and 1.06%, respectively. Unfortunately, a comparison of the proportions of people who require institutional services for other years and people who require other different types of LTC services could not be made as the real world data is not available. Secondly, this model was checked by Professor Wenjong He and Dr

Xiaoting Liu, who accepted it as a valid model. In theory, in order to validate the model, the total number of people aged 65 and over for each year between 2015 and 2024 for rural/urban China generated by the model is compared with the yearly population forecast for rural/urban China for next ten years, however, only the Population and Development Centre, Zhejiang University produces this information, which is used to estimate the initial population and incident population. When the yearly population forecast for rural/urban China for the next ten years is available, this data can be used to validate the model.

This model is therefore considered fully validated and can be used to make projections of the future LTC need of older people in urban and rural China. The next chapter discusses the data sources used for estimating the input data and the approaches followed to obtain the input data.

4.7 Summary

This chapter explains the SIMCARE China model in detail, including why the DES modelling approach and Simul8 software was selected, the process of developing the model, the description of the SIMCARE China model and the verification and validation of the model. In order to project future LTC need, the input data needed for the model is critical. The input data is discussed in Chapter 5, including the data sources, the method of estimating the inputs and the results of the estimation.

Chapter 5: The input data

The input data discussed in Section 4.5.7 is not provided directly. It is estimated from the relevant data sets, such as survey data and census data. This chapter provides the data sets and describes how to use them to estimate the input discussed in Section 4.5.7 for the SIMCARE-CHINA model.

5.1 Initial population, their age distributions and incident population

As mentioned in Section 4.5.6, to ensure that the model has the right numbers of people in the correct care categories at the beginning of 2015, a warm-up or initialisation of the model is needed. At the beginning of the warm-up period, the initial population – the population of people who are aged 65 and over in 2014 – enter the model through six entry points according to an individual's age group and gender. The projections of future LTC need are made separately for rural and urban China in this research, and therefore the populations of people who are aged 65 and over by 10-year age band and gender for urban China and for rural China for 2014 are needed. In order for the SIMCARE-CHINA model to represent the correct demographic structure for older people in urban and rural China for 2014, the age distribution of each group of people by 10-year age band and gender, that is, in each group, the number of people (in percentage terms) who belong to each single age group, is required. As age influences the need for care significantly, an individual's age in 2014 is also necessary. The age distribution of each group enables the model to recognise an individual's age. There are six groups by 10-year age band and gender; therefore, six age distributions are required for the initial population.

To obtain the initial population by 10-year age band and gender for urban China and rural China, and the age distributions, data is required for the population of

people who are aged 65 and over in each single age group and gender for urban China and rural China for the year 2014. The National Bureau of Statistics of the People's Republic of China recorded the population of people aged between 0 and 100+ by single age, gender and residence from 1949 to 2014, however, access to the data sets is limited, and only part of the data sets is published publicly. The National Bureau of Statistics of the People's Republic of China produces a, annual statistical book, however, it only provides demographic and socioeconomic information on the population aged between 0 and 100+ in China by five-year age band and gender for the individual province, urban, rural and national levels. It does not provide the population by each individual age. The Population and Development Centre, Zhejiang University, China has recorded the historical population of people aged between 0 and 100+ by single age, gender and residence in China. It also has the authorisation to access the historical population data, which is recorded by the National Bureau of Statistics of the People's Republic of China. To ensure the accuracy of its historical population data, the Population and Development Centre at Zhejiang University compares its historical data with the historical data recorded by the National Bureau of Statistics of the People's Republic of China and adjusts its data. The Population and Development Centre at Zhejiang University therefore has reliable historical population data. As a result, the population of people aged 65 and over by each individual age and by gender for urban and rural areas for the year 2014, which is recorded by the Population and Development Centre at Zhejiang University, is used to calculate the population for each group of people who are aged 65 and over by 10-year age band and gender for urban and rural China for 2014 by adding the population in each individual age group and gender for each 10-year age band and gender group. The results of the initial population for each group of people are presented in Table A2.1 in Appendix 2. The age distribution for each sub-group by 10-year age band and gender is calculated as follows, and the results are presented in Table A2.3 in Appendix 2:

Yearly population by individual year age and gender group ÷ total population in this corresponding ten-year age and gender group

From the beginning of 2015, under Assumption 1, the incident population or new arrivals (i.e. the population who reach to age 65 in each month) enter the model monthly, therefore, the population projections for people who are aged 65 for each month from 2015 to 2024 by gender for urban and rural China are also required. The Population and Development Centre, Zhejiang University, China, has made a population projection of people aged 0 to 100+ by single age and gender for urban and rural China for each year from 2015 to 2050 based on the historical population data, which is the only available projection data by single age and gender for urban and rural China for each year. The projection data for people who are aged 65 by gender for each single year from 2015 to 2024 for urban and rural China is used to estimate the monthly new arrivals for each year from 2015 to 2024. To obtain the numbers of arrivals for each month, Assumption 4 is required:

Assumption 4: In each year the numbers of arrivals for each month are assumed to be the same.

Following this assumption, the number of arrivals for each month at the urban/rural levels by individual year of age and by gender is calculated as:

Yearly population of people who are aged 65 at the urban or rural level by gender ÷12

The monthly incident population or new arrivals for urban/rural areas of China by individual year of age and gender for each single year from 2015 to 2024, which are estimated from the above formula, is presented in Table A2.2 in Appendix 2. The estimated monthly new arrivals may be under/overestimated under this assumption, however, the projection of future LTC needs is made based on yearly data, and therefore, the underestimation/overestimation does not influence the final result significantly.

5.2 The disability distribution and care received distribution

5.2.1 Introduction

As mentioned in Section 4.5.7, the model requires “disability” distributions, i.e. the probability of being disabled or not, by age and gender. This is the disability prevalence rate. Moreover, the model also needs “care received” distributions, i.e. the probability of receiving each type of care or of dying, by age, gender and disability status. This is the “type-dependent allocation probability”. The “disability” distributions and the “care received” distributions are estimated from the Chinese Health and Retirement Longitudinal Study (CHARLS) and the Chinese Longitudinal Healthy Longevity Survey (CLHLS), respectively. In the next section, 5.2.2, the justification for choosing these two data sets to estimate these inputs is provided; their estimation is explained in detail in Section 5.2.3; and finally, the results are discussed in Section 5.2.4.

5.2.2 The choice of data

Regarding CHARLS, it joins a family of well-established international ageing surveys, including the Health and Retirement Survey (HRS) in the US, the England Longitudinal Study of Ageing (ELSA), and the Survey of Health, Ageing, and Retirement in Europe (SHARE) (Zhao et al., 2013). CHARLS collects data on a representative sample of Chinese residents aged 45 and older. The baseline national wave of CHARLS was conducted in 2011 and included 10,287 households and 17,708 individuals in 150 counties/districts and 450 villages/resident committees. 35.6% of the sample is over (65+), 49.6% and 50.4% are male and female respectively, 60.0% live in rural areas and 40.0% live in urban China. The individuals are followed up every two years. Wave 2 was implemented in 2013 and was currently available, Wave 3 was

implemented in 2015 and it will available in early 2017. The response rate for the survey was over 80% (94% in rural areas and 69% in urban areas) (Zhao et al., 2013). The household survey includes seven parts:

- Demographic Background;
- Family;
- Health Status and Functioning;
- Health Care and Insurance;
- Work, Retirement and Pension;
- Household and Individual Income, Expenditure and Assets; and
- Interviewer Observation.

According to Zhao et al. (2013), the quality of CHARLS is ensured through strict quality controls at all stages of the survey, sampling, interviewer training, and field protocols. More detail about the quality control of the CHARLS survey can be found in Zhao et al. (2013). Within these control tools, it provides a unique, high quality dataset to support the scientific analysis of ageing issues in China.

Besides the high quality of the data, Wave 2 of CHARLS provides information on 2,864 individuals aged 65+ from rural areas and 1,892 individuals from urban areas. Thus this data contains an appropriate sample for representing the circumstance of individuals in both urban and rural areas of China. Moreover, in comparison with CLHLS (which is described in the following paragraph), it provides the most up-to-date information on ADLs. The disability distribution is thus estimated from Wave 2 of CHARLS, and the relevant questions in the CHARLS questionnaire can be found in Appendix 3. However, for the purpose of the analysis conducted in this research, the information gathered in CHARLS on social care services is inadequate. The relevant component of the

questionnaire should be answered by the person who is most familiar with social policies, but most respondents do not consider themselves to be familiar with these policies, and consequently, many leave this part blank. It was thus concluded that CHARLS does not provide sufficient information for estimating the care received distribution for the SIMCARE-CHINA model. The CLHLS contains the relevant needed for this research study. Future information concerning the CLHLS is discussed in the following paragraph.

The CLHLS randomly selected half the counties in 22 provinces of China, which are inhabited by around 85% of the country's total population. The baseline survey for the CLHLS was conducted in 1998, with follow-up surveys in 2000, 2002, 2005, 2008 and 2011. The surveys in 1998 and 2000 only interviewed persons aged 80+, while the 2002 wave of the survey expanded to cover individuals aged 60+, with a total sample size of 16,057 older people. All information in the CLHLS has been obtained through home face to face interviews. This survey contains information on the respondents' demographic information; life evaluation and personality; a mini mental state examination; lifestyle; difficulty with ADLs; difficulty with IADLs; as well as objective measures of health. It also provides appropriate information about LTC service utilisation for urban and rural residents. The relevant questions in the CLHLS questionnaire can be found in Appendix 4. However, despite including individuals aged 60 and over since 2002, individuals aged 85+ still account for the majority of the respondents. In the 2002, 2005, 2008 and 2011 waves of the survey, about 55% of the whole population in the survey was aged 85+. This is the main disadvantage of this data set. The most recent CLHLS study was conducted in 2011, so it is slightly out of date, which is the second disadvantage.

Nonetheless, the CLHLS data have been widely used and its reasonably good quality is widely recognised (Gu and Vlosky, 2008; Rong, Li and Qun, 2010; Zeng et al 2015). Four studies have also focused on projecting the future LTC needs of people in mainland China – Gu and Vlosky (2008), Rong, Li and Qun,

(2010), Huang and Wu (2012) and Zeng et al (2015) – all of whom used the CLHLS. This clearly shows that the CLHLS provides reliable and comprehensive information concerning the utilisation of LTC services by older people in China. Moreover, despite CLHLS being slightly out of date, it provides appropriate information about LTC service utilisation and difficulty with ADLs, and distinguishing between urban and rural residents, as well as socioeconomic and demographic characteristics, which have a significant influence on the LTC care requirements in late life. As a result, the CLHLS can be considered to be the most comprehensive source of data for estimating the care received distribution (i.e., the type-dependent allocation probability, where more details about this distribution can be found in Section 5.2.5).

CLHLS 2008 – 2011 waves (CLHLS 2008–2011) is the most recent data available, thus it is used to estimate the care received distribution. It contains 16, 563 older respondents aged 65+ in 2008. 6,501and 9, 982 individuals live in urban and rural China respectively. Based on the author's preliminary analysis, the age distributions by urban and rural China are as following: 1,199 (18.2%), 1,284 (19.5%) and 4,098 (62.3%) were aged 65–74,75–84, and 85+ respectively in urban China; in term of rural China, 1,706 (17.1%), 2,072 (20.8%) and 6,204 (62.2%) were aged 65–74,75–84, and 85+, therefore, the size of the samples for individuals in different age groups are sufficient to represent the individuals in different age groups. In the follow-up survey in 2011, 8,286 (50.0%) individuals survived and were re-interviewed, while 5,626 (34.0%) had died and a further 2,651 (16.0%) were lost to follow up.

In summary, although the CHARLS does not provide sufficient information for estimating the care received distribution for the SIMCARE-CHINA model, it provides the most up-to-date information on difficulty with ADLs. The disability distributions are thus estimated from the CHARLS. In addition, the care received distribution for different categories of LTC services for rural and urban China were estimated from the CLHLS based on reasonable assumptions (see Section 5.2.3 below).

5.2.3 The method

When a variable can only take two possible values, 1 or 0, that is, a binary variable, ‘1’ usually represents the event occurring and ‘0’ represents the event failing to occur. For example, the occurring event may be ‘with disability’ and the failure event may be ‘without disability’. The probability of an event occurring or failing to occur can be written as Pr (Y):

$$\mathrm{Y} = \begin{cases} 1 \text{ if event occurs} \\ 0 \text{ if event fails} \end{cases}$$

$$\Pr(\mathrm{Y} = 1) = \frac{1}{1 + e^{-z}}$$

$$\mathrm{z} = \beta_0 + \beta_1 \mathrm{x}_1 + \beta_2 \mathrm{x}_2 + \cdots + \beta_\mathrm{n} \mathrm{x}_{1*2*\ldots*\mathrm{n}}$$

Pr (Y= 0) = 1- Pr (Y=1)

Y is the dependent variable; it is a binary variable, either 1 or 0.

The $\mathrm{X_n}$ are the independent variables, including the interaction terms between these variables.

β_n, n ≥1, is the coefficient for the $\mathrm{x_n}$.

Logistic regression analysis is used to identify the parameters in Z, then the value of Z is substituted in the function that is used to estimate the probability of an event occurring or failing to occur. Some previous studies, such as Gu and

Vlosky (2008) and the PSSRU studies, including the original one – Wittenberg et al. (1998) – and the other versions, such as Wittenberg et al. (2008a), Wittenberg et al. (2008b) and Pickard (2015), have used logistic regression to estimate the probability of the event occurring or failing to occur, such as the probability of being disabled/healthy and the probability of receiving LTC care. The method is also used in this research to estimate the probability of being disabled/healthy for each group of people, that is, the 'disability distribution' for each group of people, and the probability of being assigned to different types of LTC services for each sub-group of people, that is, the 'care received distribution', however, if there is no logistic regression model to fit the data well, then cross-tabulation analysis is used. As mentioned in Section 5.2.2, Wave 2 of the CHARLS and the CLHLS (2008–2011) are used to estimate the 'disability distribution' and the 'care received distribution' for each sub-group respectively, using STATA.

The next section presents the results for the disability prevalence rate and for the type-dependent allocation probabilities.

5.2.4 The "disability" distribution

5.2.4.1 The variables for estimating "disability" distribution

The following four variables are used in the logistic regression model or cross-tab analysis to estimate the disability distribution:

- Disability status

Huang & Wu (2012) indicated that, in America, the LTC insurance industry defines individuals who have difficulty in at least three ADLs tasks as "with disability"; whereas, people who have one or two ADLs tasks are often defined

as “without disability”. This definition is widely used in pricing models to calculate LTC insurance premiums. This definition is used in this regression model to represent the disability status of people, i.e. people who have difficulty in at least three ADLs tasks are defined as “with disability”; whereas, people who have one or two ADLs tasks are defined as “without disability”.

- Age

Age is a crucial characteristic that is likely to influence disability status (Gu and Vlosky, 2008; Zhu and Jia, 2009; Huang and Wu, 2012). According to the conceptual SIMCARE-CHINA model (presented in Section 4.5.1), people are grouped into three age groups: 65-74, 75-84 and 85+. Therefore, this variable represents the age group of people, i.e. 65- 74 or 75-84 or 85+.

- Gender

Gender is another crucial characteristic that is associated with the disability status (Gu and Vlosky, 2008; Huang and Wu, 2012). This variable represents the gender of individuals, i.e. male or female.

- Residence

This variable represents individual’s residence distinguishing between urban and rural China.

As mentioned in 5.2.2, CHARLS contains information about people’s disability status, age, gender and residence, thus it is used to estimate the disability distribution. The corresponding variables in questions BA000_W2–3, BA002, BB002 and DB010–DB015 of the CHARLS provide information on people’s gender, year/month/day of birth, residence and ADLs, respectively, which are required in the SIMCARE-CHINA model; the corresponding questions are

shown in Appendix 3. More information about the corresponding variables and raw categories of these variables is presented in Table 5.1. The raw categories of variables of BA000_W2–3 (i.e. the variable of gender) and BB002 (i.e. the variable of residence) match the categories that are needed in the model; therefore, they remain the same, however, to avoid unwieldy categories and to make the raw categories that are used in these variables consistent with the categories in the model, the variables of BA002 (i.e. the variable of age) and DB010–DB015 (i.e. the variables of disability status) need to be recoded and regrouped to obtain the variables of age and disability. Regrouping the raw categories in these two variables is straightforward and can be achieved in STATA by recoding. The process is explained in the next two paragraphs.

To obtain the variable of age for individuals, a new variable, called ‘age’, is created using 2011 minus the year of birth in BA002. Each value in this variable represents an individual’s age. This model makes a projection of the future LTC needs of people who are aged 65 and over; therefore, it only needs individuals who are aged 65 and over. All the values that are below 65 in this variable are deleted. The values between 65 and 84 are then divided into 10-year age bands and are regrouped into two groups: aged 65–74 and aged 75–84 and these two categories are recoded as 1 and 2 respectively. The rest of the values combine to form the third age group: aged 85+ and this category is recoded as 3.

B010–DB015 in the CHARLS provide information on difficulty with ADLs, which is used to create the dependent variable ‘disability’. The CHARLS includes responses relating to difficulty with six ADLs in six separate questions. Each question focuses on one activity and the performances for each activity are divided into four categories: ‘no, I don’t have any difficulty’; ‘I have difficulty but can still do it’; ‘yes, I have difficulty and need help’ and ‘I cannot do it’. From a preliminary frequency analysis of the performance of each ADL variable in STATA, it can be found that there are only a few when comparing people who respond with ‘I have difficulty but can still do it’ and ‘yes, I have difficulty and need help’, therefore, for each individual ADL, these two categories are

combined and recoded as ‘need assistance partly’. The categories for people responding with ‘no, I don’t have any difficulty’ and ‘receives no assistance’ are kept the same. The new categories for each ADL task are recoded and scored as follows: ‘no, I don’t have any difficulty’ scores ‘0’; ‘need assistance partly’ scores ‘1’; ‘I cannot do it’ scores ‘2’. Next, a new variable, ‘disability’, which is the independent variable and is used to measure the overall ADLs, is created by adding the scores for each response of each individual ADL together. Given six activities, the scores of ‘disability’ can range from 0 to 12. It was determined that people who have difficulty in at least three ADL tasks are defined as ‘with disability’ in this model, and people who have difficulty in one or two ADLs tasks are defined as ‘without disability’. Correspondingly, scores from 0 to 5 are combined into one category of the new variable of ‘disability’ (D) – ‘without disability’ and this category is recoded as ‘0’; scores from 6 to 12 are combined as the other category of D – ‘with disability’ and it is recoded as ‘1’. The raw and recoded categories for the variables required by the SIMCARE-CHINA model, including age, gender, residence and disability status, are presented in Table 5.1.

Table 5.1 Raw and recoded categories for the variables of gender, age, residence and disability form CHARLS (2011-2013)

Variable	The corresponding variables in CHARLS	Categories in the questionnaire	Categories in the model after recoding
Gender	BA000_W2_3	1. Male 2. Female	1. Male 2. Female
Age	BA002	Year of birth	1. Aged 65–74 2. Aged 75–84 3. Aged 85+
Residence	BB002	1. Urban 2. Rural	1. Urban 2. Rural
Disability status	ADL DB010: Bathing DB011: Dressing DB012: Toilet DB013: Indoor transfer DB014: Continence DB015: Eating	There are four categories for each ADL task: 1. No, I don't have any difficulty; 2. I have difficulty but can still do it; 3. Yes, I have difficulty and need help; 4. I cannot do it.	0. Without disability 1. With disability

Source: author's own work based on the CHARLS (2011-2013)

5.2.4.2 The results of "disability" distribution

Within these re-coded variables, logistic regression or cross-tab analyses are applied to each individual data set for urban/rural China to estimate the probability of being disabled. The "disability" distributions for each group by ten-year age band and gender for rural and urban China are shown in Tables 5.2 and 5.3 respectively.

Table 5.2 Disability distributions for rural China (%)

Group of people	Disability status	
	Without	**with**
male, 65-74	98.52	1.48
male, 75-84	96.15	3.85
male, 85+	87.74	12.26
female,65-74	98.61	1.39
female, 75-84	96.38	3.62
female, 85+	88.40	11.60

Source: author's own analysis of CHARLS

Table 5.3 Disability distributions for urban China (%)

Group of people	Disability status	
	Without	**with**
male, 65-74	98.56	1.44
male, 75-84	94.49	5.51
male, 85+	84.79	15.21
female,65-74	98.41	1.59
female, 75-84	93.96	6.04
female, 85+	83.48	16.52

Source: author's own analysis of CHARLS

These two tables show that in both urban and rural China, the age-gender specific disability prevalence rate increases significantly with age for both genders. This is as expected, as age is a crucial factor that is likely to influence disability status (Zhu and Jia, 2009; Huang and Wu, 2012). Moreover, in urban China, this rate is slightly higher for females than males; whereas, in rural China, the reverse is the case. In addition, apart from males aged 65-74, the urban disability prevalence rate is higher than the rural rate, and this difference increases with age. This result is consistent with Gu and Vlosky's study in 2008 (Gu & Vlosky, 2008).

5.2.5 The “care received” distribution

5.2.5.1 The variables for estimating the “care received” distribution

The following variables are used to estimate the input data – “care received” distributions:

Care received: this variable is used as the dependent variable in the regression model. It represents the main type of care received.

Living arrangement: this variable is used to represent people’s living circumstance, i.e. whether they live at home, including with other household member(s), or live alone, or live in institutional care.

Disability status, age, gender and residence are the other four variables used in the regression model to estimate the care received distribution. The definition of these variables is the same as those used to estimate the disability status, which can be found in Section 5.2.4. However, the variable “disability status” is the independent variable for estimating the care received distribution, whereas it is the dependent variable for estimating the disability distribution.

Similar to the estimation of disability distribution, before using logistic regression to estimate the care received distribution, the related variables need to be obtained from the CLHLS. The corresponding variables of A1, A3, A4.3, A5.1, E6.1 and E1–E6 of the CLHLS provide information on people’s disability status, gender, age, residence, living arrangements (living at home/in institutional services), primary care providers or care receiving. The corresponding questions are shown in Appendix 5. Again, to avoid unwieldy categories and to

make the raw categories that are used in these variables consistent with the categories in the model, in addition to the raw categories of the variables of A1 (gender) and A4.3 (residence), the raw categories of A3 (current age), A5.1 (co-residence), E6.1 (care provider or care receiving) and E1–E6 (difficulty in completing ADLs) need to be recoded and/or regrouped. Regrouping the raw categories in the variables of A3, A5.1 and E6.1 is straightforward. It can be carried out by combining some raw categories and then renaming the new categories in STATA. The raw categories and recoded categories for A1, A3, A4.3, A5.1 and E6.1 are presented in Table 5.2.

E1–E6 in the CLHLS provide information on people's ADLs, which are used to measure their disability. The CLHLS includes responses relating to difficulty with six ADLs in six separate questions. Each question focuses on one activity and the performances for each activity are divided into three categories: 'receives no assistance', 'receives assistance partly' and 'receives assistance completely'. Similar to the regrouping and recoding of the variable of 'disability' in the CHARLS, 'receives no assistance', 'receives assistance partly' and 'receives assistance completely' are scored '0', '1' and '2', respectively; and a new variable, 'disability', which is used to measure the overall ADLs, is created by adding the scores for each individual ADL. Given six activities, the 'disability' response can obtain scores ranging from 0 to 12. In the same way, the definition of disability in the CHARLS, 'with disability' is defined as people who have at least three difficulties in ADLs. Correspondingly, the scores from 0 to 5 are combined and regrouped as one category of the variable of 'disability' as 'without disability'; the scores from 6 to 12 are combined and regrouped as the other category of the variable of 'disability' as 'with disability'. The raw and recoded categories are presented in Table 5.2.

Table 5.4 Raw and recoded categories for A1, A3, A4.3, A5.1 and E6.1from CLHLS (2008-2011)

Variable	**The corresponding variables in CLHLS**	**Categories in the questionnaire**	**Categories in the model after recoding**
Gender	A1 Sex	1. Male 2. Female	1. Male 2. Female
Age	A3 Current age	Each individual age is a category, ranging in age from 63 to 120	1. Aged 65–74 2. Aged 75–84 3. Aged 85+
Residence	A4.3 Residence	1. Urban 2. Rural	1. Urban 2. Rural
Living arrangement	A5.1 Co-residence	1. With household member(s) 2. Alone 3. In institutional care	0. Living at home (combining raw categories 1 and 2 and renaming) 1. Living in institutional setting services (renaming the third raw category)
The received care	E6.1 Who is the primary caregiver when you need assistance in each ADL task	-1. Not applicable 1. Spouse 2. Son 3. Daughter-in-law 4. Daughter 5. Son-in-law 6. Unmarried son and daughter 7. Grandchild(ren) 8. Relative(s) 9. Friends and neighbours 10. Social services 11. Housekeeper 12. Nobody	1. No need for care (raw category -1) 2. Informal care (combining raw category 1 and category 8) 3. Voluntary care (raw category 9) 4. Community-based care (raw category 10) 5. Private care (raw category 11) 6. Unmet need (raw category 12)
Disability status	E1: Bathing E2: Dressing E3: Toilet E4: Indoor transfer	There are three categories for each ADL task the response:	1. Without disability 2. With disability

	E5: Continence E6: Eating	1. Receiving no assistance 2. Receiving assistance partly 3. Receiving assistance completely	

Source: author's own work based on the CLHLS (2008-2011)

The care received distributions are the probabilities of receiving (or being assigned to) different states of care for people who have just entered the SIMCARE-CHINA model, including:

- Informal care;
- Institutional service;
- Private service;
- Voluntary service;
- Community- based service;
- Unmet care need;
- No care need; and
- Death.

The assignment process is for people who have just entered the model; therefore, at the assignment stage, the probability of being assigned to death is 0. In reality, some people require two or more categories of LTC support and service at the same time. To reduce the complexity, Assumption 3 (which is mentioned in Section 4.5.1) is also applied here:

Assumption 3: In this research only one type of LTC support and service is considered to be a person's main LTC support and service.

There is no variable in the CLHLS containing these seven categories, however, and after dividing the data sets into two parts based on the residence, to estimate the type-dependent allocation probability, a three-stage calculation is needed.

Stage one: The probability of living in an institutional service/living at home is estimated as follows:

According to 5.2.3, recoded variable in A5.1 of the CLHLS is the variable of co-residence (CR) can be written as

$$\mathrm{CR} = \begin{cases} 1 \text{ if assigning to an institutional service} \\ 0 \text{ if living at home} \end{cases}$$

Similar to the disability distribution, logistic regression analysis and cross-tab analysis which are carried by STATA are used to calculate the probability of being assigned to an institutional service/living at home.

Stage two: The probabilities of receiving each type of home-based LTC service are estimated as follows:

Variable E6.1 in the CLHLS is the variable of receiving different types of home-based services, including six categories (RH) can be written as

$$\mathrm{RH} = \begin{cases} 1 \text{ if assigning to one particular category of LTC} \\ 0 \text{ if assigning to other categories} \end{cases}$$

Logistic regression analysis and cross-tab analysis, which are carried by STATA, are then used to calculate the probability of being assigned to one particular category of home-based LTC service. These probabilities are conditional probabilities, however, and only apply for people who live at home, therefore, the probability of being assigned to one of the home-based LTC service is calculated as follows:

The probability of assignment to different categories of LTC services (which is from logistic regression or cross-tab analysis) × the probability of living at home (which is obtained from Stage One).

5.2.5.2 Values of the “care received” distributions

In the SIMCARE-CHINA model, people’s LTC pathway depends on their classification by age, gender, residence, and disability status. The values of the care received distribution for each sub-group of people by ten-year age bands and gender for rural and urban China are presented in Table 5.5 and Table 5.6 respectively

Table 5.5 The care received distribution for people in rural China (%)

Group of people	Types of services							
	Institutional service	No care need	Informal care	Community-based service	Private service	Voluntary service	Unmet need	Death
65-74, male, Without	0.23	98.48	1.07	0.11	0	0	0.11	0
65-74, male, With	0.29	0	87.25	12.46	0	0	0	0
75-84, male, Without	0.29	95.69	3.93	0	0.1	0	0	0
75-84, male, With	0.36	0	99.64	0	0	0	0	0
85+, male, Without	1.04	86.52	12.13	0.1	0	0	0.21	0
85+, male, With	1.3	0	96.12	0.52	2.06	0	0	0
65-74, female, Without	1.3	97.27	1.17	0	0	0	0.26	0
65-74, female, With	0.29	0	99.71	0	0	0	0	0
75-84, female, Without	0.29	95.46	3.64	0.11	0.3	0	0.2	0

75-84, female, With	0.36	0	99.64	0	0	0	0	0
85+, female, Without	1.06	76.59	21.6	0.2	0.09	0.06	0.41	0
85+, female, With	1.31	0	94.19	1.28	2.58	0.64	0	0

Source: author's own analysis of CLHLS

Table 5.6 The care received distribution for people in urban China (%)

Group of people	Types of services							
	Institutional service	No care need	Informal care	Community-based service	Private service	Voluntary service	Unmet need	Death
65-74, male, Without	0.69	97.67	1.64	0	0	0	0	0
65-74, male, With	0.95	0	99.05	0	0	0	0	0
75-84, male, Without	2.20	88.55	7.88	0.46	0.3	0	0.61	0
75-84, male, With	3.01	0	90.52	0	6.47	0	0	0
85+, male, Without	3.52	72.64	21.63	0.81	1.26	0.07	0.07	0
85+, male, With	4.80	0	76.01	5.9	13.29	0	0	0
65-74, female, Without	0.97	96.29	2.39	0.17	0	0	0.18	0
65-74, female, With	1.34	0	86.33	0	12.33	0	0	0

75-84, female, Without	3.69	91.05	4.78	0	0.32	0	0.16	0
75-84, female, With	4.19	0	70.59	0	25.22	0	0	0
85+, female, Without	4.89	64.54	25.84	1.38	2.85	0.18	0.31	0
85+, female, With	6.63	0	71.67	5.36	16.09	0.25	0	0

Source: author's own analysis of CLHLS

These two tables indicate that in both urban and rural China, the probability of not needing care for both genders without disability decreases with age. For institutional care, in rural and urban China, for both genders with the same disability status (apart from females without disability in rural China) the probability of receiving institutional care increases with age. In addition, apart from females aged 65-74 in rural China, individuals in the same region, age group and gender group with disability are more likely to receive institutional care. In terms of informal care, people in the same region, age and gender group with disability are more likely to receive informal care, but this probability decreases with age, whereas for people 'without disability', this probability increases with age. Furthermore, people who are 'with disability' are unlikely to have unmet need: most of them receive informal care. There are no particular trends for receiving other types of services.

5.3 The "disability next" distribution and the "care next" distribution

5.3.1 Introduction

Once individuals have entered the SIMCARE-CHINA model, they remain in the same care-receiving state for one year. At the end of each year, they may (or may not) be reassigned to a different care-receiving state. This reassignment is based on the "care next" distribution – the probability of transition between different care-receiving states. The "care next" distribution in this model is dependent on an individual's age, gender and disability status, and therefore, every year, the respondent's age and disability status needs to be updated before the reassignment process. Age in this model can be controlled and updated by Simul8 through visual logic (more details of VL are provided in Section 4.5.4). The disability status may change from year to year, and the yearly transition probabilities between disability states is called the "disability

next" distribution. This depends on age, gender and disability status before transition.

The data, the method for estimating the "disability next" distribution and the "care next" distribution are explained in Sections 5.3.2, 5.3.3 and 5.3.4, respectively. The data that is used to estimate these probabilities is first clarified in Section 5.3.2.

5.3.2 Data

The CLHLS (2008) is used to estimate the type-dependent allocation probability and the transition probabilities between different LTC services or requirements. It is followed up by the survey implemented in 2011, that is, CLHLS (2008–2011), which contains the most recent data, and it is used to estimate the type-dependent reallocation probability. More details of the CLHLS can be found in Section 5.2.2.

Wave 1 of the CHARLS, that is CHARLS (2011), is used to estimate the disability distributions, as well as the follow-up survey – Wave 2 – implemented in 2013. To estimate the transition probabilities between different disability statuses, Wave 2 needs to be merged with Wave 1 to check the transitions between different disability statuses for the same cohort of people, however, after merging Wave 2 with Wave 1 in STATA, the sample size for the variable 'disability' is too small to estimate the 'disability next distribution'. The CLHLS (2008–2011) is used to estimate the current disability distribution (disability now).

5.3.3 Method

The discrete time Markov model can be used to describe the behaviour of a stochastic process at discrete time intervals. Previous studies, such as Karlsson et al. (2006), Rong, Li and Qun (2010) and Huang and Wu (2012), have argued that the discrete time Markov model is an appropriate approach for describing the movements between different health statuses (such as very good, good, fair, bad and died) and disability statuses (such as healthy, moderately disabled, severely disabled, died) and the transitions between different health services/LTC services (such as informal care, nursing home and institutional service) and to estimate the probabilities of these transitions taking place. The reassignment process in the SIMCARE-CHINA model, that is, transitions for people transferring between care-receiving statuses until they die, and the process of movement between different disability statuses, can be described as discrete time Markov models (the model can be found in Section 3.1.3).

Similarly to the method which is used to estimate the disability distribution and care received distribution in 5.2.3, in order to estimate the disability now distribution and care received now distribution, the logistic regression analysis and cross-tab analysis are used to calculate the transitions probabilities $P_{i,j}$. In order to carry out the logistic regression analysis and cross-tab analysis, some new variables are created, which are used to indicate whether transitions between two different states occur or not. More details of these new variables are explained in Sections 5.3.4 and 5.3.5.

The next section presents the results for the yearly transition probabilities for the transitions between different disability statuses, the disability now distribution and for the transitions between different categories of care-receiving status until death, type-dependent reallocation probabilities.

5.3.4 The “disability next” distribution

5.3.4.1 The variables of estimating “distribution next” distribution

Besides the residence, age and gender variables (more detail about these two variables can be found in Section 5.2.4.1), a variable of ‘transition between two different disability states’ is also needed to estimate the input data – disability next distribution using regression or cross-tab analysis. This variable represents whether a person has the transition between two different disability states (without disability and with disability).

All the possible transitions can be described by the Markov model, which is presented in Figure 5.1.

Figure 5.1 All the possible transitions between the two disability statuses

Source: author’s own work

This Markov model has two states. Each state represents one disability status. The arrows in Figure 5.1 indicate the transitions allowed in the model. It can be seen that a person can transfer to any other disability status or stay in the initial disability status. The transition probabilities for these transitions are fed into the SIMCARE-CHINA model. They can be written as a 2 × 2 transition matrix $\widetilde{\mathrm{P}}$, and the sum of each raw category of the matrix is 1 or 100%.

$$\widetilde{\mathrm{P}} = \begin{pmatrix} P_{1,1} & P_{1,2} \\ P_{2,1} & P_{2,2} \end{pmatrix}$$

STATA is applied to CLHLS (2008–2011), to create this variable. With the same technique as that used to create the new variable ‘disability’ based on E1–E6 in the CLHLS (2008–2011), a new variable of ‘disability 2011’ is created to indicate an individual’s disability status in 2011. The a new variable, ‘transitions between different disability statuses’, is then created by STATA to indicate individual transitions between different disability statuses over three years. This new variable is recoded to 1 by STATA if a transition between two different disability statuses occurs, otherwise, it is recoded to 0. The variables of residence, age and gender are created in the way as when estimating the care received distribution, which can be found in the section 5.2.5.1.

5.3.4.2 The results of disability next distribution

Using age, gender and residence are used as independent variables, and the variable of transition between different disability statuses is used as a dependent variable, regression or cross-tab analysis is carried out to estimate the probability of transition between two different disability statuses.

The transition probabilities that are estimated directly by the model are probabilities of transition over three years, however, as the follow-up survey is carried out after three years. These three-year transition probabilities need to be

converted into yearly transition probabilities. Chhatwal, Jayasuriya and Elbasha (2014) provided the technique for converting the three-year transition probabilities into yearly transition probabilities, which is shown in the following:

$$\mathrm{P} = 1 - (1 - \widetilde{\mathrm{P}})^{\frac{1}{t}}$$

In this case t=3. The “disability next” distributions by ten-year age band and gender for rural and urban China are given in Table 5.7 and Table 5.8.

Table 5.7 Disability next distribution for people in rural China (%)

Group of people	**Initial state**	**State after one step movement**	
		1. Without disability	2.With disability
male, aged 65-74	1. Without disability	98.97	1.03
	2. With disability	3.84	96.16
male, aged 75- 84	1. Without disability	98.39	1.61
	2. With disability	3.40	96.60
male, aged 85+	1. Without disability	97.71	2.29
	2. With disability	3.76	96.24
female, aged 65-74	1. Without disability	98.83	1.17
	2. With disability	3.52	96.48
female, aged 75-84	1. Without disability	98.18	1.82
	2. With disability	3.02	96.98
female, aged 85+	1. Without disability	97.45	2.55
	2. With disability	3.42	96.58

Source: author’s own analysis of CLHLS

Table 5.8 Disability next distribution for people in urban China (%)

Group of people	Initial state	State after one step movement	
		1. Without disability	2. With disability
male, aged 65-74	1. Without disability	98.97	1.03
	2. With disability	3.71	96.29
male, aged 75-84	1. Without disability	98.23	1.77
	2. With disability	0.05	99.95
male, aged 85+	1. Without disability	97.40	2.60
	2. With disability	3.28	96.72
female, aged 65-74	1. Without disability	98.93	1.07
	2. With disability	3.66	96.34
female, aged 75-84	1. Without disability	98.16	1.84
	2. With disability	0.02	99.98
female, aged 85+	1. Without disability	97.32	2.68
	2. With disability	3.23	96.77

Source: author's own analysis of CLHLS

These two tables indicate that for both genders, in both rural and urban China, the probability of remaining 'without disability' after one year decreases with age, whereas the probability of deteriorating after one year, i.e. the probability of transition from 'without disability' to 'disability' increases with age. In both rural and urban China, for people in the same age group, the annual probability of recovering from 'with disability' for females is slightly lower than for males. Surprisingly, in both rural and urban settings and for both genders, people in the age group 75-84 have the lowest probability of recovery. In urban China in particular, the recovery rate in this age group is significantly lower than in the other two age groups. Moreover, the recovery rate for people aged 65-74 is higher than for people aged 85+ for both genders in this setting. The next section presents the results for the "care received next" distribution (i.e. type-dependent reallocation probabilities) for each sub-group.

5.3.5 The “care received next” distribution

5.3.5.1 The variables for estimating “care received next” distribution

In addition to age, gender, residence, living arrangement and the care received (see Section 5.2.5.1), the simulation model also needs a variable representing the annual transition probability between two different LTC-receiving states. This is called the “care received next” distribution and is estimated using regression and cross-tab analyses. This represents the annual probability of transition between two different LTC-receiving states. In the SIMCARE-CHINA model, there are seven categories of LTC-receiving states. The Markov model in this section is used to describe all possible transitions between these seven different states until death, i.e. all possible reassignments. A representation of the model is provided in Figure 5.2. The coloured arrows in Figure 5.2 indicate all the possible transitions allowed in the model. For each sub-group of people, these transition probabilities can be written as an 8×8 transition matrix, as presented in Table 5.9.

Figure 5.2 All the possible transitions in this Markov model

Source: author’s own work

Table 5.9 All the possible transition probabilities for this Markov model

Initial state	State after one step movement							
	1. Informal care	2. Institutional service	3. Private service	4. Voluntary service	5. Community-based service	6. Unmet care need	7. No care need	8. Death
1. Informal care	$P_{1,1}$	$P_{1,2}$	$P_{1,3}$	$P_{1,4}$	$P_{1,5}$	$P_{1,6}$	$P_{1,7}$	$P_{1,8}$
2. Institutional service	$P_{2,1}$	$P_{2,2}$	$P_{2,3}$	$P_{2,4}$	$P_{2,5}$	$P_{2,6}$	$P_{2,7}$	$P_{2,8}$
3. Private service	$P_{3,1}$	$P_{3,2}$	$P_{3,3}$	$P_{3,4}$	$P_{3,5}$	$P_{3,6}$	$P_{3,7}$	$P_{3,8}$
4. Voluntary service	$P_{4,1}$	$P_{4,2}$	$P_{4,3}$	$P_{4,4}$	$P_{4,5}$	$P_{4,6}$	$P_{4,7}$	$P_{4,8}$
5. Community-based service	$P_{5,1}$	$P_{5,2}$	$P_{5,3}$	$P_{5,4}$	$P_{5,5}$	$P_{5,6}$	$P_{5,7}$	$P_{5,8}$
6. Unmet care need	$P_{6,1}$	$P_{6,2}$	$P_{6,3}$	$P_{6,4}$	$P_{6,5}$	$P_{6,6}$	$P_{6,7}$	$P_{6,8}$
7. No care need	$P_{7,1}$	$P_{7,2}$	$P_{7,3}$	$P_{7,4}$	$P_{7,5}$	$P_{7,6}$	$P_{7,7}$	$P_{7,8}$
8. Death	$P_{8,1}$	$P_{8,2}$	$P_{8,3}$	$P_{8,4}$	$P_{8,5}$	$P_{8,6}$	$P_{8,7}$	$P_{8,8}$

The CLHLS (2008–2011) is used to estimate the transition probabilities between different care-receiving statuses, however, no variable in the CLHLS contains these eight categories; after dividing the data sets into two parts based on the residence, in order to create the new variable of transition between two LTC-receiving status and to estimate the care next distribution or the type-dependent reallocation probability, a four-stage calculation, which is carried out by STATA, is needed:

Stage one: To calculate the probability of death.

The variable ‘death’ (DE) in the CLHLS (2008–2011), which indicates whether a person who was alive in 2008 is still alive in 2011, is recoded as:

$$\mathrm{DE} = \begin{cases} 1 \text{ if died} \\ 0 \text{ if still alive} \end{cases}$$

In order to estimate Pr (DE), STATA carries out a logistic regression or cross-tab analysis to estimate the probability of death/survival for each sub-group during the three years. Age, gender and disability status are the main factors used to determine death in the SIMCARE-CHINA model, therefore, when carrying out logistic regression, age, gender and disability status are used as independent variables, and DE is used as the dependent variable.

Stage two: To calculate the probability of transitions between home and institutional service.

With the same technique as used for regrouping the variable of A5.1 in the CHLHS (2008), the variable A5.1 b in the CLHLS (2011) is regrouped to indicate where individuals live – at home or in an institutional service. Based on these two variables, a new variable of ‘transition between home and institutional

service' (THI) is then created by STATA. If transition between home and institutional services occurs, this variable is coded as 1, otherwise, it is coded as 0, This new variable can therefore be written as:

$$\mathrm{THI} = \begin{cases} 1 \text{ if transition between home and institutional services occurs} \\ 0 \text{ if no transition occurs} \end{cases}$$

STATA is used to carry out logistic regression or cross-tab analysis to estimate the probability of transitions occurring for each sub-group. Age, gender and disability status are used as independent variables and THI is used as dependent variable for logistic regression, however, the results, which are directly from logistic regression or cross-tab analysis, only apply for survivals, and therefore, probability of transitions between home and institutional service is calculated as:

The probability of living at home/institutional directly from logistic regression/cross-tab analysis × the probability of survival (which is obtained from Stage One).

Stage three: To calculate the transition probabilities of transitions between home-based LTC services.

With the same technique as used for the regrouping of the variable 'primary caregiver' in Section 5.2.5, the variable 'primary caregiver in 2011' is regrouped; and a new variable of 'transitions between different home-based care' (TH) is created by STATA. Similarly to estimating the transition probabilities of transitions between home and institutional service, if a transition between two different home-based LTC services occurs, this new variable is coded to 1, otherwise, it is coded to 0. Therefore, TH can be written as:

$$\mathrm{TH} = \begin{cases} 1 \text{ transition occurs} \\ 0 \text{ no transition occurs} \end{cases}$$

STATA is used to carry out logistic regression and cross-tab descriptive analysis to calculate these probabilities, however, these probabilities only apply to people who live at home. The probability of transitions between two home-based LTC services service is therefore calculated as:

The probability of transitions between home-based LTC services directly from logistic regression/cross-tab analysis × The probability of living at home (which is obtained from Stage Two).

Stage four: To convert three-year type-dependent reallocation probability into a one-year probability

The technique provided by Mu (2012), is not applicable to models with more than two states; therefore, before applying this technique to this model with eight states, the transition probabilities in this model are paired, and then this technique is applied to convert them into yearly transition probabilities; finally, these pair-wise matrixes are converted into one 8×8 matrix.

5.3.5.2 Value of the “care next” distribution

Table 5.10 and Table 5.11 give examples of the values of the “care next” distribution or type-dependent reallocation probabilities of people by ten-year age band, gender and disability status respectively. The full results are presented in Appendix 5.

Table 5.10 Care received next distribution for people in rural China (%)

Group of people by age, gender and disability status	**Initial state**	**State after one movement**							
		Institutional	No need	Informal	Community	Private	Voluntary	Unmet	death
75-84, female, without	Institutional	30.74	66.46	0.00	0.00	0.00	0.00	0.00	2.80
	No need	0.76	32.02	42.98	0.00	4.54	0.00	16.90	2.80
	Informal	0.29	95.89	1.02	0.00	0.00	0.00	0.00	2.80
	Community	0.16	97.04	0.00	0.00	0.00	0.00	0.00	2.80
	Private	0.16	0.00	0.00	0.00	0.00	0.00	97.04	2.80
	Voluntary	16.43	0.00	0.00	0.00	0.00	80.77	0.00	2.80
	Unmet	0.16	0.00	97.04	0.00	0.00	0.00	0.00	2.80
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Source: author's own analysis of CLHLS

Table 5.11 Care received next distribution for people in urban China (%)

Group of people by age, gender and disability status	**Initial state**	**State after one movement**							
		Institutional	No need	Informal	Community	Private	Voluntary	Unmet	death
75-84, male, without	Institutional	33.20	32.20	0.00	9.56	12.95	0.00	9.56	2.55
	No need	1.85	4.84	60.76	6.74	8.54	0.00	14.72	2.55
	Informal	1.06	71.02	2.38	0.00	7.97	0.00	15.02	2.55
	Community	0.52	96.93	0.00	0.00	0.00	0.00	0.00	2.55
	Private	1.01	0.00	94.25	0.00	2.19	0.00	0.00	2.55
	Voluntary	24.55	0.00	0.00	0.00	0.00	72.90	0.00	2.55
	Unmet	0.52	48.47	48.47	0.00	0.00	0.00	0.00	2.55
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Source: author's own analysis of CLHLS

Table 5.10 indicates that in rural China, females aged 75-84 without disability have zero probability of moving into community-based care in the following year. The main reason for this is that community-based care is underdeveloped. Moreover, if they are currently receiving institutional, informal or community-based care, it is most likely that next year, they will not need care. If they currently have unmet need, it is very likely that the following year, they will receive care from family members. However, if they are currently receiving private care they have a very high risk of having unmet need next year. Therefore, this group of people raises concern for the future. Policy-makers who are planning for future LTC services need to pay attention to them.

Table 5.11 indicates that in urban China, males aged 75-84 without disability and currently receiving informal or community-based care are very likely not to need care the following year. However, if they currently have unmet need, in one year's time they are equally likely either to receive care from family members, or not to need care. Furthermore, if they are receiving institutional or informal care or do not need care, the following year, they may have unmet need, but with low probability. Therefore, males who are aged 75-84 and without disability do not have a high risk of having unmet need in a year's time.

In addition, due to the lack of detailed data we were unable to estimate the probability of death from each care-receiving state. Therefore we have assumed that this depends only on region, age, gender and disability status.

5.4 Summary

This chapter explains the input data for the model, in terms of the data sources and the method of estimating them. The following table summarises this information.

Table 5.12 A summary of data source and the method of estimation of the input data for the SIMCARE – China model

Input data	Data source	Methods of estimation
The initial population	Projection data from the Population and Development Centre, Zhejiang University, China	Estimation based on assumptions
Their age distribution	Projection data from the Population and Development Centre, Zhejiang University, China	Estimation based on assumptions
The incident population	Projection data from the Population and Development Centre, Zhejiang University, China	Estimation based on assumptions
The disability distribution (i.e. probability of being disabled, or the disability prevalence rate)	The China Health and Retirement Longitudinal Study (CHARLS, 2011-2013	Logistic regression or crosstab analysis
The disability next distribution (i.e. transition probability of disability status)	The Chinese Longitudinal Healthy Longevity Survey (CLHLS, 2008-2011)	Logistic regression or crosstab analysis
The care received distribution (i.e. type-dependent allocation probability)	The Chinese Longitudinal Healthy Longevity Survey (CLHLS, 2008-2011)	Logistic regression or crosstab analysis
The care received next distribution (i.e. type-dependent reallocation probability or transition probability of received care)	The Chinese Longitudinal Healthy Longevity Survey (CLHLS, 2008-2011)	Logistic regression or crosstab analysis

Source: author's own work

The input data which is estimated based on the methods and data sources in Table 5.12 are fed into the model. The results of the model are discussed in Chapter 6.

Chapter 6: Results from the baseline scenario

The projections which are estimated based on the assumption presented in Table 6.1 (i.e. the baseline assumption), are the projections from the baseline scenario. This chapter discusses the results of experiments conducted with the baseline scenario to project the need for different categories of LTC support and services for older individuals in rural and urban China up to 2024. The types of support and services include informal, institutional, community-based, private and voluntary care. Similar percentages are shown for individuals who will not need any LTC and for those who will need LTC, but will not receive it, i.e. individuals with unmet care needs. There are two identical DES models, but with two different datasets for projecting the future LTC needs of individuals in rural and urban China. The results of these two models are discussed in sections 6.1 and 6.2, respectively, and they address research question 1 (see also section 1.4).

Table 6.1 Assumptions used in the model

Assumption number	Assumptions
1.	All models assume that new arrivals for the incident population (i.e. the number of people who reach their 65th birthday) arrive monthly
2.	The model assumes that individuals who have similar demographic characteristics, i.e. age, gender and disability status, are likely to have similar needs and utilisations in terms of LTC services
3.	This model assumes that all individuals can only have one care receipt status each time
4.	In each year, the numbers of arrivals for each month are assumed to be the same
5.	The disability prevalence rate and the transition probabilities of the disability status are assumed to be constant between 2015 and 2024
6.	The type-dependent allocation and the reallocation probabilities for each sub-group of people are assumed to be constant between 2015 and 2024

6.1 Projection of future LTC needs for rural China

6.1.1 Projection of people who will need care and who will not need care

Key finding: In rural China, the number (in absolute terms) and proportion of people who will not need care are expected to increase in the next ten years. However, although the number of people who will need care in absolute terms is expected to increase, the proportion of this group of people is expected to decrease.

Figures 6.1 and 6.2 present the number and proportion of older people who will need care and those who will not need of care in the next ten years in rural China. Figure 6.2 indicates that in the next ten years, the proportion of older people who will be in need care is expected to reduce by about 5%. However, although the share of older people in need of LTC support falls, the absolute number will continue to rise, which will be of particular interest to policy makers.

Figure 6.1 The number of older people in need of care and not in need of care from 2015 to 2024 in rural China (unit:10,000)

Source: model results

Figure 6.2 The percentage of older people in need of care and not in need of care from 2015 to 2024 in rural China

Source: model results

Moreover, as shown in Figure 6.2, there is a crossover between the older people who will be in need of care and those people who will not be in need care between 2016 and 2017.This fall in the percentage of people aged 65 and over in China in need of care from 2015-2017, and subsequent rise 2017-2019, in part reflects a change in the age composition of the older population – with more 'young' old as the larger birth cohorts born in 1952 – 1954 enter old age (as shown in Table 6.2. and Figure 6.3). The People's Republic of China was established in 1949, after three years of development, and people were exhilarated and optimistic about the future. As a result, the first baby boom (i.e. the 1950s baby boom) developed (Vaup & Zeng, 1991). However, in 1959, the Three Years of Great Chinese Famine began (Cai & Feng 2010) (more details can be found in Section 2.1). It reduced the number of new-born babies sharply, especially for rural areas. Thus, larger birth cohorts were born between 1952 to1958, especially, in the period of 1952 – 1954. The people who were born in the period of 1952 – 1954 will in turn be age 65 in 2017– 2019, which leads to more new arrivals in 2017 – 2019, and as a result, the proportion of people who will be in need care is expected to increase rapidly.

Table 6.2 The number of new-borns for each year from 1950 to 1959 for rural China (Unit: 10,000)

Year	No. of new-borns	Year of reaching to 65 if they survive to 65
1950	1,324	2015
1951	1,297	2016
1952	1,551	2017
1953	1,507	2018
1954	1,666	2019
1955	1,575	2020
1956	1,562	2021
1957	1,709	2022
1958	1,542	2023
1959	1,175	2024

Source: Population Development Centre, Zhejiang University

Figure 6.3 The number of people who reach to their 65th birthday, i.e. new arrivals from 2015 to 2024 in rural China (Unit: 10,000)

Source: author's work based on the Population Development Centre, Zhejiang University

In addition, the crossover between 2016 and 2017 may reflect that the projection results are highly sensitive to the numbers of new arrivals, which are presented in Figure 6.3.

Overall, there is a considerable increase in the average number of people who will be in need of care from 2017 onwards. Such projections are important for policy-makers, as they can help policy-makers in ensuring that appropriate resources are in place to provide sufficient services to meet the needs of future cohorts of older people. The policy implications of the baseline results will be discussed in Section 8.2.1. As the number of older people who will be in need of care increases, so will need for the different types of LTC services, that is family care, state care, privately funded care and voluntary care. The need for different types of LTC services in rural China is discussed in Section 6.1.2.

6.1.2 Projection of people requiring different LTC services

Key finding: In rural China, in absolute terms, the numbers of people who will require different types of care and who will have unmet needs are expected to increase. However, in percentage terms, the proportions of people who will require community-based, voluntary, private and institutional services are expected to increase, while those of people who will require informal care and who will have unmet needs are expected to decrease.

The full details of the population projections for the average number and percentages of people who will require different types of services by year from 2015 to 2024 in rural China are presented in Tables A6.6 to A6.10 in Appendix 6.

Figure 6.4 The average percentage of people who will require different LTC services from 2015 to 2024 in rural China

Source: model results

Figure 6.4 shows the central role of informal care among all types of care, although over the whole prediction period, the average percentage of persons requiring such care is expected to decrease by about 10%. Such a finding is a reminder of the key role of informal care provision in China and across other parts of the world (Wong & Leung, 2012; and Xu & Chow, 2012). These changes may reflect that, as a consequence of urbanisation, more and more young and middle-aged workers from rural areas have moved to urban areas in order to find employment, and they are less able to provide informal support (Song & Li, 2008; Palmore, Whittington & Kunkel, 2009; and Luo, 2012). At the same time, other types of LTC services, including institutional, private, community-based and voluntary services are still underdeveloped in rural China (Du & Yang, 2009; Wong & Leung, 2012; and Zhan, Luo & Chen, 2012). Finally, the figure above shows that the proportion of individuals who will require other types of services (e.g. institutional care) remains around or under 10% for the projection period, while that of people with unmet needs accounts for approximately one-quarter of the population.

The predictions show that the increase in the average percentage of people who will require institutional, community-based, private and voluntary care is not significant; however, the increases in the absolute average numbers can pose important policy challenges, especially in the case of institutional, community-based and private care. Indeed, as previous literature has indicated, such predictions emphasise the important role of the formal provision of care, which is provided either by the state or by the private sector, or a combination of the two (Xu & Chow, 2012). This is valuable information for policy-makers who are planning for future LTC services. The policy implications of these findings are discussed in section 8.2.1. The next section discusses the equivalent patterns of individuals who will or will not need care between 2015 and 2024 in urban China.

6.2 Projection of future LTC needs for urban China

6.2.1 Projection of people who will need care and who will not need care

Key finding: In urban China, although the number of people who will not need care in absolute terms is expected to increase, the proportion of this group of people is expected to decrease in the next ten years. However, the absolute number and the proportion of people who will need care are both expected to increase.

The full details of the projections of the average numbers and percentages of people who will not need care and who will need care for each year from 2015 to 2024 in urban China are shown in Tables A6.11 to 6.15 in Appendix 6.

Figure 6.5 The average number of people who will and who will not need care from 2015 to 2024 in urban China (unit:10,000)

Source: model results

Figure 6.6 The average percentage of people who will and who will not need care from 2015 to 2024 in urban China

Source: model results

Figure 6.5 and 6.6 show the average number and proportion of people who will and who will not need care in the next ten years in urban China. Figure 6.6

shows that the average percentages of people who will not/will need care fluctuate, but have a trend of generally decreasing/increasing from 2016 onwards. Such trend is as expected. It may reflect that life expectancy is becoming longer in urban China, but the numbers of years that men and women can expect to spend with a limiting illness of disability have been increasing alongside life expectancy (Vlachantoni et al, 2011; and Zhan, Luo & Chen, 2012). Therefore, the proportion of people who will need care is expected to increase. Again, similar to rural China, the considerable increase in the average percentage of people who will need care from 2016 onwards will also increase the need for the different types of LTC services, as older persons are the main users of such services. Building on these results, the projected requirements for different types of LTC services are discussed in section 6.2.2.

6.2.2 Projection of people with different LTC services

Key finding: In urban China, in the next ten years, the absolute numbers of people who will require different types of care and those of people with unmet needs are expected to increase. However, the proportions of people who will require community-based and private care are expected to increase, while the proportions of people who will require informal care, institutional services and voluntary services will remain steady and of those with unmet needs are expected to decrease.

The full details of the population projections for the average number and percentage of people who will require different types of services for each year from 2015 to 2024 in urban China are shown in Tables A6.16 to A6.20 in Appendix 6.

Figure 6.7 The average percentage of people who will require different types of care from 2015 to 2024 in urban China

Source: model results

Figure 6.7 illustrates that the average percentage of persons who will require informal care is expected to peak in 2015, and then it is expected to decrease for the rest of period (although the absolute number in this category is expected to increase). This may reflect that, over the next ten years, in urban China, family members are less likely to provide care for their older relatives due to the changing family structure (Wong & Leung, 2012; and Xu & Chow, 2012). The proportion of persons with unmet needs is expected to decrease, which may reflect that there is a shortage of LTC facilities now and for the near future (Xu & Chow, 2012; and Glass, Gao & Luo, 2013).

The patterns shown in Figure 6.7 need to be taken into account alongside the changes in the policy landscape of China in the area of LTC services. For example, the provision of community-based services has grown rapidly, particularly in urban areas (Wong & Leung, 2012; and Xu & Chow, 2012). In addition, according to Chinese tradition, elderly persons prefer to live at their homes or with their children; therefore, when home-based services, such as

private or community-based services are available, most elderly persons still prefer them over institutional services (Zhang, Liu & Bai, 2006; Wong & Leung, 2012; and Xu & Chow, 2012). As a result, in urban China, the proportion of people who will require private and community-based services is expected to increase. In terms of voluntary services, according to Zhang, Liu and Bia (2006) and Xu and Chow (2012), the central government has recently been promoting such services, and therefore, the proportion of people who will require voluntary services is expected to increase slowly over the next ten years. Finally, Zhan et al (2006) summarised the main reasons why the need for institutional services is low: the lack of affordable care institutions, family financial constraints, concerns over the quality of care provided by institutions, and finally, the family's guilt about placing their older relatives in an institution.

Overall, the predictions using the baseline model show that although the increase in the average percentage of people who will require institutional, community-based, private and voluntary care is not significant, any increases in the absolute average numbers can pose important policy challenges, especially in the case of institutional, community-based and private care. Similar to rural China, the role of the formal provision of care is projected to become more important in the near future (Xu & Chow, 2012).This is valuable information for policy-makers who are planning future LTC services, as appropriate resources can be allocated in order to meet the needs of older individuals. The policy implications of these findings are discussed in section 8.2.1.

6.3 Summary

Chapter 6 presents the projections of the population who will not be in need of care and of these persons who will be in need of care, in addition to the projections for different LTC needs under the baseline scenario for rural and urban areas in China. Overall, in rural and urban China, although the share of older people in need of LTC support falls, the absolute number will continue to

rise. In terms of people who require different types of care, although the proportion of people who require informal care is expected to decrease, however informal care remains the main type of care which is required by older people in both rural and urban China.

However, the projection results would be different if the input data and/or key assumptions for estimating the inputs of the model are changed. There are infinite possibilities for changing in the input data and/or key assumptions. A number of scenarios, including likely changes in the input data and/or the key assumptions, were carried out in order to show the impact of these changes. Chapter 7 will explore the impact.

Chapter 7: Results from the other scenarios

This chapter discusses the results of experiments conducted with another three scenarios projecting the need for different categories of LTC support and services for older individuals in rural and urban China up to 2024. Before showing the results, projection scenarios are introduced briefly first.

7.1 Projection scenarios

There are infinite possibilities for changes in the input and parameters used in the model. Three plausible scenarios have been selected in this research in order to show the impact which different scenarios can have on the results.

As discussed above in Section 4.5.2, many studies, such as Wittenberg et al. (1998), Pickard et al. (2007) and Zeng et al. (2015), have indicated that the disability prevalence rate is a key factor which influences the level of future LTC needs. The experiments in Scenario 2 are used to explore how the changes in the disability prevalence rate influence the future LTC needs. More information about the level of changes in the disability prevalence rate is explained in Section 7.2.1.

As discussed in Chapter 1, with adult children being less likely to be available to provide informal care to their older relatives in China, due to e.g. economic migration and changing economic roles of women, it is likely that an increasing number of older people will have to rely on formal LTC services, such as community-based services and institutional services. Consequently, in order to better plan LTC services for older people, policy-makers are very keen to know what the impact of a decrease in the provision of informal care has on future LTC need. Therefore, the experiments in scenario 3 are used to explore the

impact of a fall in the provision of adult child. More information of how the provision of informal care changes is discussed in Section 7.3.1.

Moreover, scenarios 2 and 3 explore the impact of an increase in the disability prevalence rate and a fall in provision of informal care on future LTC need respectively. However, LTC policy-makers are also keen to understand the joint impact of scenario 2 combined with scenario 3, i.e. an increase in the disability prevalence rate accompanied by a decrease in the provision of informal care, in order to examine the impact on future LTC need (i.e. scenario 4).

In addition, for the latter two scenarios, the consequences of two potential LTC policies, which are used to deal with the changes, are explored. These two potential LTC policies include the absence of any government intervention and the substitution of community-based care for (adult children) informal care. A summary of the projection scenarios is presented in Table 7.1.

Table 7.1 A summary of projection scenarios and the experiments

No. of the scenario	Scenario	The corresponding experiments in each scenario and what does each experiment explore	Each experiment explores
2	a. The disability prevalence rate is increased by 1% per year.	Experiment 1	How will future need for LTC change?
	b. The disability prevalence rate is increased by 2% per year.	Experiment 2	How will future need for LTC change?
3	a. Informal care provided by adult children decreases	Experiment 1	What is the impact of no government intervention on future LTC need?

	proportionally to the fall in the number of living children.	Experiment 2	What is the impact substitution of community-based care on influences future LTC need?
	b. Informal care provided by adult children decreases to zero.	Experiment 3	What is the impact of no government on future LTC need?
		Experiment 4	What is the substitution of community-based care on future LTC need?
4	a. The disability prevalence rate is increased by 1% per year + informal care provided by adult children decreases proportionally to the fall in the number of living children.	Experiment 1	What is the impact of no government intervention on future LTC need?
		Experiment 2	What is the impact of the substitution of community-based care on future LTC need?
	b. The disability prevalence rate is increased by 1% per year + informal care provided by adult children falls to zero.	Experiment 3	What is the impact of no government intervention on future LTC need?
		Experiment 4	What is the impact of the substitution of community-based care on future LTC need?
	c. The disability prevalence rate is increased by 2% per year + informal care provided by adult children decreases proportionally to the fall in the number of living children.	Experiment 5	What is the impact of no government intervention on future LTC need?
		Experiment 6	What is the impact of the substitution of community-based care on future LTC need?
	d. The disability prevalence rate is increased by 2% per year + informal care provided by adult children decreases to zero.	Experiment 7	What is the impact of no government intervention on future LTC need?
		Experiment 8	What is the impact of the substitution of community-based care on future LTC need?

Source: author's work

7.2 Scenario 2: Changes to the initial disability prevalence rate

7.2.1 Scenarios and experiments

Scenario 2: How will the probability of being disabled (i.e. the initial disability prevalence rate) influence future needs for LTC in terms of the numbers of people who will not need care, who will need care, who will require different categories of LTC and who will have unmet needs?

As mentioned in the section 7.1, many researches have indicated that the disability prevalence rate is a key factor which influences future LTC needs. However, changes in the disability prevalence rate or future trends of disability are unknown. Some studies, such as Gu and Zeng (2004) and Du and Wu (2006) have shown an increasing disability prevalence rate among older people, while Gu and Zeng (2006) estimated that the prevalence of ADL disability among older adults in China had been declining. They argued that disability is determined by the progression of chronic disease, medical improvements, and individual health practices, and that therefore the disability prevalence rate is declining. However, Huang (2006) argued that it is most likely that the age specific disability of the elderly remains unchanged across future years in China. Given such uncertainties and the unknown information, it is difficult for policy-makers to plan LTC services. Therefore, this research constructs a scenario which relates to disability to capture the possible LTC needs for the future.

The future trends and proportions of the changes in the disability rate were determined after the discussion with Profession Jiong, Hewen, and Dr Xiaoting Liu, they are the experts in research into LTC for older people in China. They work closed with the LTC policy makers. They indicated that if the provision of

care and other input are unchanged, the increased disability rate is more likely to raise the concern about how to meet the increased needs of LTC, than the reduced disability rate. Therefore, the policy makers are more interested in how increased disability rates – to increase the disability prevalence rate by 1% per year and by 2% per year, influence the future needs of LTC. Based on the discussion, the following two experiments in this scenario are carried out:

Experiment 1: to increase the disability prevalence rate by 1% per year, i.e. a 1% increase;

Experiment 2: to increase the disability prevalence rate by 2% per year, i.e. a 2% increase.

The results of projections for future LTC needs are used to answer Research Question 2a, which can be found in Section 1.4. The results for the projections are presented in tables of A7.1 to A7.16 in Appendix 7. The full details of what each table shows and the corresponding table number are presented in the following table**:**

Table 7.2 The results of the scenario 2

Number of the table	Rural or Urban China	The result in each table
A7.1	Rural	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the scenarios of a 1% and 2% increase
A7.9	Urban	
A7.2	Rural	The changes in the number of people who will/will not need care between the baseline, and the scenarios of a 1% and 2% for each year from 2015 to 2024
A7.10	Urban	
A7.3	Rural	The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the scenarios of a 1% and 2% increase
A7.11	Urban	
A7.4	Rural	The changes in the percentage of people who will/will not need care between the baseline and the scenarios of a 1% and 2% increase for each year from 2015 to 2024
A7.12	Urban	
A7.5	Rural	The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the scenarios of a 1% and 2% increase
A7.13	Urban	
A7.6	Rural	The changes in the percentage of people who will require different types of care between the baseline and the scenarios of a 1% and 2% increase for each year from 2015 to 2024
A7.14	Urban	
A7.7	Rural	The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the scenarios of a 1% and 2% increase
A7.15	Urban	
A7.8	Rural	The changes in the percentage of people who will require different types of care between the baseline and the scenarios of a 1% and 2% increase for each year from 2015 to 2024
A7.16	Urban	

The key findings from the results of Scenario 2 are discussed in Section 7.2.2.

7.2.2 Projection of future LTC needs for Scenario 2

7.2.2.1 Projection of people who will not need care and who will need care

Key finding: In the next ten years, in both rural and urban China, as the disability prevalence rates increase – from 0% (baseline) to 1%, and then to 2%, although the proportion of people who will need care will change only slightly, the absolute terms in this group of people will increase dramatically.

Figure 7.1 Population projection: average number of people who will need care in the baseline, 1% and 2% change in rural China (unit: 10,000)

Source: model results

Figure 7.2 Population projection: average number of people who will need care in the baseline, 1% and 2% change in urban China (unit: 10,000)

Source: model results

As shown in Figure 7.1 and Figure 7.2, in both rural and urban China, as the disability prevalence rates increase – from 0% (baseline) to 1%, and then to 2%, the absolute number of people who will need care will increase dramatically, which is as expected. Many studies have illustrated that dependence or disability, which is measured in terms of difficulties with ADLs and IADLs, is a crucial driver of the need for LTC (Pickard et al., 2007; Zeng et al., 2015). This result indicates that the number of people who will need care in absolute terms is sensitive to the prevalence rate.

Figure 7.3 The changes in the numbers of people who will/will not need care between the baseline, and the scenarios of a 1% and 2% increase for rural China (unit: 10, 000)

Source: model results

Figure 7.4 The changes in the numbers of people who will/will not need care between the baseline, and the scenarios of a 1%/2% increase for urban China (unit: 10, 000)

Source: model results

In both rural and urban China, the difference in the proportion of people who will/will not need care between a 2% and 0% increase will not be significantly different to the corresponding changes between a 1% and 0% increase, however, as shown in Figure 7.3 and 7.4, the differences in the absolute number of people who will/will not need care between a 2% and 0% increase will be much higher than the corresponding difference between a 1% and 0% increase, which indicates that the absolute number of people who will/will not need care is sensitive to the prevalence disability rate. Reducing the prevalent disability rate is therefore critical in order to decrease the number of people who need care. In order to project the number of people who will need care more precisely, disability prevalence rate is one of the key factors.

Furthermore, as shown in Figure 7.3 and 7.4, as time goes by, the difference in the absolute number of people who will need care between a 2% and 0% increase, and between a 1% and 0% increase, will expand from 2015 to 2022, and then the corresponding differences will shrink in 2024, especially in 2024, caused by the decrease in the number of new arrivals in 2024 for urban and rural China (the estimated number of new arrivals for rural and urban China from 2015 to 2024 can be found in the following table).

Table 7.3 The estimated number of new arrivals for rural and urban China from 2015 to 2024 (Unit: 10,000)

Year	No. of new arrival in urban China	No. of new arrival in rural China
2015	622	688
2016	623	680
2017	728	803
2018	744	769
2019	835	823
2020	845	800
2021	827	746
2022	902	797
2023	858	683
2024	682	487

Source: Population Development Centre, Zhejiang University

In both rural and urban China, any increase in the number of people who will need care will have an impact on the provision of LTC services: this group of people will create a critical challenge for policy-makers, as they are the main users of the LTC services. LTC policy-makers therefore need to implement sufficient LTC services to meet the increased need for LTC services. In order to achieve this, it is important for policy-makers to know how the need for each individual LTC service changes, as the disability prevalence rate increases by 1% or 2% per year for rural China, which is discussed in the next section.

7.2.2.2 Projection of people who will require different types of LTC services

Key finding: In the next ten years, an increased the disability prevalence rate:

- *will not influence the proportions of people who will require different types of services and the numbers (in absolute term) of people who will require institutional and voluntary services for both rural and urban China;*

- *will significantly increase the number of people who will require informal care and will dramatically reduce the number of people who will have unmet needs in both rural and urban China;*

- *will dramatically increase the number of people who will require community-based services in rural China; whereas in urban China, this number will not change significantly.*

There is little change in the number of people who require institutions in rural and urban China. This may reflect the fact that institutions in China prefer people who are without disability, and some institutions will even not allow people with disabilities to live in (Mu, 2012). In terms of voluntary care, as mentioned in Section 2.3, volunteers only provide services such as assistance with shopping, and accompanying services to hospital, but not help with the activities of daily living, such as dressing, eating and bathing (Fu and Xue, 2003), however, people who are disabled normally need assistance with daily living. Consequently, the increased disability prevalence rate will not significantly affect the number of people who require this type of service in either rural or urban China. In terms of private care, there is also little increase in this number in both rural and urban China. Financial constraints are the main reason (Gu and Vlosky, 2008).

Figure 7.5 The changes in the numbers of people who will require informal care, community-based care and who will have unmet need between the baseline and in a 1%/2% increase for rural China (unit: 10,000)

Source: model results

Figure 7.6 The changes in the numbers of people who will require informal care, community-based care and who will have unmet need between the baseline and in a 1%/2% increase for urban China (unit: 10, 000)

Source: model results

The changes in the number of people who will require informal care, community-based care, and who will have unmet needs for rural and urban China are shown in Figures 7.5 and 7.6. When the number of people who need care increases, as shown in Figure 7.5 and 7.6, in both rural and urban China, the number of people who require informal care increases. This may reflect the idea that, according to Chinese tradition, children are responsible for taking care of their elderly relatives when they need care (Sung, 1995; Wong & Leung, 2012). In rural China, the care burden will not only fall to individual families, but also to the community-based care providers. This may be because many young and middle-aged people in rural China migrate to urban areas to find employment (Song & Li, 2008; Du & Yang, 2009; Luo, 2012) and thus they live far away from their parents. When their older relatives need care, they may provide financial support rather than providing care for their parents (Lei, et al., 2011). As a result, when older people need care other than informal care, they will rely on the substitute – the community-based services – and thus the number of people who require community-based services will increase in rural China.

There is little change in the number of people who require institutions in rural and urban China. This may reflect the fact that institutions in China prefer people who are without disability, and some institutions will even not allow people with disabilities to live in (Mu, 2012). In terms of voluntary care, as mentioned in Section 2.3, volunteers only provide services such as assistance with shopping, and accompanying services to hospital, but not help with the activities of daily living, such as dressing, eating and bathing (Fu and Xue, 2003), however, people who are disabled normally need assistance with daily living. Consequently, the increased disability prevalence rate will not significantly affect the number of people who require this type of service in either rural or urban China. Moreover, there is also little increase in the number of people who require private care in both rural and urban China. Financial constraints are the main reason (Gu and Vlosky, 2008).

The results also indicate that the influence of the increased disability prevalence rates on the number of people in rural China who will require informal care and community-based care are more significant than the influence on the numbers of people who require other types of care; whereas in urban China, the impact of the increased disability prevalent rates on the number of people who require informal care is more significant. In both rural and urban China, as time goes by, the impact of increased disability prevalence rate on these numbers will become more significant.

A discussion of the policy implications of the changes in the disability prevalence rates on the numbers of people who will require different categories of LTC services can be found in Section 8.2.2. In Scenario 2, the provision of informal care is constant over the projection period, however, as mentioned in the previous chapter, family members are less able to provide informal care for their older relatives, and therefore it is important for policy-makers to know how the changes in the provision of informal care (the proportion of people who have a disability stays constant, while the proportion of people who have a disability increases) will influence future LTC needs, which will be discussed in Scenario 3 in the next section.

7.3 Scenario 3: Changes in the provision of informal care

7.3.1 Scenarios and experiments

Scenario 3: How will changes in the provision of informal care affect future needs for LTC, and what is the impact of potential LTC policies (no government intervention and the substitution of community-based care) on future needs for LTC?

As discussed in Chapter 1, family members, mainly the children, are the main carers of older people in China, however, as the traditional family structure has been changing and urbanisation has been taking place, family members, again especially the children, are less able to provide care: informal care will decrease in the future in China. It is thus likely that an increasing number of people in China will have to rely on LTC support provided by alternative sectors, such as community-based services, voluntary services, or private services, and other categories of LTC services. Consequently, it is important for policy-makers to understand how the decrease in the provision of informal care influences future LTC needs in terms of the numbers and proportions of people who will not need care and who will need care: for people who will need care, the numbers and proportions of people who will require different types of services and those who will have unmet needs, are discussed in this scenario.

As discussed in Section 1.3.2, informal care is mainly provided by children. As the number of children decreases, the provision of informal care will decrease. In this scenario, a realistic case – Case A – explores the consequences when the provision of informal care, which is provided by children, decreases proportionally to the decrease in the number of living children, on future LTC needs. In order to evaluate Case A, the decreasing numbers of living children of individuals who are aged 65 and over, by five-year age bands and by residence (rural/urban) for each single year from 2015 to 2024, are first calculated. These numbers are estimated from CHARLS (2011) and CLHLS (2008-2011) by STATA. The method for estimating these numbers is explained in Appendix 8, and these numbers are presented in Table A8.3 in Appendix 8. The amount of provision of informal care decreases proportionally to the decrease in the number of living children.

In Case A (scenario 3a in Table 7.1) – when informal care which is provided by children decreases proportionally to the decrease in the number of living children, without any policy-maker intervention, or if there has been a failure to provide sufficient alternative LTC services, older individuals will face the risk of

inadequate care for their care needs. It is important for policy-makers to know when the provision of the informal care which is provided by children will decrease, as well as the consequences if policy-makers do not implement any intervention, or how future LTC needs will change if policy-makers do nothing. Furthermore, instead of providing no government intervention, in order to satisfy the care needs of older individuals, policy-makers need to develop policies for the implementation of alternative LTC services. According MCA (2010), the overall direction of the development of LTC services is to expand community-based services; however, research in this area is very rare, and the consequences are unknown (Liu, 2009). As the provision of informal care decreases, the consequences of the substitution of community-based services for informal care on the need for other LTC services are also explored. In summary, in Case A, two experiments are carried out in order to explore:

Experiment 1: When the provision of informal care decreases proportionally to the decrease in the number of living children, how the future need for LTC will change, and the consequences for future LTC needs if there is no government intervention;

Experiment 2: When the provision of informal care decreases proportionally to the decrease in the number of living children, how the future need for LTC will change, and the consequences for future LTC needs if community-based care is substituted.

Many studies have indicated that the population of individuals who live without their children has been increasing. According to Wong and Leung (2012), around 50% of older people in cities live in ‘empty-nest families’, that is, they live without their children, and this increases to over 70% in large cities. In rural areas, the proportion of such families may reach 37%. The population of ‘empty-nest families’ will increase, and it is therefore important for policy-makers to know about and prepare for the worst case scenario – how the decrease to zero in the provision of informal care by children (i.e. when all living children are unable to provide care for their older relatives) will influence future LTC needs,

although this case is less likely to happen. This is discussed in the other case – Case B. CLHLS (2008-2011) provided the proportions of LTC which are provided by living children in rural and urban areas: 91.82% and 89.26%, respectively. In each year, the provision of informal care by age group is thus reduced by 91.82% for rural China and 89.26% for urban China, respectively. Similar to Case A, in Case B (scenario 3b in Table 7.1), when the provision of informal care which is provided by children decreases to none, it is important for policy-makers to know how future need for LTC will change, as well as the consequences if policy-makers do not implement any intervention, and the consequences of the substitution of community-based services for informal care on the need for other LTC services. In Case B, another two experiments will be carried out to explore:

Experiment 3: When the provision of informal care by children decreases to none, how the future need for LTC will change, and the consequences for future LTC needs if there is no government intervention;

Experiment 4: When the provision of informal care by children decreases to none, how the future need for LTC will change, and the consequences for future LTC needs if community-based care is substituted.

The results of these four experiments for Case A and Case B for rural China and urban China are used to address Research Question 2b, and they are presented in Tables A9A to A9 D in Appendix 9. The full details of what each table shows and the corresponding table number are presented in the following table:

Table 7.4 The results of Scenario 3

Number of the table	**Rural or Urban China**	**The result in each table**	
A9A.1	Rural	Case A	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2
A9C.1	Urban		
A9A.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A9C.2	Urban		
A9A.3	Rural		The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A9C.3	Urban		
A9A.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A9C.4	Urban		
A9A.5	Rural		The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A9C.5	Urban		
A9A.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A9C.6	Urban		
A9A.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A9C.7	Urban		
A9A.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments1 and 2for each year from 2015 to 2024
A9C.8	Urban		
A9B.1	Rural	Case B	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4
A9D.1	Urban		
A9B.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 3 and 4 for each year from 2015 to 2024
A9D.2	Urban		
A9B.3	Rural		The projections of the percentage of people

A9D.3	Urban		who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A9B.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 3 and 4 for each year from 2015 to 2024
A9D.4	Urban		
A9B.5	Rural		The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A9D.5	Urban		
A9B.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 3 and 4for each year from 2015 to 2024
A9D.6	Urban		
A9B.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A9D.7	Urban		
A9B.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 3 and 4 each year from 2015 to 2024
A9D.8	Urban		

The key findings from these results of the Scenario 3 are discussed in Section 7.3.2.

7.3.2 Projection of future LTC needs for Scenario 3

7.3.2.1 Projection of people who will not need care and who will need care

Key finding: In the next ten years,:

- *In case A, in rural China, the percentages and absolute number of people who will/will not need care will not change greatly; whereas in urban China, the number of people who need care is expected to increase significantly only after 2020.*

- *In case B, in both rural and urban China, the number of people who require care is expected to increase significantly, although the percentage of people who will/will not need care will change slightly.*

The projections of the numbers of people who will require different types of care and who will have unmet needs under Experiments 3 and 4 are explored in Section 7.3.2.2.

7.3.2.2 Projection of people who will require different types of LTC service

Case A: Informal care which is provided by children decreases proportionally to the decrease in the number of living children

Key findings in this case:

- *in rural China, in the next ten years, the proportions/absolute numbers of people who will require different types of LTC services and who will have unmet needs will change slightly in both Experiment 1 and 2: there is little difference in these numbers between without government intervention and the substitution of community-based care for informal care;*

- *in urban China, the proportions/absolute numbers of people who will require different types of LTC services and who will have unmet needs will change slightly in both Experiments 1 and 2 before 2020, however, the changes in the absolute numbers of people who require community-based care and who will with unmet needs after 2020 are much higher than the corresponding changes before 2020. The role of the substitution of community-based care therefore becomes important in order to decrease the number of people who will have unmet needs from 2020.*

In rural China, in Case A, in both Experiments 1 and 2, as the number of living children only decreases slightly, as can be seen in Table 8A.3 in Appendix 8, the provision of informal care is expected to decrease slightly. Consequently, the proportions and numbers of people who will require different types of LTC services and people who will have unmet needs will not change significantly in either Experiment 1 or 2. As a result, the influence of having no government intervention/the substitution of community-based services on the numbers of people who will require different types of LTC services will be small in the next ten years.

Figure 7.7 The changes of the numbers of people who will require different types of care between the experiment 1/2 and the baseline for urban China (unit: 10,000)

Source: model results

The one-child policy was stricter in urban China, and consequently, the numbers of living children of the cohort of parents who were affected by this policy has decreased quite significantly. In 2020, this cohort of parents will begin to reach 65. As a result, there is little change in the proportions and absolute numbers of people who require different types of care in both

Experiments 1 and 2 until 2020; from 2020, the provision of informal care will decrease significantly, and therefore the number of people who require informal care will significantly reduce in both Experiments 1 and 2, however, in Experiment 1, there is no government intervention, that is, there is no increase in the provision of community-based care, private, institutional or voluntary services. As a result, there is little difference in the numbers of people who will require these services and older people will face the risk of a lack of care, thus, as shown in Figure 7.7, the number of people who have unmet needs will increase. In experiment 2, where community-based services will be provided, the number of people who require them will increase, and so the number of people who have unmet needs will decrease. Section 8.2.2 discusses the policy implications of changes in the provision of informal care on the number of people who will require different categories of LTC services.

Case B: A decrease in informal care from children to none

Key finding: when there is a decrease in informal care from children to none, in the next ten years

- *In both rural and urban China, there is little change in the proportions of people who will require different types of services and who will have unmet needs, and the numbers (in absolute term) of people who will require institutional, private and voluntary services in Experiments 3 and 4;*

- *in both rural and urban China, substituting community-based care for informal care will have a remarkable impact on the number of people who require informal care, community-based care, and who will have unmet needs. It will more significantly reduce the number of people (in absolute terms) who require informal care in urban China.*

Figure 7.8 The changes in the numbers of people who will require informal care, community-based care and who will have unmet care between the experiment 3/4 and the baseline for rural China (unit: 10,000)

Source: model results

Figure 7.9 The changes in the numbers of people who will require informal care, community-based care and who will have unmet care between the experiment 3/4 and the baseline for urban China (unit: 10, 000)

Source: model results

Figure 7.8 and 7.9 show the trends of the changes in the number of people who will require informal care, community-based care and who will have unmet care between baseline, experiment 3 and 4. They indicate in Case B, in both rural and urban China, when all adult children are unable to provide informal care for their older relatives, the provision of informal care decreases significantly. As a result, as shown in Figure 7.8 and 7.9, the numbers of people who will require informal care in both Experiments 3 and 4 will decrease dramatically.

In addition, when provision of informal care decreases significantly, in Experiment 3 where there is no government intervention, people whose adult children are unable to provide care will face an insufficient LTC service. As shown in Figures 7.8 and 7.9, in both rural and urban China, the number of people with unmet needs will increase significantly. In Experiment 4, the government will provide more community-based services and the increased care needs of people whose adult children are unable provide care will require

community-based services. As a result, in both rural and urban China, the substitution of community-based services for informal care will significantly increase the number of people who will require community-based services and therefore the number of people with unmet needs will decrease. In urban China, the number of people who require informal care decreases more in Experiment 4 than 3, which indicates that people may prefer community-based care to informal care if community-based care is available.

Additional policy implications of changes in the provision of informal care for the numbers of people who will require different categories of LTC services can be found in Section 8.2.2. In Sections 7.1 and 7.2, the influences of the decreased provision of informal care and an increase in the prevalence disability rate on future LTC needs are discussed separately, however, an increase in the disability prevalence rate and a reduction in the provision of informal care may happen at the same time, which is discussed in Scenario 4 in Section 7.3 – when an increase in the disability prevalence rate is accompanied by a reduction in the provision of informal care, how the future need for LTC will change.

7.4 Scenario 4: Changes to the disability prevalence rate plus provision of informal care

7.4.1 Scenarios and experiments

Scenario 4: When an increase in the disability prevalence rate is accompanied by a reduction in the provision of informal care, how will future need for LTC change, and what is the impact of potential LTC policies on future need for LTC?

Scenario 2 and Scenario 3 explore how the future need for LTC will change, and the consequences of no government intervention and the substitution of community-based care on future LTC needs, when the disability prevalence rate increases and when the provision of informal care decreases respectively, however, Dr Xiaoting Liu, an expert in research into LTC for older people in China, suggests that the disability prevalence rate and the provision of informal care are likely to change simultaneously in future. It is thus important for policy-makers to know, when the disability prevalence rate and the provision of informal care change simultaneously, how future LTC needs will change and the impact of the potential LTC policies. According to Scenario 2 and Scenario 3, when the disability prevalence rate and the provision of informal care change simultaneously, there are four situations:

Case A (scenario 4a in Table 7.1): Increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children that is proportional to the decrease in the number of living children;

Case B (scenario 4b in Table 7.1): Increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children to none;

Case C (scenario 4c in Table 7.1): Increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children that is proportional to the decrease in the number of living children; and

Case D (scenario 4d in Table 7.1): Increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children to none.

In each case, in order to explore the consequences of two potential LTC policies – no government intervention and the substitution of community-based care for informal care – two experiments are carried out. In total, there are 8 (4×2) experiments, which are used to explore:

Experiment 1: When increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children that is proportional to the number of living children, how the future need for LTC will change, and the impact of no government intervention on future LTC needs;

Experiment 2: When increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children that is proportional to the decrease in the number of living children, how the future need for LTC will change, and the influence of the substitution of community-based care for informal care on future LTC needs;

Experiment 3: When increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children to none, how the future need for LTC will change, and the influence of no government intervention on future LTC needs;

Experiment 4: When increasing the disability prevalence rate by 1% per year is accompanied by a reduction in informal care provided by children to none, how the future need for LTC will change, and the influence of no government intervention on future LTC needs;

Experiment 5: When increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children that is proportional to the decrease in the number of living children, how the future need for LTC will change, and the influence of no government intervention on future LTC needs;

Experiment 6: When increasing the disability prevalence rate by 2% per year is accompanied by a decrease in informal care provided by children that is proportional to the decrease in the number of living children, how the future need for LTC will change, and the influence of a substitution of community-based care for informal care on future LTC needs;

Experiment 7: When increasing the disability prevalence rate by 2% per year is

accompanied by a reduction in informal care provided by children to none, how the future need for LTC will change, and the influence of no government intervention on future LTC needs;

Experiment 8: When increasing disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children to none, how the future need for LTC will change, and the influence of a substitution of community-based care for informal care on future LTC needs.

The results of these eight experiments, for both rural and urban China, are used to address Research Question 2c, and they are presented in Tables A10A to A10H in Appendix 10. The full details of what each table shows and the corresponding table number are presented in the following table:

Table 7.5 The results of Scenario 4

Number of the table	**Rural or Urban China**	**The result in each table**	
A10A.1	Rural	Case A	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2
A10E.1	Urban		
A10A.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A10E.2	Urban		
A10A.3	Rural		The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A10E.3	Urban		
A10A.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A10E.4	Urban		
A10A.5	Rural		The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A10E.5	Urban		

A10A.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024
A10E.6	Urban		
A10A.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 1 and 2
A10E.7	Urban		
A10A.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments1 and 2for each year from 2015 to 2024
A10E.8	Urban		
A10B.1	Rural	Case B	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4
A10F.1	Urban		
A10B.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 3 and 4 for each year from 2015 to 2024
A10F.2	Urban		
A10B.3	Rural		The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A10F.3	Urban		
A10B.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 3 and 4 for each year from 2015 to 2024
A10F.4	Urban		
A10B.5	Rural		The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A10F.5	Urban		
A10B.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 3 and 4for each year from 2015 to 2024
A10F.6	Urban		
A10B.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 3 and 4
A10F.7	Urban		
A10B.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 3 and 4 each year from 2015 to 2024
A10F.8	Urban		
A10B.1	Rural	Case C	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 5 and
A10G.1	Urban		

			6
A10B.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024
A10G.2	Urban		
A10B.3	Rural		The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 5 and 6
A10G.3	Urban		
A10B.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024
A10G.4	Urban		
A10B.5	Rural		The projections of the number of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 5 and 6
A10G.5	Urban		
A10B.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024
A10G.6	Urban		
A10B.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 5 and 6
A10G.7	Urban		
A10B.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024
A10G.8	Urban		
A10D.1	Rural	Case D	The projections of the number of people who will/will not need care for each year from 2015 to 2024 at the baseline, the experiments 7 and 8
A10H.1	Urban		
A10D.2	Rural		The changes in the number of people who will/will not need care between the baseline and the experiments 7 and 8 for each year from 2015 to 2024
A10H.2	Urban		
A10D.3	Rural		The projections of the percentage of people who will/will not need care for each year from 2015 to 2024 at the baseline, and the experiments 7 and 8
A10H.3	Urban		
A10D.4	Rural		The changes in the percentage of people who will/will not need care between the baseline and the experiments 7 and 8 for each year from 2015 to 2024
A10H.4	Urban		
A10D.5	Rural		The projections of the number of people who

A10H.5	Urban		will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 7 and 8
A10D.6	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 7 and 8 for each year from 2015 to 2024
A10H.6	Urban		
A10D.7	Rural		The projections of the percentage of people who will require different types of care for each year from 2015 to 2024 at the baseline, and the experiments 7 and 8
A10H.7	Urban		
A10D.8	Rural		The changes in the percentage of people who will require different types of care between the baseline and the experiments 7 and 8 each year from 2015 to 2024
A10H.8	Urban		

7.4.2 Projection of future LTC needs for Scenario 4

Only the results of Experiments 5 to 8 are discussed in this thesis, as the results of those experiments are more significant. The results of the projection of people who will need care/will not need care are discussed in Section 7.4.2.1. The numbers of people who will require different types of care are discussed in Section 7.4.4.2.

7.4.2.1 Projection of people who will not need care and who will need care

Key finding: in both rural and urban China：

- *in Case C, in the next ten years, in both Experiment 5 and 6, the proportions of people who will need care will not significantly change, but this number will increase significantly in absolute terms;*

- *in Case D, in both Experiments 7 and 8, the numbers of people (in absolute terms) who will need care will significantly increase in the next*

ten years, but the proportions of this group of people will not increase significantly until 2020;

Figure 7.10 Population projection: average number of people who will need care at the baseline, and in the experiments 5 and 6, in rural China (unit: 10,000)

Source: model results

Figure 7.11 Population projection: average number of people who will need care at the baseline, and in the experiments 5 and 6, in urban China (unit: 10,000)

Source: model results

Figure 7.12 Population projection: average number of people who will need care at the baseline, and in the experiments 7 and 8, in rural China (unit: 10,000)

Source: model results

Figure 7.13 Population projection: average number of people who will need care at the baseline, and in the experiments 7 and 8, in urban China (unit: 10,000)

Source: model results

In both Cases C and D, as the disability prevalence rate increases, the number of people who will have disability increases. Consequently, as shown in Figures 7.10 to 7.13, in both rural and urban China, the number of people who will need

care will increase significantly. The number of people who require different categories of LTC services and the influence of without government intervention /substitution of community-based services on these numbers for cases C and D are discussed in Section 7.4.2.2.

7.4.2.2 Projection of people who will require different types of LTC services

Case C: Increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children that is proportional to the decrease in the number of living children.

Key finding: In the next ten years, in Case C,

- *the proportions of people who will require different types of LTC services will not change significantly in either rural or urban China in both Experiments 5 and 6;*
- *in comparison to no government intervention, the substitution of community-based care will: produce a greater increase in the absolute number of people who will require community-based care, and decrease the absolute number of people who will have unmet needs, in both urban and rural China;*
- *these results indicate that the role of the substitution of community-based services in Case C, in both rural and urban China, will be critical in order to reduce the number of people who will have unmet needs.*

Figure 7.14 The changes in the number of people who will require informal care, community-based care and who will have unmet care need between the experiments 5/6 and the baseline in rural China (Unit: 10,000)

Source: model results

Figure 7.15 The changes in the number of people who will require informal care, community-based care and who will have unmet care need between the experiment 5/6 and the baseline in urban China (Unit: 10, 000)

Source: model results

In Case C, in Experiment 5, when older people need care in rural China, the care burden will fall to the individual families and community-based care providers (the results for Scenario 2 give more details), and thus as shown in Figure 7.14, the numbers of people who require informal care and community-based care will increase significantly. In urban China, individual families will still be the main care providers. As shown in Figure 7.15, the number of people who require informal care will therefore increase.

Due to a reduction in the provision of informal care and no other care being provided in Experiment 5, older people will face the risk of a lack of care, and thus the number of people who have unmet care will increase in both rural and urban China. In Experiment 6, more community-based services are provided. Consequently, as shown in Figures 7.14 and 7.15, in rural and urban China, older people whose living children will unable to provide informal care will require community-based services, and thus the number of people who require them will increase, and therefore, the number of people with unmet needs will reduce.

The policy implications of the changes in the disability prevalence rate plus the provision of informal care for the numbers of people, who will require different categories of LTC services, can be found in Section 8.2.2.

Case D: Increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children to none.

Key finding: In the next ten years, in this case:

- *in both rural and urban China, without government intervention and the substitution of community-based care will decrease the proportion and absolute number of people who require informal care, but there is little*

difference in the proportion and absolute number of this group of people between the two potential policies;

- *in both urban and rural China, in comparison with without government intervention, the substitution of community-based care will significantly increase the proportion and number of people who require community-based care, and reduce the proportion and number of people who have unmet needs; therefore the role of the substitution of community-based services for informal services will become critical in reducing the number of people who will have unmet needs in both rural and urban China.*

Figure 7.16 The changes in the number of people who will require informal care, community-based care and who will have unmet care need between the experiments 7/8 and the baseline in rural China

(Unit: 10,000)

Source: model results

Figure 7.17 The changes in the percentage of people who require different types of care between the experiments 7/8 and the baseline for rural China

Source: model results

Figure 7.18 The changes in the number of people who will require informal care, community-based care and who will have unmet care need between the experiments 7/8 and the baseline in urban China (Unit: 10, 000)

Source: model results

Figure 7.19 The changes in the percentage of people who require different types of care between the experiments 7/8 and the baseline for urban China

Source: model results

In Case D, when the disability prevalence rate increases by 2% per year, the number of people who will require informal care is expected to increase significantly, however, simultaneously, the provision of informal care by children decreases to none. As a result, as shown in Figures 7.16 and 7.18, in both Experiments 7 and 8, the percentage and absolute number of people who will require informal care is expected to decrease significantly for both rural and urban China. The corresponding changes in this number in percentage terms for rural and urban China are presented in Figures 7.17 and 7.19.

In Experiment 7, due to a lack of LTC services caused by the decreased provision of informal services, and no additional LTC services being provided, in both rural and urban China, the proportion and absolute number of people who have unmet needs will increase dramatically, whereas in Experiment 8, in order to mitigate the dramatic decrease in the provision of informal care, the government will provide a large number of community-based services. As a result, in both rural and urban China, the proportion and absolute number of people who will require community-based care will increase significantly, the number of people who with unmet needs will reduce dramatically. The changes

in these numbers in absolute and proportional terms can be found in Figures 7.16 and 7.17 for rural China, and in Figures 7.18 and 7.19 for urban China.

Due to the significant increase in the number of people who need care, the absolute numbers of people who require institutional care, private care and voluntary in rural China, and the absolute number of people who require private care in urban China will undergo a significant change, especially in 2022, 2023 and 2024.

The policy implications of changes in the disability prevalence rate plus the provision of informal care for the numbers of people who will require different categories of LTC services can be found in Section 8.2.

7.5 Summary of the results

This chapter presents and discusses the results from the other three scenarios. In summary, in scenario 2, in the next ten years, in both rural and urban China, the higher disability prevalence rate is likely to lead to more people (in absolute terms) requiring LTC. The full details of the number of people who will be in need of care under baseline, experiment 1 (i.e. E1: a 1% increase per year) and 2 (E2: a 2% increase per year), and the influence of E1 and E2 on the number of people who will need care, in terms of the changes in this number under E1and E2, are presented in Appendix 11. Table 7.6 gives an example of these results. It indicates that in 2019, an extra 520,000 and 1,080,000 people are expected to be in need of care when the disability prevalence rate increases 1% per year and 2% per year respectively in rural China; whereas, in urban China, when there is a 1% increase and a 2% increase in the disability prevalence rate, an extra 700,000 and 1,360,000 people are expected to be in need of care.

Table 7.6 The number of people who will need care under the baseline, a 1% increase (E1) and a 2% increase (E2) and the respective changes from the baseline

Year	Region	Experiment	No. of people who will need care (in 10,000)	Change from baseline
2019	Rural China	Baseline	4,760	*
		E1	4,812	+52
		E2	4,868	+108
	Urban China	Baseline	5,873	*
		E1	5,943	+70
		E2	6,009	+136

Source: model results

Among people who need care, in both rural and urban China, the increase in the disability prevalence significantly increases the number of people who will require informal care, whereas the number of people who will have unmet care need is expected to reduce. In terms of individuals who will require community-based care, the size of this group of people is expected to increase in rural China, whereas in urban China, this number is not expected to change significantly. The full details of the changes in these numbers are presented in Appendix 11. Table 7.7 gives an example of these changes. It shows that if the disability prevalence rate increases 1% per year, by 2021 in rural China, more than 520,000 and 310,000 people are expected to require informal care, and community-based care, but the number of people who will have unmet need is expected to reduce by 190,000. In urban China, an extra 1,100,000 people are expected to require informal care. The number of people who will require community-based care and who will have unmet need care are expected to reduce by 40,000 and 360,000. If the disability prevalence rate increases by 2% per year, by 2021 in rural China, the number of people who will require informal care are expected to increase by 980,000 and 510,000, whereas the number of people who will have unmet need is expected to reduce by 230,000. In urban China, an additional 2,180,000 people are expected to require informal care, and it is expected that 10 thousand people will require community-based care

and that there would be a fall of 440,000 people who would have unmet care need.

These results may reflect that in both rural and urban China, older people will still rely on their family members when they need care in the next ten years (Wong & Leung, 2012). In rural China, as more young and middle-aged people migrate to urban China, their older relatives will also seek alternative support particularly community-based care (Luo, 2012). As disability prevalence rate increase over the next ten year, policy makers need to discuss the provision and funding of alternative forms of support for older people, particularly community based care in rural China. Families are likely, however, to remain the primary source of care. Therefore policy makers also need recognise and to put in place support services to support families who are caring so as to make familial care more sustainable.

Table 7.7 The number of people who will require informal care, community-based care and who will have unmet need under a 1% increase (E1) and a 2% increase (E2), and the respective changes from the baseline (unit: 10,000)

Year	Region	Experiment	No. of people who require informal care	Change from baseline	No. of people who require community-based care	Change from baseline	No. of people who will have unmet care need	Change from baseline
2019	Rural China	Baseline	2,350	*	495	*	1,181	*
		E1	2,402	+52	526	+31	1,162	-19
		E2	2,448	+98	546	+51	1,158	-23
	Urban China	Baseline	2,657	*	871	*	1,348	*
		E1	2,767	+110	867	-4	1,312	-36
		E2	2,876	+218	870	-1	1,304	-44

Source: model results

In scenario 3, where the provision of informal care provided by children decreases proportionally to the fall in the number of living children (3a in Table 7.1), in rural China, the percentage and absolute number of people who will or will not need care will not change greatly, and the number of people who require different type of care is not expected to change significantly. As a result, it will be less important to ensure that community-based care is provided as a substitute for family care. However, in urban China, by 2020, the numbers of adult living children amongst the cohort of older people who were most affected by the one-child policy will have decreased quite significantly. This has implications for the provision of informal care by adult children, reducing the availability of such care. As a result, in scenario 3a, the number of older people who will have unmet care need is expect to increase. In order to meet this unmet need, given that family care is not an option, the government will need to provide more community-based care.

Under the scenario where no informal care is provided by children (3b in Table 7.1), in both rural and urban China, the number of people who will need care is expected to change greatly. In the absence of an expansion of community-based services provided by government, unmet need will rise. Thus the provision of community-based care will be very important in scenario 3b.The number of people who will require informal (family) care, community-based care and who will have unmet need under the baseline scenario, when there is no government intervention to substitute for community-based care, and how these two policies influence these numbers are presented in Appendix11. Table 7.8 gives an example of how these two potential policies influence these three numbers.

Table 7.8 The number of people who will require informal care, community-based care and who will have unmet need in the baseline, E3 and E4, and how these numbers change when no informal care is provided by children (unit: 10,000)

Year	Region	Experiment	No. of people who require informal care	Change from baseline	No. of people who require community-based care	Change from baseline	No. of people who will have unmet need	Change from baseline
2023	Rural China	Baseline	2,636	*	483	*	1,360	*
		E3	2,614	-22	470	-14	1,444	+84
		E4	2,610	-26	531	+48	1,375	-15
	Urban China	Baseline	2,651	*	1,149	*	1,256	*
		E3	2,596	-55	1,142	-7	1,360	+104
		E4	2,552	-99	1,293	+144	1,246	-11

Source: model results

In scenario 4, as the disability prevalence rate is a key factor which influences future LTC need (Zeng et al., 2015), in both scenarios 4a to 4d (see Table 7.1) the number of people who require care will increase significantly in absolute terms in both urban and rural China. In addition, in scenarios 4c and 4d, the disability prevalence rate is higher than in scenarios 4a and 4b, and as a result the increase in the number of people who need care under these two scenarios will be even higher than the corresponding increase in 4a and 4b.

In addition, in both rural and urban China, in both scenarios 4c and 4d, the number of people who require care is expected to increase, whereas the provision of informal family based care is expected to reduce. Only if government substitutes the community-based care for informal care, will the number of people who require informal care and who will have unmet need be expected to reduce significantly. The number of people who will require informal care, community-based care and who will have unmet care need without government intervention (i.e.in experiment 7) and substituting community-based care (i.e. in experiment 8), and the influence of experiment 7 and 8 on those numbers are presented in Appendix 11. An example of these results are presented in Table 7.9.

These results again indicate that in order to meet the increased LTC need in scenario 4c and 4d, it is important for policy–makers to provide community-based services, especially when an increase in the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children to none (i.e. scenario 4d in Table 7.1).

Table 7.9 The number of people who will require informal care, community-based care and who will have unmet need in the baseline, E7 and E8, and how these numbers change when the disability prevalence rate increases by 2% per year and no informal care is provided by children (unit: 10,000)

Year	Region	Experiment	No. of people who require informal care	Change from baseline	No. of people who require community-based care	Change from baseline	No. of people who will have unmet need	Change from baseline
2022	Rural China	Baseline	2,485	*	472	*	1,256	*
		E7	2,385	-99	488	+16	1,676	+420
		E8	2,353	-132	820	+347	1,221	-35
	Urban China	Baseline	2,692	*	977	*	1,339	*
		E7	2,569	-123	960	-17	1,840	+502
		E8	2,540	-152	1,535	+559	1,288	-50

Source: model result

Chapter 8: Discussion, conclusions and future work

This chapter provides a summary of the main points from the previous seven chapters. It is structured as follows: Section 8.1 revisits the aim of the research, Section 8.2 discusses the key findings in relation to the three research questions, and the limitations and possibilities for future work, and the contributions of this research, are addressed in Sections 8.3 and 8.4.

8.1 Aim of the research

The overall aim of this research is to apply Operational Research modelling to estimate future needs for LTC for people in urban and rural areas of China. More explicitly, the aim of this research is to address the following research questions:

1. What are the future LTC needs for older people in China, for the next ten years from 2015 to 2024? More specifically:

    a) What is the number and proportion of older people aged 65 and over in China who will not need LTC, and what are the equivalent numbers/ proportions of those who will need LTC?

    b) What is the number and proportion of older people who will need care, who will require different types of LTC services (including informal care, institutional services, community-based service, private service and voluntary service) (these terms are explained in Chapter 2), and what is the number and proportion who will not receive any care from any source from 2015 to 2024?

2. How will the following changes influence the needs of older people in

China?

a) changes in disability prevalence rates;

b) the reduction in informal services provided by living children;

c) the change in the disability prevalence rates that are accompanied by a reduction in the informal care provided by living children.

3. How could an Operational Research (OR) modelling approach to the LTC system in China benefit policy-makers in planning LTC services?

8.2 Key findings and policy implications

This section is used to discuss the policy implications which are based on the key findings from the baseline scenario and the other three scenarios. The key findings of the baseline scenario and Scenarios 2, 3 and 4 are used to address the research questions 1, 2a, 2b, and 2c, respectively. The third question is addressed through a discussion of the implications for policy-makers. This section discusses the key findings and their policy implications.

8.2.1 Policy implications of projection from the baseline scenario

This section is used to answer Research Question 1. The key findings of the projections of future LTC needs for rural China and urban China can be found in Chapter 6.

As discussed in Sections 6.1.1 and 6.1.2, in rural and urban China, the absolute

number of people who will need care will continue to rise. In order to meet growing care needs of the ageing population, on the one hand, an increasing number of adult children will need to provide care. So relevant policies and planning aimed at encouraging people to look after their older relatives are needed. Policy-makers could encourage employers to provide flexible working hours for full-time employees to support them to provide care to their older relatives. On the other hand, the model predicted that if policy-makers provide sufficient formal services as projected in Chapter 6, then the need for informal care would be expected to fall over the next ten years and the proportion of people with unmet needs is expected to decrease in both rural and urban China. Policy-makers therefore also need to provide more formal services to meet the increased need, however, the results in Chapter 6 also indicate that not every type of formal LTC service needs to increase. In order to effectively use limited financial resources, policy-makers need to develop formal services based on older people's needs for different types of LTC services. The results in Chapter 6 show that, as part of such formal services, the proportion of people who will require private services, in both urban and rural China, is expected to increase significantly. In order to meet the increased requirement for private services, policy-makers could provide financial support, such as cash subsidies or allowances to older people or their families to allow them to employ private carers. Policy-makers also need to develop or help private businesses to develop exchange service centres/organisations, such as agencies that can help individual families to hire private carers. In rural China, in addition to private services, the proportion of people who will require institutional services is expected to increase more rapidly than that of people requiring other formal services.

In this context, policy-makers need to develop more institutional services to meet the increased needs of the older population. In contrast, in urban China, the proportion of people who will require community-based services is expected to increase rapidly; therefore, more resources could be dedicated to these services. Voluntary services are expected to increase slightly in both rural and urban China, as this is a new type of service operating in China. Policy makers

could carry out the pilot project in some cities, such as to encourage healthy and active young older people/retirees and/or students to join in volunteers to provide care. At the meanwhile, more research is needed to evaluate such services.

8.2.2 Policy implication of projection from Scenario 2

The second scenario explores the impact of a change in the disability prevalence rate on future LTC needs. Research Question 2 (a) is addressed by this scenario. The projection results are presented in Chapter 7. As in previous studies, such as Wittenberg et al. (1998) and Zeng et al. (2015), the projection results in Chapter 7 indicate that the disability prevalence rate is a main driver of future need for LTC: as the disability prevalence rate increases, the number of people who need care increases dramatically. In rural China, the increased disability prevalence rate is expected to increase the number of people who will require informal care, private care (in 2023 and 2024) and community-based services in next ten years; whereas in urban China, an increased prevalence rate is expected to increase the numbers of people who will require informal care and private services. Consequently, relevant policies and planning should be implemented to respond to the large and rapid increase in the need for these types of services in rural and urban China, respectively. For example, in order to meet growing informal care needs of the ageing population, an increasing number of adult children will need to provide care. Policy-makers could encourage employers to provide flexible working hours for full-time employees to support them to provide care to their older relatives.

If the increase of the disability prevalence rate is stopped or it keeps constant in the next ten years, or it increases as a lower rate, for example, 1% per year rather than 2% per year, then the number of people who will need care is not expected to increase rapidly. On the one hand, policy-makers or local governments should offer or provide courses to teach older people or their

family members about healthy and active ageing. On the other hand, policy-makers could also invest in the research addressing diseases related to the ageing population, such as dementia and/or chronic diseases.

As disability prevalence is a main driver of the need for future LTC services, less uncertainty about the disability prevalence rate would reduce uncertainty about future LTC needs. In order to facilitate policy-makers in planning for future LTC services, information on future trends of the disability prevalence rate is valuable. In order to obtain this valuable information, high quality longitudinal data are required. Advanced methods for estimating the future trends of disability prevalence rates are required.

The policy implications above are based on the constant allocation of the probabilities of different types of services or the constant provision of different categories of LTC services. The consequences of a reduction in the provision of informal care on future LTC needs are explored in Scenario 3.

8.2.3 Policy implication of projection from Scenario 3

The third scenario explores how a reduction in the provision of informal care will affect future LTC needs. More specifically, when the informal care provided by children is reduced proportionally to the decrease in the number of living children per year, and when the informal care provided by children is reduced to none, how will future LTC needs change? The performance of potential LTC policies, including without government intervention and the substitution of community-based care for informal care, are also investigated. The results from this scenario address Research Question 2 (b), and the results of the projections are presented in Section 7.2.

If informal care provided by children is decreased proportionally to the decrease

in the number of living children, for rural China, in the next ten years, this is not expected to significantly influence the number of people who will and will not need care, or the future needs for LTC services. As a result, the influence on these numbers of no government intervention/substitution of community-based services for informal services is small, however, after 2024, its consequences are unknown. Additional future projections are thus needed. For urban China, the results inform policy-makers that, before 2020, future needs for LTC are not significantly influenced by the reduction in the number of living children. Consequently, there is no need to provide more community-based services as a substitute for informal care, however, from 2020 onwards, the one-child policy will start to significantly reduce the informal care provision, and consequently future need for LTC services is expected to increase the burden upon on formal care services. In order to respond to this challenge, from 2020, it is important for policy-makers to provide more community-based services, as no government intervention is expected to significantly increase the number of people who will have unmet needs; in contrast, the provision of more community-based care is expected to reduce this number dramatically.

If informal care provided by children decreases to zero, if all adult children are unable to provide care for their relatives, the influence on future LTC needs is significant for both rural and urban China. These results inform policy-makers that, in the next ten years, if all adult children are unable to provide care for their older relatives, as the number of people who need care increases dramatically, the provision of informal care will decrease significantly. Thus, policy-makers must face the serious challenge of providing sufficient formal LTC services for older people. In order to respond to this challenge, the relevant reforms of policy and planning should be taken. The scenarios tested in Section 7.2 suggest that the substitution of community-based services for informal care should be implemented, although the provision of more such services is expected to increase the financial burden. If nothing is done, the care challenge will still have to be faced by the families of individuals, and older people whose adult children are unable to provide informal care will receive insufficient care. The number of people who will have unmet needs is expected to increase

dramatically.

Zeng et al. (2015) have suggested that if China launched a two-child policy as soon as possible, the care burden for the elderly with living children will be significantly reduced after 2030, however, before 2030, other policies should also be implemented, such as encouraging elderly parents to migrate from rural to urban areas with their adult children and encouraging adult children to live with or near their older parents, which will help elderly persons to receive informal care when they need it.

8.2.4 Policy implication of projection from Scenario 4

The fourth scenario explores the situation when an increase in the disability prevalence rate is accompanied by a reduction in the provision of informal care, and how future LTC needs will change and how potential LTC policies – no government intervention and the substitution of community-based care for informal care – will influence future LTC needs. The results from this scenario address Research Question 2 (c). The results are presented in Section 7.3.

The results show that, for both rural and urban China, when an increase in the disability prevalence rate of 2% per year is accompanied by a reduction in the provision of informal care (in both Cases C and D), the changes in future LTC needs are significant. As a result, a relevant LTC policy, such as the substitution of community-based care, is really needed to address the increased number of people who will need LTC.

The projection results show that this scenario is the worst scenario: its effect on the need for future LTC is the greatest, especially when an increase in the disability prevalence rate by 2% per year is accompanied by a reduction in the provision of informal care by children to none. Consequently, in addition to the

substitution of community-based services for informal care, other relevant actions, as discussed in the baseline scenario and Scenarios 2 and 3, are also needed to address the increased need for LTC services.

8.2.5 Summary

This sub-section addresses Research Question 3 in a number of ways. First, the main objective of this research was to build a discrete-event simulation (DES) model – the SIMCARE-CHINA model to model the LTC system in China. The model can make predictions of future needs for LTC support and services, in terms of:

- the number and proportion of people who will need care and the number and proportion of people who will not need care;

- amongst those who will need care, the numbers and proportions of people who will require different categories of LTC services, including informal care, institutional services, community-based services, private services and voluntary services. The number and proportion of people who will have unmet needs are also projected.

The projection is made for urban and rural areas of China based on several assumptions which are presented at the beginning of Section 6. The limitations of these assumptions on the projections are discussed in Section 8.3. Projections are made for up to ten years, from 2015 to 2024. It is anticipated that the results may help potential users to clarify the future need for LTC support and services for people. One responsibility of LTC policy-makers in China is to make sure that LTC facilities meet the needs of older people. The projections of the need for LTC could potentially help policy-makers to allocate the appropriate resources and funding in planning for LTC services for people in different areas of China.

Secondly, the SIMCARE-CHINA model is capable of running additional experiments to explore a range of scenarios for different assumptions about the future disability prevalence rate and/or the provision of different services.

There are many benefits of using this approach. A DES model is an ideal tool to model a system (such as LTC services in China) in order to better understand it and to investigate its performance under various conditions. The DES model enables the stochastic aspects of the system to be captured in the real world. This approach also provides very useful results which can assist policy-makers in planning LTC services. The results from the four scenarios enable policy-makers to understand future LTC needs, explore how uncertainties about the future, such as the disability prevalence rate and the provision of LTC services, influence future LTC needs, investigate the performance of the potential LTC policies, and allow them to allocate resources to the right places to meet the LTC needs of older people in rural and urban China. These results are potentially useful as a resource planning tool.

This research can not only be used as a policy tool to assist policy-makers in planning LTC services for future, which is one of the contributions of this research, but also makes many other significant contributions, which are discussed in Section 8.4. Like any other study, however, this research has limitations. In the next section, the limitations of this research will be discussed.

8.3 Limitations of the research and future work

When making projections under the baseline scenario, the baseline assumptions are described in the relevant chapters. A summary of these assumptions is presented at the beginning of Section 6.1. The limitations of these assumptions are summarised below.

- The ‘arrival rates’ are based on the population projection from Zhejiang University and these may be not accurate, although they are the best available variables. Dividing the annual projections by 12 to get monthly ‘arrivals’ is a minor assumption in comparison. In order to obtain more accurate projection results, a population projection by the individual year of age for each month’s data for urban areas and rural areas must be made.

- In order to reduce complexity, it is assumed that older people only receive one type of LTC support and service when they receive LTC services, however, in reality, it is highly likely that some people will receive two or more types of LTC services at the same time. CLHLS (2008) showed that about 10% of older people have received two or more types of LTC services. For example, during the day, older people may go to a community-based day care centre, but they may go to their own homes in the evening. Future research could take this into account.

- The model assumes that individuals who have similar characteristics are more likely to have similar needs and utilisations in terms of LTC services, which considerably simplifies the reality. For modelling purposes, people in this research were also grouped into twelve groups by their age, gender and disability status, however, in reality, there are more factors that influence the need for LTC services, such as cognitive impairment/mental health and self-reported health status (Wittenberg et al., 1998; Zeng et al., 2015). It would be helpful, in future research, to add these factors into the model.

- The model assumes that the disability distributions, the disability now distributions (i.e. the initial disability prevalence rate and the transition probabilities between different disability states), the care received distribution, and the care received next distribution for each sub-group of people will be constant over the ten years from 2015 to 2024, however, the influence of the disability prevalence rate increases by 1%/2% per year and/or reductions in the provision of informal care on future LTC needs are

explored in the scenario tests. In order to minimise the effect of the constant transition probabilities of different disability states and type-dependent reallocation probabilities on future LTC needs, the projection is only made for a short period – ten years. In future research, other changes in the disability prevalence rate (such as a reduction of the disability prevalence rate by 1% per year) and/or changes in the provision of other LTC services can be explored.

- This model makes projections regarding the future LTC needs for five types of LTC services: informal care, institutional services, community-based services, private services, and voluntary services. The numbers of people who will not need care and people with unmet care needs are also considered in this model, however, in reality, there are other types of LTC support and services available, such as financial support. In future research, the other types of LTC support and services could be considered using the model.

- Due to a lack of data regarding the length of stay in different care-receiving states, this model checks and updates care-receiving states and disability states once a year, however, in reality, some people may transfer to other care receiving states and disability states at any time during a year. Consequently, the results could be wrong in either direction, that is, they could underestimate or overestimate future LTC needs. In future, when data for the length of stay is available, this can be substituted in the model for one year to provide more precise projections of future LTC needs.

- At this stage, to estimate the transition probabilities for transitions between people's different disability states, type-dependent allocation probabilities and type-dependent reallocation probabilities for transitions between different categories of care-receiving states, Markov models are developed to describe these transitions, however, the Markov model has a limitation – a lack of 'memory' (Sato & Zouain, 2010) – which means that people's characteristics and the LTC services they received in the

past will not affect their characteristics and LTC services in the future. This is not true in reality. In this research, in order to reduce the impact of the lack of 'memory' and to improve the accuracy of the projections, when carrying out the logistic regression analysis, the previous care received states were considered included as an independent variable, however, because the sample size is too small, this variable was not added for the logistic regression analysis in the thesis of this research.

- When estimating disability distribution, disability now distribution, the care received distribution, and the care received next distribution, Wave 1 of CHARLS, which was constructed in 2011, and CLHLS, which was constructed in 2008 and 2011, were used. This data is slightly out of date, however, it is the most up-to-data survey data available. In the future, disability distribution, disability now distribution, type-dependent allocation probability and type-dependent reallocation probability will be updated when new waves of CHARLS and CLHLS, which are used to estimate these probabilities, are available.

- This model ignores any supply-induced need effect, that the greater provision of certain types of LTC services might lead to more people to requiring/needing these types of services, however, there is no data to support the existence of this effect, and it is beyond the scope of the research in this thesis.

A number of areas are identified as potential areas for future research. Some address the limitations identified above. In addition to addressing these limitations, two other potential areas for future work can be expanded.

This research does not consider the costs of providing different categories of LTC services. This is outside of the scope of this research, however, the future costs of providing such LTC services for urban/rural China or at the regional level may be helpful when planning budgets for the provision of LTC services.

This is an important policy issue that policy-makers need to address (Chung et al., 2009; Zeng et al., 2015).

Future research could also consider combining an optimisation algorithm into this model to deal with capacity planning issues, for example, the numbers of beds that institutional services should have to minimise the number of people who will have unmet needs in urban/rural China, considering limited financial resources. The results could be used as input for this model in order to run scenario tests to identify the optimal levels for resource utilisation. This is also an important issue faced by policy-makers, the efficient use of limited resources (Zhang et al., 2012; Zhang & Puterman, 2013).

Last, but not least, this research is used to identify the needs for future LTC in terms of how many people will require different types of LTC services. Future with who have the greatest need for LTC services can also help policy-makers to understand the real need for future LTC services, and to design LTC policies to improve their quality of life.

8.4 Contribution of the research

As discussed in 8.2, this work has a practical impact for potential LTC users in China. Recently, social care policy-makers have been developing LTC support and services for an ageing population (Palmore, Whittington & Kunkel, 2009). The key findings from the research can be used as guidance for policy-makers in planning different categories of LTC and exploring the performance of potential LTC policies. This work has the potential to be an invaluable tool to enhance planning for LTC services and support for older people in China. This research also informed the EPSRC Care Life Cycle project at the University of Southampton, which was collaborating with policy stakeholders with the aim of planning care services more effectively, both in the UK and globally.

This research is also expected to make a significant scientific contribution. To the best of the author's knowledge, there is no existing study focusing on Operational Research modelling, or more specifically, discrete-event simulation (DES) modelling, to determine future LTC needs in the Chinese context, however, in developed countries, DES models and other Operational Research modelling approaches have been proven to work well in many areas, including social care and health care. This is thus the first study using a DES model to model LTC support and services for people in the Chinese context to ascertain future LTC needs.

The research creates a new approach to estimating future LTC needs using DES in both developed countries and developing countries when data for the length of stay in different categories of LTC services is unavailable. Data for the length of stay in different categories of LTC services is key in applying DES to making projections for future LTC needs, but these data sets are difficult to collect, mainly due to the long period over which the data is collected. As a result, the data used for the length of stay or to estimate the length of stay in the model is unavailable. The technique used in this research, the SIMCARE-CHINA model, checks and updates the individual's care-receiving states yearly, and thus, overcomes the issue of the lack of data for the length of stay.

In addition to having a practical impact and making a methodological contribution, this research is also expected to make a significant academic contribution. In China, research aimed at estimating the future LTC services needs of people is rare; further, all such studies have made projections at the national level in China, and none have examined the LTC needs of people in terms of the rural and urban areas of China.

In China, but also in developing countries, none of the existing studies have examined the need for specific types of LTC support and services. Most of the studies have only looked at LTC services as a whole. The SIMCARE-CHINA

model in this research not only estimates the total number of people who will require LTC support and services in the near future, but also estimates future need for specific types of LTC support and services (including informal care, and institutional, community-based, private, voluntary services), as well as the number of people who will have unmet needs in rural and urban China.

Appendices

Appendix 1 Summary of LTC policy model

Table A1. 1 Summary of LTC policy model

Problems addressed	Area	Methodology	Data	Studies	Whether the issues have been solved
To predict future LTC demand and associated cost for old people. Some papers expand the original PSSRU model with methodological improvements and/or updated data; Some papers are focus on old people with disability, and some papers	UK	Cell-based/macro-simulation	The national – level official datasets are used in this model, which include, Office for National Statistics (ONS) population estimates for England for 1994/5; 1996-based population projections for England produced by ONS and	Wittenberg et al., 1998; Wittenberg et al., 2001; Pickard et al., 2001,; Wittenberg et	Yes

refer to old people with informal care only.			Government Actuary's Department (GAD); 1994/95 General Household Survey (GHS), England data; Data on the unit costs of services at 1995/96 price were taken from Netten and Dennett's Unit of Community Care 1996.These datasets are updated for different papers.	al., 2001,; Comas-Herrera et al., 2003b,; Comas-Herrera et al., 2003c,; Malley et al., 2005,; Wittenberg et al., 2006,; Wittenberg et al., 2008,;	
To project the likely demand of LTC service for older people in other countries in the Europe.	Germany, Spain, Italy and	cell-based/macro-simulation	The national level official datasets for each country.	Comas-Herrera et al., 2003a,;	Yes

	UK			Comas-Herrera et al., 2006, and Pickard et al., 2007	
To project the costs for the provision of nursing and care services to people who were incapable for the United Kingdom.	UK	microsimulation	The basis for prevalence rates was estimated from Office of Population Censuses and Survey (OPCS) in the mid-1980 on the prevalence of LTC disability in Great Britain. Annually General Household Survey (GHS) of 1980, 1985, 1991, 1994 and 1996.	Nuttall et al., 1994	Yes
To estimate the number of people who will be disabled over the next 35 years for the United Kingdom, thereby	UK	Markov model	The OPCS survey of disabilities in Great Britain; General Household Survey, and the Government Actuary's	Rickayzen and Walsh, 2002	Yes

identifying implications for demand for LTC for the elderly in the future United Kingdom.			Department central population projection for the period 1996 to 2036.		
To projected the number of people in Australia who were likely to require LTC to 2051 and associated cost.	Australia	Markov model	The Survey of Disability, ageing and carers, population projection Australia, 1999 to 2001, and Australian Life Table 1995-1997	Lenung, 2003	Yes
To project future needs of LTC (only institutional care and certain home care service were considered in this paper) and future costs for LTC for older people in the UK. However, they did not aim for producing monetary projection for future cost projection, they aimed to analyse the future sustainability	UK	Markov model	The OPCS study of disability between 1986 and 1991 in Great Britain, the transition probabilities are from previous paper: Rickayzen and Walsh, 2002.	Karlsson et al., 2006	Yes

of the UK system for LTC provision.					
To simulate LTC charges under different charging regimes.	Great Britain	microsimulation	The data used in the model was from 1999/2000, 2000/01 and 2001/02 British Family Resources Survey (FRS) with money values uprated to the price levels prevailing in 2002.	Hancock, 2000	Yes
To calculate: how much, the older people aged 65+ who self-fund their social care contribute towards the costs of their care; The level of unmet need – also referred to as shortfalls in care; and to make projection about the number of self-funder in the future	UK	microsimulation	Community Care Statistics 2006 were the main source for the information on local authority supported care; the Relative Needs Formula (RNF) survey data, and English Longitudinal Study of Ageing (ELSA) data.	Forder, 2007	Yes
To make projections on the	UK	macrosimulation	The estimations from CARESIM	Hancock et	Yes

possible future costs of LTC service under the current funding arrangements and under a number of options involving changes to the funding arrangements.		link with microsimulation model	and RSSRU models.	al., 2003,; Hancock et al., 2007 and Wittenberg et al., 2011	
To estimate future burdens on the social care for older people in terms of service provision and costs per needs group according to age, gender, marital status and degree of disability or ill-health, when there is a lack of national data connecting public care services.	Sweden	Computer spreadsheet model	The different local data and using this combined data to estimate the distribution of the old people population in national-level.	Lagergren, 2005a and Lagergren, 2005b	Yes
This paper made projections on future demand for nursing home are, residential care and home-	Wales, UK	cell-based/macro-simulation	The data was provided by the Welsh Assembly Government on the numbers of residents of	Commas-Herrera, Wittenberg	Yes

based care for older people in Wales, by local authority to 2010, 2020 and 2030.			residential care homes and nursing homes and of users of community-based services by local authority. Population projection form Government Actuary's Department for Wales by age and gender for 2001 as the base year of projection.	and Pickard, 2003,; and Commas-Herrera et al., 2005	
To forecast demand from older people for social service for Hampshire over the next five years, and to explore the future effects of the significant challenges of an ageing population within a context of budget limitations.	UK	system dynamics simulation	The data used for this model were from the HCC client recording system. The demand data used was for the period April 2005 to April 2006 and included the information on all clients start initial contact to when they leave the system or receive a care package. The supply data included two snapshots of the numbers	Desai et al., 2008	Yes

			received care in April 2005 and April 2006, along with details of people moving between types of care and ceasing to receive care between those dates.		
To predict for future client counts for various HCC client grouping for BC Ministry of Health Service.	British Columbia, Canada	Markov model	The data included: the "population Extrapolation for Organization Planning with Less Error" (P.E.O.P.L.E.); Statistics Canada's web-pages were consulted to gain an understanding of the wealth demographics; a telephone survey for all privately run Accommodation Environments was construct to get the quantity of non-publicly funded HCC services in BC; historical HCC client group data from	Hare et al., 2009	Yes

			April 2001 to March 2005 contained all clients' personal information, such as identification number, age in April 2001 etc.		
To illustrated level of unmet need in the population in the UK under different proportion of provision of care that provided by the families, neighbours and friends.	UK	system dynamics simulation	Since lack the key source of data, modellers used data from variety sources, range from national level to local level, even the expert opinions of individual social workers, and covering different periods of time. Social statisticians raised concern about the sources of data.	Brailsford et al., 2012	Yes
To predict annual number of individuals in needs of each type of LTC service (formal and	Lisbon, Portugal	simulation model based on a Markov cycle	Demographic data for past years on the number of inhabitants in each Lisbon	Cardoso et al., 2012	Yes

informal home-based, ambulatory and institutional services), the resources/services (informal caregivers, domiciliary visits, consultations and bed) that are required to satisfy those needs and associated costs for the coming years.		tree structure	borough of the country of Lisbon and Tagus Valley region, which was collected from Portuguese National Institute of Statistics; prevalence, incidence and dependency rates were from the 4th Portuguese National Health Survey (2005-2006), this survey also used to build population groups according to household composition and level of income; the recommendations from professionals were used to estimate the service and resource required to delivery care; past unit cost from Long-term care service were used to estimate the costs for meeting		

			the demand.		
To examine whether a “hospital-at-home” service, which was initiative by Hillingdon Health Authority in West London in the UK, was cost saving compared with conventional inpatient care after discharge from hospital.	UK	discrete event simulation	The sources of costs are from NHS salary scales 1998/99, British National Formulary 1998, Rapid response service accounts, Hospital finance department, social services department, and Netten and Dennett. The source for the average cost (1998/99 price) per hospital bed day is from Hillingdon Hospital Finance Department.	Campbell, Karnon and Dowie, 2001	Yes
To calculate the total number of days of delays discharge from hospital caused solely by the limited capacity of post-acute service and to estimate the	UK	discrete event simulation	lack of data and time consuming for collecting of accurate data	Katsaliaki et al., 2005	No. Due to lack of data and time consuming for collecting of accurate data,

likely associated cost.					finally this quantitative model analysis shifted to a more descriptive approach
To determine the minimal LTC capacity level needed each year to satisfy a service level criterion based on clients' waiting time.	British Columbia, Canada	simulation and optimization	Data for estimating the arrival and LOS distribution included the Population Extrapolation for Organization Planning with Less Error (PEOPLE) database from BC Stats, and Continuing Car Information Management System (CCIMS) database collected by VIHA.	Zhang et al., 2012	Yes
To estimate how many patients were expected to stay in nursing home (NH) and residential home (RH), for how long, and	UK	continuous time Markov model	Data were provided by the Housing and Social Service Department of London Borough of Merton, which consisted of	Xie, Chaussalet and Millard, 2005,; and	Yes

the difference in the patterns.			935 records of 899 distinctive individual between April 1997 and April 2001.	Xie, Chaussalet and Millard, 2006	
To make projections of the demand for LTC by older people (aged 65 and over) in Hong Kong, and estimate the associated future LTC expenditure to be incurred by the individual	Hong Kong, China	Markov chain	The US Health Insurance Portability and Accountability Act of 1996 (HIPAA) The US National Long-Term Care Surveys (NLTCS) Hong Kong population projections for 2002–2031	Chan, Li and Fong, (2004)	Yes, but the main data was used in this study was based on the population in the USA, therefore, the results may not reflect the population in Hong Kong.
To investigate the factors which are significant to LTC.	China	multivariable logistic regression	2005 Chinese Longitudinal Healthy Longevity Survey (CLHLS); aggregated data relevant to LTC needs from the	Gu and Vlosky, 2008	Yes

			Sample Survey on the Aged Population in Urban/Rural in 2000 by the China National Research Centre on Ageing (CNRCA), population distributions from 2000 census and the projected elderly people from the United Nations Population Division.		
To estimate the future numbers of older people who require LTC; and the costs associated with this demand.	Hong Kong, China	cell-based/ macro simulation	Thematic Household Survey; Hong Kong Population Projections, 2007-2036; Hong Kong Annual Digest of Statistics. The data for utilisation, aggregate and unit costs of different types of LTC services for different years were from different data sources which include Hong Kong's	Chung et al., 2009	Yes

			Domestic Health Accounts, Hong Kong Government Budget Estimates and Social Welfare Department, Hospital Authority, and non-governmental organisations.		
To estimate the population aged 65 and over who need LTC from 2005 to 2050 and the associated cost	China	Markov Chain	US National Long-Term Care Surveys (NLTCS)	Rong (2009)	Yes, but, in this research, first, the transition probabilities are estimated based on the US dataset; second, two-year transition probabilities are used rather than one-year transition probabilities

Appendix 1

To make projection of the future need for LTC from 2010 to 2050	China	Markov multi-state model	Chinese Longitudinal Healthy Longevity Survey (CLHLS) conducted in 1998, 2000 and 2002	Rong, Li and Qun (2010)	Yes
To estimate the number of older people who require the LTC and expected time they spent in each LTC status.	China	continuous – time Markov chain model	The Chinese Longitudinal Healthy and Longevity Survey 2005 and 2008	Huang and Wu, 2012	Yes
They estimated numbers of people who need daily domestic service, health services and mental support and associated costs for older people up to 2050	China	Markov model	Chinese Longitudinal Healthy Longevity Survey (CLHLS) 2008 and 2011	Hu, Li and Zhang (2015)	Yes,
To look at the future needs of home-based care and the related cost by taking family structure, and ADL status	China	Markov model	Micro-data file of the 2000 census and 2005 mini-census; Chinese Longitudinal Healthy Longevity Survey (CLHLS)	Zeng et al. (2015)	Yes, but they only look at home-based care

transitions into account for older people in China			2002 and 2005		
To explore the consequences of demographic ageing on health care demand in Slovenia for primary care, secondary care, hospital day – care treatments and hospitalisations. This model calculated the influence of changes in the age structure on healthcare demand on the assumption that the demand by age will remain constant, in terms of projections of the total number of treatments of these services for each year for the period from 2015 until 2035.	Slovenia	the age-group projection method with the scenario approach.	Population projections used in the analysis were obtained from the EUROSTAT statistical office and the Slovenian Institute of Macroeconomic Analysis and Development; The data for the age-specific healthcare demand were obtained from the Slovenian National Institute for Public Health.	Vrhovec & Tajnikar (2016)	Yes.
To explore how strategic health	Great	Mathematics	LTC supply at the end of 2013	Cardoso, et al	Yes

policy influence delivery of the LTC services including institutional, home-based and ambulatory services with consideration of uncertainty in demand and supply. The model aimed at minimizing expected costs while ensuring satisficing the attainment of equity of access, equity of utilization, socioeconomic equity and geographical equity.	Lisbon region, Portugal	programming	in the Great Lisbon region; Operational and investment costs; Travel time (in minutes) between each Great Lisbon county and each LTC service; Maximum travel time allowed per patient requiring IC; Number of hours of care that need to be provided by physicians and nurses per individual receiving each type of LTC service from previous studies.	(2015)	
To help planning the delivery of institutional LTC services in the medium-term, both in terms of location selection and capacity planning..	Great Lisbon region, Portugal	Mathematics programming	Demand for institutional LTC in each county in the Great Lisbon region between 2012 and 2016,disaggregated by socioeconomic groups; Supply	Cardoso et al (2016)	Yes

			of institutional LTC (CC,MTRC,LTMC and PC) at the beginning of 2012 in the Great Lisbon region; Average LOS for each type of institutional LTC; Travel time (in minutes) between each county in the Great Lisbon region and each institutional LTC service; Maximum travel time allowed for LTC patients accessing services; Operational and investment costs; operational and investment budgets available for operations and investments within the RNCC in the Great Lisbon region are from previous studies.		

Appendix 2 Numbers of new arrivals and age distribution

Table A2. 1 Initial population by ten-year age band and gender for rural and urban China (unit: 10,000)

Residence	Group	Population	Residence	Group	Population
Urban	65-74, Male	1,970	Rural	65-74, Male	2,416
	75-84, Male	976		75-84, Male	1,112
	85+, Male	210		85+, Male	234
	65-74, Female	2,045		65-74, Female	2,358
	75-84, Female	1,099		75-84, Female	1,269
	85+, Female	296		85+, Female	396

Source: author's work

Table A2. 2 Monthly incident population or new arrivals from 2015 to 2024 for urban and rural China (unit: 10, 000)

Residence	Year	Male	Female	Residence	Year	Male	Female
Urban	2015	25.7	26.1	Rural	2015	28.8	28.5
	2016	25.4	26.5		2016	28.2	28.5
	2017	29.8	30.9		2017	33.4	33.5
	2018	30.3	31.7		2018	31.7	32.4
	2019	34.3	35.3		2019	34.2	34.4
	2020	34.9	35.5		2020	33.3	33.4
	2021	34.1	34.8		2021	30.8	31.4
	2022	37.6	37.6		2022	33.3	33.1
	2023	35.9	35.6		2023	28.2	28.7
	2024	28.8	28.0		2024	20.4	20.2

Source: author's work

Table A2. 3 Age distributions for initial population in 2014 for rural and urban China (Unit: %)

Age group	Urban			Rural		
	Individual Age	Gender		Individual Age	Gender	
		Male	Female		Male	Female
65-74	65	14.65	14.33	65	13.75	13.81
	66	13.58	13.2	66	13.52	12.9
	67	11.5	11.51	67	11.61	11.48
	68	10.93	10.76	68	10.99	10.86
	69	9.99	9.97	69	9.94	10.24
	70	8.94	9.02	70	9.06	9.34
	71	8.31	8.35	71	8.75	8.67
	72	7.52	7.71	72	7.82	7.9
	73	7.36	7.66	73	7.38	7.44
	74	7.21	7.5	74	7.18	7.37
	Total	100	100	Total	100	100
75-84	75	14.39	13.69	75	14.87	13.46
	76	11.86	11.73	76	11.9	10.86
	77	12.74	12.5	77	13.14	12.02
	78	11.63	11.32	78	11.73	11.06
	79	10.72	10.8	79	10.8	10.8
	80	9.6	10.02	80	9.54	10.04
	81	8.56	8.96	81	8.39	9.11
	82	8.31	8.38	82	8.06	8.9
	83	6.55	6.84	83	6.36	7.41
	84	5.65	5.75	84	5.21	6.33
	Total	100	100	Total	100	100
85+	85	23	19.77	85	22.35	19.12
	86	16.12	14.6	86	15.61	13.97
	87	14.6	13.68	87	14.89	13.53
	88	11.26	10.84	88	11.42	10.96
	89	8.45	8.64	89	8.65	8.82
	90	7.07	7.59	90	7.33	7.97
	91	5.3	6.08	91	5.61	6.37
	92	3.87	4.71	92	4.14	4.92
	93	2.97	3.61	93	2.96	3.77

	94+	7.36	10.48	94+	7.05	10.57
	Total	100	100	Total	100	100

Source: author's work

Appendix 3 China Health and Retirement Longitudinal Survey (CHARLS) Questionnaire

Demographic backgrounds

BA000_W2_3 Interviewer record R's gender.

1. Male

2. Female

BA002 When were you born?

____ 1900…2013 (BA002_1) year

__0…12 (BA002_2) month

__0..31 (BA002_3) day

BA004 What is your age?

1…120 years old

BB002 What is the type of your birth place? Is that rural village or urban community?

1. Rural Village

2. Urban Community

Health status and functioning

DB010 Because of health and memory problems, do you have any difficulty with dressing? Dressing includes taking clothes out from a closet, putting them on, buttoning up, and fastening a belt.

1. No, I don't have any difficulty Skip to DB011

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

DB011 Because of health and memory problems, do you have any difficulty with bathing or showering?

1. No, I don't have any difficulty Skip to DB012

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

DB012 Because of health and memory problems, do you have any difficulty with eating, such as cutting up your food? (Definition: By eating, we mean eating food by oneself when it is ready.

1. No, I don't have any difficulty Skip to DB013

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

DB013 Do you have any difficulty with getting into or out of bed?

1. No, I don't have any difficulty Skip to DB014

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

DB014 Because of health and memory problems, do you have any difficulties with using the toilet, including getting up and down?

1. No, I don’t have any difficulty Skip to DB022_W2_1

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

DB015 Because of health and memory problems, do you have any difficulties with controlling urination and defecation? If you use a catheter (conduit) or a pouch by yourself, then you are not considered to have difficulties.

1. No, I don’t have any difficulty.

2. I have difficulty but can still do it.

3. Yes, I have difficulty and need help.

4. I can not do it.

Appendix 4 Chinese Longitudinal Healthy Longevity Survey (CLHLS) (2008) Questionnaire

A1 Sex

1. Male
2. Female

A3 Current Age

__ __ years

A4.3 What the place of birth an urban area or a rural area (at time of birth)

1. Urban
2. rural

A5.1 Co-residence

1. With household member(s)
2. Alone---skip to A5.4
3. In an institution care---skip to A5.4

E1 Bathing – either sponge bath, tub bath, shower or washing the body

1. Receives no assistance

2. Receives assistance in bathing only for part of the body

3. Receives assistance in bathing more than one part of the body

E2 Dressing – gets clothes from closets and drawers – including underwear, outer garments and fasteners (including suspenders, if wore)

1. Gets clothes and gets completely dressed without assistance

2. Gets clothes and gets dressed without assistance except for tying shoes

3. Receives assistance in getting clothes or in getting dressed, or stays partly or completely undressed

E3 Toilet – going to the toilet; cleaning oneself afterwards

1. Goes to the toilet, cleans self, and arranges clothes without assistance

2. Can partly manage on his/her won, and receives assistance in going to the toilet or in cleaning self or in arranging clothes afterwards or in use of night bedpan or commode

3. Bedridden and needs complete assistance in use of night bedpan or commode in bed

E4 Indoor transfer

1. Gets in and out of bed as well as in and out of a chair without assistance

2. Gets in and out of bed or chair with assistance

3. Bedridden

E5 Continence

1. Has complete control of urination and bowl movement without assistance
2. Has occasional ‘accidents’
3. Supervision helps keep urine or bowel control; catheter is used or elder is incontinent

E6 Eating

1. Feeds self without assistance
2. Feeds self, with some help
3. Receives assistance in feeding or is fed partly or completely intravenously

E6.1 Who is the primary caregiver when you need assistance in above bathing, dress, toileting, indoor transferring, continence, and eating?

1. Spouse
2. Son
3. Daughter
4. Daughter-in-law
5. Son-in-low
6. Unmarried son and daughter
7. Grandchild(ren)

8. Relatives

9. Friend and neighbours

10. Social services

11. Housekeeper

12. Nobody

Appendix 5 The results of the “care received next” distribution

Table A5.1 The care received next distribution for people in rural China (%)

Group of people	Initial state	State after one movement							
		institutional	No need	Informal	Community	Private	Voluntary	Unmet	Death
65-74, male, without	institutional	20.21	77.74	0.00	0.00	0.00	0.00	0.00	2.06
	No need	0.63	37.58	35.55	4.88	0.00	0.00	19.30	2.06
	Informal	0.13	97.30	0.51	0.00	0.00	0.00	0.00	2.06
	Community	13.48	0.00	0.00	84.47	0.00	0.00	0.00	2.06
	Private	13.48	0.00	0.00	0.00	84.47	0.00	0.00	2.06
	Voluntary	13.48	0.00	0.00	0.00	0.00	84.47	0.00	2.06
	Unmet	0.08	97.33	0.00	0.00	0.00	0.00	0.53	2.06
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institutional	No need	Informal	State	Private	Voluntary	Unmet	Death
65-74, male, with	Institutional	95.89	0.00	0.00	0.00	0.00	0.00	0.00	4.11
	No need	×	×	×	×	×	×	×	×
	Informal	0.14	95.75	0.00	0.00	0.00	0.00	0.00	4.11

	Community	0.14	95.75	0.00	0.00	0.00	0.00	0.00	4.11
	Private	15.61	0.00	0.00	0.00	80.28	0.00	0.00	4.11
	Voluntary	15.61	0.00	0.00	0.00	0.00	80.28	0.00	4.11
	Unmet	15.61	0.00	0.00	0.00	0.00	0.00	80.28	4.11
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institutional	No need	Informal	Community	Private	Voluntary	Unmet	Death
75-84, male, without	Institutional	5.48	91.65	0.00	0.00	0.00	0.00	0.00	2.87
	No need	0.90	29.03	38.03	5.40	6.34	0.00	17.44	2.87
	Informal	0.56	94.78	1.78	0.00	0.00	0.00	0.00	2.87
	Community	19.30	0.00	0.00	77.83	0.00	0.00	0.00	2.87
	Private	19.30	0.00	0.00	0.00	77.83	0.00	0.00	2.87
	Voluntary	19.30	0.00	0.00	0.00	0.00	77.83	0.00	2.87
	Unmet	19.30	0.00	0.00	0.00	0.00	0.00	77.83	2.87
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institutional	No need	Informal	State	Private	Voluntary	Unmet	Death
74-84, male, with	Institutional	95.89	0.00	0.00	0.00	0.00	0.00	0.00	4.11
	No need	×	×	×	×	×	×	×	×
	Informal	2.22	86.98	6.69	0.00	0.00	0.00	0.00	4.11
	Community	22.51	0.00	0.00	73.38	0.00	0.00	0.00	4.11
	Private	22.51	0.00	0.00	0.00	73.38	0.00	0.00	4.11
	Voluntary	22.51	0.00	0.00	0.00	0.00	73.38	0.00	4.11

	Unmet	22.51	0.00	0.00	0.00	0.00	0.00	73.38	4.11
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institutional	No need	Informal	Community	Private	Voluntary	Unmet	Death
85, male, without	Institutional	22.85	36.10	18.61	18.61	0.00	0.00	0.00	3.84
	No need	0.98	21.67	50.02	6.13	8.33	0.00	9.03	3.84
	Informal	0.82	84.65	2.32	0.00	8.38	0.00	0.00	3.84
	Community	21.11	0.00	0.00	75.05	0.00	0.00	0.00	3.84
	Private	21.11	0.00	0.00	0.00	75.05	0.00	0.00	3.84
	Voluntary	21.11	0.00	0.00	0.00	0.00	75.05	0.00	3.84
	Unmet	0.34	47.91	47.91	0.00	0.00	0.00	0.00	3.84
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85, male, with	Institutional	95.56	0.00	0.00	0.00	0.00	0.00	0.00	4.44
	No need	×	×	×	×	×	×	×	×
	Informal	1.89	65.84	4.70	0.00	23.13	0.00	0.00	4.44
	Community	24.77	0.00	0.00	70.79	0.00	0.00	0.00	4.44
	Private	24.77	0.00	0.00	0.00	70.79	0.00	0.00	4.44
	Voluntary	24.77	0.00	0.00	0.00	0.00	70.79	0.00	4.44
	Unmet	24.77	0.00	0.00	0.00	0.00	0.00	70.79	4.44
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death

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65-74, female, without	Institutional	96.03	0.33	0.33	0.33	0.33	0.33	0.33	1.99
	No need	0.53	36.53	33.57	5.12	0.00	5.12	17.14	1.99
	Informal	0.10	97.30	0.60	0.00	0.00	0.00	0.00	1.99
	Community	11.47	0.00	0.00	86.54	0.00	0.00	0.00	1.99
	Private	11.47	0.00	0.00	0.00	86.54	0.00	0.00	1.99
	Voluntary	11.47	0.00	0.00	0.00	0.00	86.54	0.00	1.99
	Unmet	0.05	48.98	48.98	0.00	0.00	0.00	0.00	1.99
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
65-74, female, with	Institutional	95.90	0.00	0.00	0.00	0.00	0.00	0.00	4.10
	No need	×	×	×	×	×	×	×	×
	Informal	0.17	94.93	0.80	0.00	0.00	0.00	0.00	4.10
	Community	13.27	0.00	0.00	82.62	0.00	0.00	0.00	4.10
	Private	13.27	0.00	0.00	0.00	82.62	0.00	0.00	4.10
	Voluntary	13.27	0.00	0.00	0.00	0.00	82.62	0.00	4.10
	Unmet	13.27	0.00	0.00	0.00	0.00	0.00	82.62	4.10
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
75-84, female, without	Institutional	30.74	66.46	0.00	0.00	0.00	0.00	0.00	2.80
	No need	0.76	32.02	42.98	0.00	4.54	0.00	16.90	2.80
	Informal	0.29	95.89	1.02	0.00	0.00	0.00	0.00	2.80

	Community	0.16	97.04	0.00	0.00	0.00	0.00	0.00	2.80
	Private	0.16	0.00	0.00	0.00	0.00	0.00	97.04	2.80
	Voluntary	16.43	0.00	0.00	0.00	0.00	80.77	0.00	2.80
	Unmet	0.16	0.00	97.04	0.00	0.00	0.00	0.00	2.80
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
74-84, female, with	Institutional	95.90	0.00	0.00	0.00	0.00	0.00	0.00	4.10
	No need	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Informal	0.38	0.00	0.94	94.58	0.00	0.00	0.00	4.10
	Community	0.26	0.00	0.00	0.00	95.64	0.00	0.00	4.10
	Private	0.26	0.00	0.00	0.00	0.00	95.64	0.00	4.10
	Voluntary	0.26	0.00	0.00	0.00	0.00	0.00	95.64	4.10
	Unmet	0.26	0.00	0.00	0.00	0.00	0.00	95.64	4.10
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85+, female, without	Institutional	46.71	20.02	10.03	11.83	7.63	0.00	0.00	3.78
	No need	0.83	19.31	58.62	5.49	7.43	3.29	1.24	3.78
	Informal	0.76	90.27	2.91	2.28	0.00	0.00	0.00	3.78
	Community	0.41	47.24	0.00	1.34	47.24	0.00	0.00	3.78
	Private	17.98	0.00	0.00	0.00	78.24	0.00	0.00	3.78
	Voluntary	17.98	0.00	0.00	0.00	0.00	78.24	0.00	3.78

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	Unmet	0.21	57.57	38.45	0.00	0.00	0.00	0.00	3.78
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85+, female, with	Institutional	12.08	0.00	83.49	0.00	0.00	0.00	0.00	4.43
	No need	×	×	×	×	×	×	×	×
	Informal	1.97	87.13	6.47	0.00	0.00	0.00	0.00	4.43
	Community	0.34	0.00	95.22	0.00	0.00	0.00	0.00	4.43
	Private	0.34	0.00	47.61	0.00	0.00	47.61	0.00	4.43
	Voluntary	0.67	93.14	0.00	0.00	0.00	1.75	0.00	4.43
	Unmet	21.11	74.46	0.00	0.00	0.00	0.00	0.00	4.43
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Source: author's own analysis of CLHLS

Table 5A.2 The Care received next distribution for people in urban China (%)

Group of people	Initial state	State after one movement							
		institutional	No need	Informal	Community	Private	Voluntary	Unmet	Death
65-74, male, without	institutional	38.26	42.00	0.00	0.00	17.90	0.00	0.00	1.84
	No need	1.40	5.84	59.89	2.52	2.52	0.00	25.99	1.84
	Informal	0.34	64.42	1.02	0.00	0.00	0.00	32.38	1.84
	Community	18.16	0.00	0.00	80.00	0.00	0.00	0.00	1.84
	Private	18.16	0.00	0.00	0.00	80.00	0.00	0.00	1.84
	Voluntary	18.16	0.00	0.00	0.00	0.00	80.00	0.00	1.84
	Unmet	18.16	0.00	0.00	0.00	0.00	0.00	80.00	1.84
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
65-74, male, with	Institutional	17.31	13.14	13.14	13.14	13.14	13.14	13.14	3.85
	No need	×	×	×	×	×	×	×	×
	Informal	11.14	0.00	85.01	0.00	0.00	0.00	0.00	3.85
	Community	11.14	0.00	0.00	85.01	0.00	0.00	0.00	3.85
	Private	11.14	0.00	0.00	0.00	85.01	0.00	0.00	3.85
	Voluntary	11.14	0.00	0.00	0.00	0.00	85.01	0.00	3.85
	Unmet	11.14	0.00	0.00	0.00	0.00	0.00	85.01	3.85

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	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
75-84, male, without	Institutional	33.20	32.20	0.00	9.56	12.95	0.00	9.56	2.55
	No need	1.85	4.84	60.76	6.74	8.54	0.00	14.72	2.55
	Informal	1.06	71.02	2.38	0.00	7.97	0.00	15.02	2.55
	Community	0.52	96.93	0.00	0.00	0.00	0.00	0.00	2.55
	Private	1.01	0.00	94.25	0.00	2.19	0.00	0.00	2.55
	Voluntary	24.55	0.00	0.00	0.00	0.00	72.90	0.00	2.55
	Unmet	0.52	48.47	48.47	0.00	0.00	0.00	0.00	2.55
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
74-84, male, with	Institutional	20.18	12.62	12.62	12.62	12.62	12.62	12.62	4.13
	No need	×	×	×	×	×	×	×	×
	Informal	0.77	92.55	2.55	0.00	0.00	0.00	0.00	4.13
	Community	19.43	0.00	0.00	76.45	0.00	0.00	0.00	4.13
	Private	19.43	0.00	0.00	0.00	76.45	0.00	0.00	4.13
	Voluntary	19.43	0.00	0.00	0.00	0.00	76.45	0.00	4.13
	Unmet	19.43	0.00	0.00	0.00	0.00	0.00	76.45	4.13
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85, male, without	Institutional	26.10	22.79	9.37	15.76	12.90	0.00	9.37	3.70

	No need	1.85	3.43	65.95	4.46	11.19	1.33	8.09	3.70
	Informal	3.29	53.07	7.02	7.54	17.88	0.00	7.49	3.70
	Community	0.83	0.00	47.73	0.00	47.73	0.00	0.00	3.70
	Private	1.20	23.65	46.14	23.65	1.66	0.00	0.00	3.70
	Voluntary	28.52	0.00	0.00	0.00	0.00	67.77	0.00	3.70
	Unmet	28.52	0.00	0.00	0.00	0.00	0.00	67.77	3.70
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85, male, with	Institutional	16.12	13.24	13.24	13.24	13.24	13.24	13.24	4.46
	No need	×	×	×	×	×	×	×	×
	Informal	4.06	82.48	8.99	0.00	0.00	0.00	0.00	4.46
	Community	28.01	0.00	0.00	67.53	0.00	0.00	0.00	4.46
	Private	28.01	0.00	0.00	0.00	67.53	0.00	0.00	4.46
	Voluntary	28.01	0.00	0.00	0.00	0.00	67.53	0.00	4.46
	Unmet	28.01	0.00	0.00	0.00	0.00	0.00	67.53	4.46
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
65-74, female, without	Institutional	51.09	47.11	0.00	0.00	0.00	0.00	0.00	1.80
	No need	1.24	4.74	53.84	0.00	2.01	0.00	36.36	1.80
	Informal	0.44	82.34	1.31	0.00	0.00	0.00	14.10	1.80
	Community	0.24	97.95	0.00	0.00	0.00	0.00	0.00	1.80

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	Private	19.14	0.00	0.00	0.00	79.06	0.00	0.00	1.80
	Voluntary	19.14	0.00	0.00	0.00	0.00	79.06	0.00	1.80
	Unmet	0.24	97.95	0.00	0.00	0.00	0.00	0.00	1.80
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
65-74, female, with	Institutional	21.37	12.54	12.54	12.54	12.54	12.54	12.54	3.38
	No need	×	×	×	×	×	×	×	×
	Informal	0.06	48.10	0.34	0.00	48.11	0.00	0.00	3.38
	Community	10.65	0.00	0.00	85.97	0.00	0.00	0.00	3.38
	Private	10.65	0.00	0.00	0.00	85.97	0.00	0.00	3.38
	Voluntary	10.65	0.00	0.00	0.00	0.00	85.97	0.00	3.38
	Unmet	10.65	0.00	0.00	0.00	0.00	0.00	85.97	3.38
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
75-84, female, without	Institutional	40.90	19.20	14.00	0.00	23.39	0.00	0.00	2.51
	No need	2.09	5.09	56.02	0.00	10.13	3.05	21.10	2.51
	Informal	1.21	52.12	2.51	13.88	13.88	0.00	13.88	2.51
	Community	25.86	0.00	0.00	71.63	0.00	0.00	0.00	2.51
	Private	25.86	0.00	0.00	0.00	71.63	0.00	0.00	2.51
	Voluntary	25.86	0.00	0.00	0.00	0.00	71.63	0.00	2.51
	Unmet	0.61	0.00	96.88	0.00	0.00	0.00	0.00	2.51

	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
74-84, female, with	Institutional	24.32	11.99	11.99	11.99	11.99	11.99	11.99	3.76
	No need	×	×	×	×	×	×	×	×
	Informal	18.55	0.00	77.69	0.00	0.00	0.00	0.00	3.76
	Community	18.55	0.00	0.00	77.69	0.00	0.00	0.00	3.76
	Private	18.55	0.00	0.00	0.00	77.69	0.00	0.00	3.76
	Voluntary	18.55	0.00	0.00	0.00	0.00	77.69	0.00	3.76
	Unmet	96.24	0.00	0.00	0.00	0.00	0.00	0.00	3.76
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85+, female, without	Institutional	31.32	21.13	7.86	13.76	12.65	4.17	5.44	3.67
	No need	1.75	2.82	11.84	38.61	32.45	3.32	5.54	3.67
	Informal	1.16	81.70	1.15	2.20	3.76	0.73	5.63	3.67
	Community	0.95	19.42	68.08	0.17	4.26	0.00	3.45	3.67
	Private	1.08	39.07	16.25	39.07	0.85	0.00	0.00	3.67
	Voluntary	0.96	11.07	31.43	5.95	46.69	0.23	0.00	3.67
	Unmet	0.95	47.69	47.69	0.00	0.00	0.00	0.00	3.67
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		institution	No need	Informal	Community	Private	Voluntary	Unmet	death
85+, female, with	Institutional	28.73	0.00	0.00	40.41	26.57	0.00	0.00	4.29

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	No need	×	×	×	×	×	×	×	×
	Informal	3.49	44.30	8.36	13.17	13.17	0.00	13.22	4.29
	Community	1.95	0.00	0.00	4.17	89.59	0.00	0.00	4.29
	Private	0.91	0.00	77.44	0.00	1.18	16.18	0.00	4.29
	Voluntary	0.70	0.00	95.01	0.00	0.00	0.00	0.00	4.29
	Unmet	26.72	0.00	0.00	0.00	0.00	0.00	68.99	4.29
	Death	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Source: author's own analysis of CLHLS

Appendix 6 The results from the baseline

Table A6. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 in rural China (unit: 10,000)

Year	Will not need care			Will need care			Total population		
	-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	3,403	3,421	3,440	4,684	4,684	4,739	8,086	8,160	8,234
2016	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
2017	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
2018	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
2019	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
2020	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
2021	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
2022	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
2023	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
2024	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196

Source: author's own analysis of CLHLS

Table A6. 2 The changes in the average number people who will and who will not need care by year from 2016 to 2024 in rural China (unit: 10,000)

	Population in 2015	**Population change by year**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	3,421	498	2,036	2,185	1,557	1,746	1,996	2,113	1,867	1,707
Will need care	4,684	-124	-1,276	-963	21	245	333	596	983	1,199

Source: author's own analysis of CLHLS

Table A6. 3 The change in the average number people who will and who will not need care by year in percentage term from 2016 to 2024 in rural China

	Population in 2015 (10,000)	**Population change in percentage term by year (%)**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	3,421	15	60	64	46	51	58	62	55	50
Will need care	4,684	-3	-27	-20	1	5	7	13	21	25

Source: author's own analysis of CLHLS

Table A6. 4 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 in rural China (%)

Year	Will not need care			Will need care		
	-0.95	**average**	**0.95**	**-0.95**	**average**	**0.95**
2015	42	42	42	58	58	58
2016	46	46	46	54	54	54
2017	61	61	62	38	39	39
2018	59	60	60	40	40	41
2019	51	51	52	48	49	49
2020	51	51	51	49	49	49
2021	51	52	52	48	48	49
2022	51	51	51	49	49	49
2023	48	48	48	52	52	52
2024	46	46	47	53	54	54

Source: author's own analysis of CLHLS

Table A6. 5 The change in the average percentage of people who will and who will not need care by year from 2016 to 2024 in rural China (%)

	Percentage in 2015	**Percentage change by year**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	42	4	19	18	9	9	10	9	6	4
Will Need care	58	-4	-19	-18	-9	-9	-10	-9	-6	-4

Source: author's own analysis of CLHLS

Table A6. 6 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 for rural China (unit: 10,000)

Year	Type of care								
	Informal care			Institution care			Community-based care		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	2,773	2,791	2,808	86	90	95	348	356	365
2016	2,732	2,751	2,770	87	91	95	326	336	346
2017	1,674	1,702	1,729	212	222	233	355	367	379
2018	1,881	1,895	1,908	221	229	238	355	367	378
2019	2,329	2,375	2,422	281	290	300	463	474	484
2020	2,471	2,496	2,520	301	312	323	444	457	470
2021	2,317	2,350	2,383	361	379	397	481	495	509
2022	2,465	2,485	2,504	394	401	408	460	472	485
2023	2,575	2,636	2,696	436	457	478	478	483	488
2024	2,717	2,743	2,769	456	472	489	484	499	514
Year	Type of care								
	Private care			Voluntary care			Unmet need		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	201	207	213	108	113	119	1,168	1,182	1,195
2016	218	226	233	98	103	108	1,093	1,109	1,125
2017	253	264	275	137	143	148	745	765	786
2018	290	297	304	128	135	141	844	854	865
2019	356	367	378	191	201	210	1,024	1,054	1,083

2020	412	420	427	171	180	189	1,105	1,121	1,136
2021	467	482	497	178	186	194	1,145	1,181	1,217
2022	543	558	572	156	164	172	1,239	1,256	1,273
2023	592	620	648	161	166	172	1,329	1,360	1,391
2024	673	688	702	138	145	152	1,375	1,392	1,410

Source: author's own analysis of CLHLS

Table A6. 7 The changes in the average numbers of people who will require different types of care by year from 2016 to 2024 for rural China (unit: 10,000)

Different types of care	Population in 2015	Population change by year								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	2,791	-40	-1,089	-896	-415	-295	-441	-306	-155	-48
Institutional service	90	0	132	139	200	222	289	311	367	382
Community-based service	356	-21	11	10	117	101	138	116	127	142
Private service	207	19	57	90	160	213	275	351	413	481
Voluntary service	113	-10	30	21	87	66	73	51	53	32
Unmet need	1,182	-73	-416	-327	-128	-61	0	74	178	210

Source: author's own analysis of CLHLS

Table A6. 8 The changes in the average numbers of people who will require different types of care by year in percentage term from 2016 to 2024 (Unit: 10,000)

Different types of care	Population in 2015	Population change in percentage term by year (%)								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	2,791	-1	-39	-32	-15	-11	-16	-11	-6	-2
Institutional care	90	0	146	153	221	245	319	344	405	422
Community-based care	356	-6	3	3	33	28	39	32	36	40
Private care	207	9	28	43	78	103	133	170	200	232
Voluntary care	113	-9	26	19	77	59	65	45	47	28
Unmet need	1,182	-6	-35	-28	-11	-5	0	6	15	18

Source: author's own analysis of CLHLS

Table A6. 9 Population projection: the average percentage (with 95% confidence interval) of people who will require different type of LTC services by year for rural China (%)

Year	Type of care								
	Informal care			Institution care			Community-based care		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	59	59	59	2	2	2	7	8	8
2016	59	60	60	2	2	2	7	7	7
2017	49	50	49	6	6	7	11	11	11
2018	51	50	50	6	6	6	10	10	10
2019	50	50	50	6	6	6	10	10	10
2020	50	50	50	6	6	6	9	9	9
2021	47	46	46	7	7	8	10	10	10
2022	47	47	46	8	8	8	9	9	9
2023	46	46	46	8	8	8	8	8	9
2024	46	46	47	8	8	8	8	8	9
Year	Type of care								
	Private care			Voluntary care			Unmet need		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	4	4	4	2	2	2	25	25	25
2016	5	5	5	2	2	2	24	24	24
2017	8	8	8	4	4	4	22	22	22
2018	8	8	8	3	4	4	23	23	23
2019	8	8	8	4	4	4	22	22	22
2020	8	8	8	3	4	4	23	22	22
2021	9	10	10	4	4	4	23	23	23

2022	10	10	11	3	3	3	24	24	24
2023	11	11	11	3	3	3	24	24	24
2024	12	12	12	2	2	3	24	23	23

Source: author's own analysis of CLHLS

Table A6. 10 The changes in the average percentage of people who will need different types of care by year from 2016 to 2024 for rural China (%)

Different types of care	Population in 2015	Percentage change by year								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	59	1	-10	-9	-9	-9	-13	-12	-13	-13
Institutional care	2	0	5	4	4	4	6	6	6	6
Community-based care	8	0	3	2	2	2	2	1	1	1
Private care	4	1	3	3	3	4	5	6	6	7
Voluntary care	2	0	2	1	2	1	1	1	1	0
Unmet need	25	-1	-3	-2	-3	-2	-2	-1	-1	-1

Source: author's own analysis of CLHLS

Table A6. 11 Population projection: the average number (with 95% confidence interval) of people who will and who will not need care from 2015 to 2024 in urban China (unit: 10,000)

	Will not need care			**Will need care**			**Total population**		
	-0.95	**average**	**0.95**	**-0.95**	**average**	**0.95**	**-0.95**	**average**	**0.95**
2015	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
2016	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
2017	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
2018	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
2019	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
2020	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
2021	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
2022	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
2023	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
2024	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215

Source: author's own analysis of CLHLS

Table A6. 12 The change in the average number people who will and who will not need care by year from 2016 to 2024 in urban China (unit: 10,000)

	Population in 2015	**Population change by year**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	2,806	430	-2	281	71	274	327	494	538	393
Will need care	4,159	-61	826	1,019	1,715	2,043	2,516	2,905	3,279	3,728

Source: author's own analysis of CLHLS

Table A6. 13 The change in the average number people who will and who will not need care by year in percentage term from 2016 to 2024 in urban China

	Population in 2015 (10,000)	**Population change in percentage term by year (%)**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	2,806	15	0	10	3	10	12	18	19	14
Will Need care	4,156	-1	20	25	41	49	61	70	79	90

Source: author's own analysis of CLHLS

Table A6. 14 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not care for each year from 2015 to 2024 in urban China (%)

Year	Will not need care			Will need care		
	-0.95	**average**	**0.95**	**-0.95**	**average**	**0.95**
2015	40	40	40	60	60	60
2016	44	44	44	56	56	56
2017	36	36	36	64	64	64
2018	38	37	37	62	63	63
2019	33	33	33	67	67	67
2020	33	33	33	67	67	67
2021	32	32	32	68	68	68
2022	32	32	32	68	68	68
2023	31	31	31	69	69	69
2024	29	29	29	71	71	71

Source: author's own analysis of CLHLS

Table A6. 15 The change in the average percentage of people who will and who will not need care by year from 2016 to 2024 in urban China (%)

	Percentage in 2015	**Percentage change by year**								
		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Will not need care	40	4	-4	-3	-7	-7	-8	-8	-9	-11
Will need care	60	-4	4	3	7	7	8	8	9	11

Source: author's own analysis of CLHLS

Table A6. 16 Population projection: the average number (and their 95% confidence interval) of people who will require different LTC from 2015 to 2024 for urban China (unit: 10,000)

Year	Type of care								
	Informal care			**Institution care**			**Community-based care**		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	2,336	2,355	2,373	99	104	109	278	285	291
2016	2,299	2,316	2,334	102	107	111	284	289	295
2017	2,325	2,349	2,373	105	110	115	434	443	452
2018	2,409	2,444	2,480	106	111	116	464	478	493
2019	2,548	2,573	2,598	117	123	129	650	665	679
2020	2,644	2,664	2,685	127	132	137	702	714	727
2021	2,630	2,657	2,684	137	144	151	860	871	882
2022	2,666	2,692	2,717	150	155	160	957	977	996
2023	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
2024	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
Year	**Type of care**								
	Private care			**Voluntary care**			**Unmet need**		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	528	535	541	87	91	95	777	790	803
2016	523	531	539	87	92	96	749	762	775
2017	834	851	867	102	107	113	1,113	1,124	1,136
2018	875	896	918	110	116	122	1,113	1,132	1,150
2019	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278

2020	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
2021	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
2022	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
2023	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
2024	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297

Source: author's own analysis of CLHLS

Table A6. 17 The changes in the average numbers of people who will require different types of care by year from 2016 to 2024 for urban China (unit: 10,000)

Different types of care	Population in 2015	Population change by year								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	2,355	-39	-6	89	218	310	302	337	296	418
Institutional care	104	3	6	7	19	28	40	51	66	80
Community-based care	285	5	158	194	380	430	587	692	864	964
Private care	535	-4	316	362	582	713	947	1,167	1,452	1,628
Voluntary care	91	1	16	25	42	61	82	109	135	149
Unmet need	790	-28	334	342	473	502	558	549	466	489

Source: author's own analysis of CLHLS

Table A6. 18 The changes in the average numbers of people who will require different types of care by year in percentage term from 2016 to 2024 (Unit:10,000)

Different types of care	Population in 2015	Population change in percentage term by year (%)								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	2,355	-2	0	4	9	13	13	14	13	18
Institutional care	104	3	6	7	19	27	39	49	63	77
Community-based care	285	2	56	68	134	151	206	243	304	339
Private care	535	-1	59	68	109	133	177	218	272	305
Voluntary care	91	1	18	27	47	67	90	119	148	164
Unmet need	790	-4	42	43	60	64	71	69	59	62

Source: author's own analysis of CLHLS

Table A6. 19 Population projection: the average percentage (with 95% confidence interval) of people who will require different type of LTC services by year for urban China (%)

Year	Type of care								
	Informal care			Institutional care			Community-based care		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	57	57	56	2	3	3	7	7	7
2016	57	57	56	3	3	3	7	7	7
2017	47	47	47	2	2	2	9	9	9
2018	47	47	47	2	2	2	9	9	9
2019	44	44	44	2	2	2	11	11	11
2020	43	43	43	2	2	2	11	12	12
2021	40	40	40	2	2	2	13	13	13
2022	38	38	38	2	2	2	14	14	14
2023	36	36	35	2	2	2	15	15	16
2024	35	35	35	2	2	2	16	16	16
Year	Type of care								
	Private care			Voluntary care			Unmet need		
	-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	13	13	13	2	2	2	19	19	19
2016	13	13	13	2	2	2	19	19	19
2017	17	17	17	2	2	2	23	23	22
2018	17	17	17	2	2	2	22	22	22

2019	19	19	19	2	2	2	22	21	21
2020	20	20	20	2	2	3	21	21	21
2021	22	22	22	3	3	3	20	20	20
2022	24	24	24	3	3	3	19	19	19
2023	27	27	27	3	3	3	17	17	17
2024	27	27	27	3	3	3	16	16	16

Source: author's own analysis of CLHLS

Table A6. 20 The changes in the average percentage of people who will need different types of care by year from 2016 to 2024 for rural China

Different types of care	Population in 2015	Percentage change by year								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
Informal care	57	0	-10	-9	-13	-14	-17	-19	-21	-21
Institutional care	3	0	0	0	0	0	0	0	0	0
Community-based care	7	0	2	2	4	5	6	7	9	9
Private care	13	0	4	4	6	7	9	11	14	15
Voluntary care	2	0	0	0	0	0	0	1	1	1
Unmet need	19	0	4	3	3	2	1	0	-2	-3

Source: author's own analysis of CLHLS

Appendix 7 The results from the scenario 2

Table A7. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 in rural China (unit: 10,000)

Year	Percentage change	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	0%	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	1%	3,395	3,414	3,433	4,691	4,746	4,802	8,086	8,160	8,235
	2%	3,388	3,407	3,426	4,698	4,754	4,810	8,085	8,160	8,235
2016	0%	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	1%	3,881	3,899	3,917	4,574	4,635	4,697	8,455	8,534	8,614
	2%	3,861	3,878	3,896	4,595	4,656	4,718	8,456	8,534	8,613
2017	0%	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	1%	5,377	5,420	5,464	3,415	3,499	3,584	8,792	8,920	9,047
	2%	5,343	5,387	5,432	3,450	3,532	3,615	8,793	8,920	9,046
2018	0%	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	1%	5,544	5,561	5,578	3,766	3,821	3,877	9,310	9,382	9,455
	2%	5,499	5,518	5,536	3,808	3,864	3,921	9,307	9,382	9,457

Appendix 7

2019	0%	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	1%	4,887	4,922	4,958	4,696	4,812	4,929	9,582	9,734	9,887
	2%	4,837	4,869	4,900	4,740	4,868	4,997	9,576	9,737	9,898
2020	0%	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	1%	5,061	5,085	5,109	4,973	5,049	5,126	10,034	10,134	10,235
	2%	4,970	5,000	5,030	5,034	5,120	5,206	10,004	10,120	10,236
2021	0%	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	1%	5,279	5,314	5,350	5,041	5,145	5,249	10,320	10,459	10,599
	2%	5,190	5,231	5,272	5,101	5,206	5,311	10,291	10,437	10,583
2022	0%	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	1%	5,357	5,401	5,445	5,305	5,413	5,520	10,661	10,813	10,965
	2%	5,216	5,255	5,294	5,424	5,519	5,615	10,639	10,774	10,909
2023	0%	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	1%	5,067	5,200	5,162	5,722	5,774	5,998	10,789	10,974	11,159
	2%	4,911	4,952	4,992	5,823	5,956	6,089	10,735	10,908	11,081
2024	0%	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	1%	4,950	4,995	5,041	5,878	5,982	6,085	10,828	10,977	11,126
	2%	4,796	4,842	4,888	5,957	6,065	6,174	10,753	10,907	11,062

Source: author's own analysis of CLHLS

Table A7. 2 The changes in the average number of people who will and who will not need care between baseline and the scenarios of a 1% and 2% increase per year from 2015 to 2024 in rural China (unit:10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	1% and 0%	-8	-7	-7	7	7	8
	2% and 0%	-15	-15	-14	14	15	15
2016	1% and 0%	-20	-20	-20	20	20	20
	2% and 0%	-41	-41	-41	41	41	42
2017	1% and 0%	-35	-37	-38	39	37	35
	2% and 0%	-69	-69	-70	73	69	66
2018	1% and 0%	-46	-46	-45	47	46	44
	2% and 0%	-90	-89	-88	89	89	88
2019	1% and 0%	-53	-56	-59	51	52	52
	2% and 0%	-103	-110	-117	95	108	121
2020	1% and 0%	-88	-83	-77	68	65	62
	2% and 0%	-178	-167	-156	129	135	141
2021	1% and 0%	-99	-103	-108	92	72	53
	2% and 0%	-188	-187	-185	152	133	115
2022	1% and 0%	-151	-134	-116	48	77	106
	2% and 0%	-291	-279	-267	167	184	201
2023	1% and 0%	-175	-134	-173	151	60	124
	2% and 0%	-331	-280	-282	145	164	216
2024	1% and 0%	-145	-133	-120	36	43	50
	2% and 0%	-298	-286	-273	115	127	138

Source: author's own analysis of CLHLS

Table A7. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care in rural China

Year	Percentage change	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	0%	42%	42%	42%	58%	58%	58%
	1%	42%	42%	42%	58%	58%	58%
	2%	42%	42%	42%	58%	58%	58%
2016	0%	46%	46%	46%	54%	54%	54%
	1%	45%	46%	46%	54%	54%	55%
	2%	45%	45%	46%	54%	55%	55%
2017	0%	61%	61%	62%	38%	39%	39%
	1%	60%	61%	61%	39%	39%	40%
	2%	60%	60%	61%	39%	40%	40%
2018	0%	59%	60%	60%	40%	40%	41%
	1%	59%	59%	60%	40%	41%	41%
	2%	59%	59%	59%	41%	41%	41%
2019	0%	51%	51%	52%	48%	49%	49%
	1%	50%	51%	51%	49%	49%	50%
	2%	50%	50%	51%	49%	50%	50%
2020	0%	51%	51%	51%	49%	49%	49%
	1%	50%	50%	50%	50%	50%	50%
	2%	49%	49%	50%	50%	51%	51%
2021	0%	51%	52%	52%	48%	48%	49%
	1%	50%	51%	51%	49%	49%	50%
	2%	50%	50%	50%	50%	50%	50%
2022	0%	51%	51%	51%	49%	49%	49%
	1%	50%	50%	50%	50%	50%	50%
	2%	49%	49%	49%	51%	51%	51%
2023	0%	48%	48%	48%	52%	52%	52%
	1%	46%	47%	47%	53%	53%	54%
	2%	45%	46%	46%	54%	54%	55%
2024	0%	46%	46%	47%	53%	54%	54%
	1%	45%	46%	46%	54%	54%	55%
	2%	44%	44%	45%	55%	56%	56%

Source: author's own analysis of CLHLS

Table A7. 4 The changes in the average percentage of people who will and who will not need care between baseline and the scenarios of a 1% and 2% increase per year from 2015 to 2024 in rural China

Year	Comparisons	Will not need care	Will need care
2015	1% and 0%	0%	0%
	2% and 0%	0%	0%
2016	1% and 0%	0%	0%
	2% and 0%	0%	0%
2017	1% and 0%	0%	0%
	2% and 0%	-1%	1%
2018	1% and 0%	0%	0%
	2% and 0%	-1%	1%
2019	1% and 0%	-1%	1%
	2% and 0%	-1%	1%
2020	1% and 0%	-1%	1%
	2% and 0%	-1%	1%
2021	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2022	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2023	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2024	1% and 0%	-1%	1%
	2% and 0%	-2%	2%

Source: author's own analysis of CLHLS

Table A7. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services from 2015 to 2024 for rural China (unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	2,773	2,791	2,808	86	90	95	348	356	365
	1%	2,780	2,798	2,816	86	90	95	348	357	365
	2%	2,786	2,804	2,822	86	90	94	349	357	366
2016	0%	2,732	2,751	2,770	87	91	95	326	336	346
	1%	2,751	2,770	2,789	87	91	95	327	337	347
	2%	2,771	2,790	2,809	87	91	95	329	339	349
2017	0%	1,674	1,702	1,729	212	222	233	355	367	379
	1%	1,712	1,737	1,762	212	222	232	358	371	383
	2%	1,745	1,769	1,793	211	221	231	361	374	386
2018	0%	1,881	1,895	1,908	221	229	238	355	367	378
	1%	1,927	1,939	1,951	220	229	237	361	373	384
	2%	1,966	1,980	1,993	220	229	237	369	380	392
2019	0%	2,329	2,375	2,422	281	290	300	463	474	484
	1%	2,376	2,422	2,468	281	291	301	479	488	498
	2%	2,422	2,472	2,521	281	290	300	479	493	506
2020	0%	2,471	2,496	2,520	301	312	323	444	457	470

	1%	2,529	2,553	2,578	300	311	322	470	480	490
	2%	2,583	2,615	2,646	300	312	323	489	500	510
2021	0%	2,317	2,350	2,383	361	379	397	481	495	509
	1%	2,363	2,402	2,440	363	380	398	510	526	542
	2%	2,419	2,448	2,477	365	380	395	530	546	562
2022	0%	2,465	2,485	2,504	394	401	408	460	472	485
	1%	2,501	2,541	2,580	397	413	429	502	515	527
	2%	2,583	2,614	2,645	386	403	421	558	565	573
2023	0%	2,575	2,636	2,696	436	457	478	478	483	488
	1%	2,680	2,719	2,757	442	465	487	512	536	559
	2%	2,753	2,777	2,801	433	453	474	572	597	622
2024	0%	2,717	2,743	2,769	467	480	492	484	499	514
	1%	2,731	2,765	2,798	456	472	489	529	545	561
	2%	2,764	2,802	2,839	447	469	492	590	605	621
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	201	207	213	108	113	119	1,168	1,182	1,195
	1%	201	207	213	108	113	119	1,168	1,182	1,195
	2%	201	207	213	108	113	119	1,168	1,182	1,195
2016	0%	218	226	233	98	103	108	1,093	1,109	1,125
	1%	218	226	233	98	103	108	1,093	1,109	1,125
	2%	218	226	233	98	103	108	1,093	1,109	1,125

2017	0%	253	264	275	137	143	148	745	765	786
	1%	253	264	275	137	143	148	743	763	784
	2%	253	264	275	137	143	148	742	762	782
2018	0%	290	297	304	128	135	141	844	854	865
	1%	289	296	303	128	134	140	840	851	861
	2%	289	296	303	127	134	140	837	847	857
2019	0%	356	367	378	191	201	210	1,024	1,054	1,083
	1%	357	368	379	191	200	209	1,011	1,043	1,074
	2%	355	368	380	189	199	209	1,013	1,048	1,082
2020	0%	412	420	427	171	180	189	1,105	1,121	1,136
	1%	412	421	429	167	176	184	1,095	1,109	1,123
	2%	409	418	428	168	176	184	1,085	1,100	1,114
2021	0%	467	482	497	178	186	194	1,145	1,181	1,217
	1%	478	492	507	177	183	188	1,150	1,162	1,174
	2%	478	490	501	176	185	193	1,133	1,158	1,183
2022	0%	543	558	572	156	164	172	1,239	1,256	1,273
	1%	539	553	567	155	163	170	1,210	1,229	1,247
	2%	544	559	574	157	165	172	1,195	1,213	1,230
2023	0%	592	620	648	161	166	172	1,329	1,360	1,391
	1%	624	644	663	157	164	172	1,306	1,333	1,360
	2%	624	651	679	166	174	183	1,275	1,303	1,331
2024	0%	673	688	702	138	145	152	1,374	1,392	1,410
	1%	681	693	705	146	154	161	1,324	1,346	1,368

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	2%	704	713	722	153	158	163	1,299	1,318	1,337

Source: author's own analysis of CLHLS

Table A7. 6 The changes in the percentage of people who will require different types of care between the baseline and the scenarios of a 1% and 2% increase per year from 2015 to 2024 in rural China (unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	1% and 0%	7	0	0	0	0	0
	2% and 0%	14	0	1	0	0	0
2016	1% and 0%	19	0	1	0	0	0
	2% and 0%	38	0	3	0	0	0
2017	1% and 0%	36	0	4	0	0	-2
	2% and 0%	67	-1	7	0	0	-4
2018	1% and 0%	44	0	6	-1	-1	-4
	2% and 0%	85	-1	14	-1	-1	-8
2019	1% and 0%	47	1	15	1	0	-11
	2% and 0%	96	0	19	0	-2	-6
2020	1% and 0%	58	-1	23	1	-4	-11
	2% and 0%	119	0	42	1	-4	-21
2021	1% and 0%	52	1	31	11	-4	-19

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	2% and 0%	98	1	51	8	-2	-23
2022	1% and 0%	56	12	43	5	-1	-27
	2% and 0%	130	2	93	1	1	-43
2023	1% and 0%	83	8	52	23	-2	-27
	2% and 0%	142	4	114	31	8	-57
2024	1% and 0%	22	7	46	5	8	-46
	2% and 0%	59	3	107	26	13	-74

Source: author's own analysis of CLHLS

Table A7. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	59%	59%	59%	2%	2%	2%	7%	8%	8%
	1%	59%	59%	59%	2%	2%	2%	7%	8%	8%
	2%	59%	59%	59%	2%	2%	2%	7%	8%	8%
2016	0%	59%	60%	60%	2%	2%	2%	7%	7%	7%
	1%	60%	60%	59%	2%	2%	2%	7%	7%	7%
	2%	60%	60%	60%	2%	2%	2%	7%	7%	7%
2017	0%	49%	50%	49%	6%	6%	7%	11%	11%	11%
	1%	50%	50%	49%	6%	6%	6%	10%	11%	11%
	2%	51%	50%	50%	6%	6%	6%	10%	11%	11%
2018	0%	51%	50%	50%	6%	6%	6%	10%	10%	10%
	1%	51%	51%	50%	6%	6%	6%	10%	10%	10%
	2%	52%	51%	51%	6%	6%	6%	10%	10%	10%
2019	0%	50%	50%	50%	6%	6%	6%	10%	10%	10%
	1%	51%	50%	50%	6%	6%	6%	10%	10%	10%
	2%	51%	51%	50%	6%	6%	6%	10%	10%	10%
2020	0%	50%	50%	50%	6%	6%	6%	9%	9%	9%

	1%	51%	51%	50%	6%	6%	6%	9%	10%	10%
	2%	51%	51%	51%	6%	6%	6%	10%	10%	10%
2021	0%	47%	46%	46%	7%	7%	8%	10%	10%	10%
	1%	47%	47%	46%	7%	7%	8%	10%	10%	10%
	2%	47%	47%	47%	7%	7%	7%	10%	10%	11%
2022	0%	47%	47%	46%	7%	8%	8%	9%	9%	9%
	1%	47%	47%	47%	8%	8%	8%	9%	10%	10%
	2%	48%	47%	47%	7%	7%	7%	10%	10%	10%
2023	0%	46%	46%	46%	8%	8%	8%	8%	8%	9%
	1%	47%	46%	46%	8%	8%	8%	9%	9%	9%
	2%	47%	47%	46%	7%	8%	8%	10%	10%	10%
2024	0%	46%	46%	47%	8%	8%	8%	8%	8%	9%
	1%	46%	46%	46%	8%	8%	8%	9%	9%	9%
	2%	46%	46%	46%	8%	8%	8%	10%	10%	10%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	4%	4%	4%	2%	2%	2%	25%	25%	25%
	1%	4%	4%	4%	2%	2%	2%	25%	25%	25%
	2%	4%	4%	4%	1%	1%	1%	14%	14%	15%
2016	0%	5%	5%	5%	2%	2%	2%	24%	24%	24%
	1%	5%	5%	5%	2%	2%	2%	24%	24%	24%
	2%	5%	5%	5%	1%	1%	1%	13%	13%	13%

2017	0%	8%	8%	8%	4%	4%	4%	22%	22%	22%
	1%	7%	8%	8%	4%	4%	4%	22%	22%	22%
	2%	7%	7%	8%	2%	2%	2%	8%	9%	9%
2018	0%	8%	8%	8%	3%	4%	4%	23%	23%	23%
	1%	8%	8%	8%	3%	4%	4%	22%	22%	22%
	2%	8%	8%	8%	1%	1%	1%	9%	9%	9%
2019	0%	8%	8%	8%	4%	4%	4%	22%	22%	22%
	1%	8%	8%	8%	4%	4%	4%	22%	22%	22%
	2%	7%	8%	8%	2%	2%	2%	11%	11%	11%
2020	0%	8%	8%	8%	3%	4%	4%	23%	22%	22%
	1%	8%	8%	8%	3%	3%	4%	22%	22%	22%
	2%	8%	8%	8%	2%	2%	2%	11%	11%	11%
2021	0%	9%	10%	10%	4%	4%	4%	23%	23%	23%
	1%	9%	10%	10%	4%	4%	4%	23%	23%	22%
	2%	9%	9%	9%	2%	2%	2%	11%	11%	11%
2022	0%	10%	10%	11%	3%	3%	3%	24%	24%	24%
	1%	10%	10%	10%	3%	3%	3%	23%	23%	23%
	2%	10%	10%	10%	1%	2%	2%	11%	11%	11%
2023	0%	11%	11%	11%	3%	3%	3%	24%	24%	24%
	1%	11%	11%	11%	3%	3%	3%	23%	23%	23%
	2%	11%	11%	11%	2%	2%	2%	12%	12%	12%
2024	0%	12%	12%	12%	2%	2%	3%	24%	23%	23%
	1%	12%	12%	12%	2%	3%	3%	23%	23%	22%

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	2%	12%	12%	12%	1%	1%	1%	12%	12%	12%

Source: author's own analysis of CLHLS

Table A7. 8 The changes in the average percentage of people who will require different type of LTC between baseline and scenarios of a 1% and 2% increase from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	0%	0%	0%	0%	-1%	0%
2016	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	0%	0%	0%	0%	-1%	0%
2017	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	0%	0%	0%	0%	-3%	-1%
2018	1% and 0%	1%	0%	0%	0%	0%	0%
	2% and 0%	1%	0%	0%	0%	-2%	-1%
2019	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	1%	0%	0%	0%	-2%	-1%
2020	1% and 0%	1%	0%	0%	0%	0%	-1%
	2% and 0%	1%	0%	0%	0%	-2%	-1%
2021	1% and 0%	0%	0%	0%	0%	0%	-1%

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	2% and 0%	1%	0%	1%	0%	-2%	-1%
2022	1% and 0%	0%	0%	1%	0%	0%	-1%
	2% and 0%	1%	0%	1%	0%	-2%	-2%
2023	1% and 0%	0%	0%	1%	0%	0%	-1%
	2% and 0%	1%	0%	2%	0%	-1%	-2%
2024	1% and 0%	0%	0%	1%	0%	0%	-1%
	2% and 0%	0%	0%	2%	0%	-1%	-2%

Source: author's own analysis of CLHLS

Table A7. 9 Population projection: the average number (with95% confidence interval) of people who will and who will not need care from 2015 to 2024 in urban China (unit: 10,000)

Year	Percentage change	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	0%	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	1%	2,783	2,800	2,817	4,111	4,165	4,218	6,894	6,965	7,035
	2%	2,776	2,793	2,811	4,117	4,171	4,225	6,893	6,965	7,036
2016	0%	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	1%	3,204	3,219	3,235	4,060	4,114	4,169	7,264	7,334	7,404
	2%	3,186	3,202	3,218	4,078	4,132	4,186	7,263	7,334	7,404
2017	0%	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	1%	2,749	2,769	2,789	4,951	5,019	5,087	7,700	7,788	7,877
	2%	2,716	2,736	2,757	4,982	5,052	5,122	7,698	7,788	7,879
2018	0%	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	1%	3,003	3,029	3,054	5,134	5,236	5,339	8,136	8,265	8,393
	2%	2,955	2,981	3,007	5,180	5,283	5,387	8,135	8,265	8,394
2019	0%	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	1%	2,791	2,806	2,864	5,863	5,943	6,024	8,653	8,750	8,846
	2%	2,722	2,849	2,753	5,930	6,009	6,088	8,652	8,747	8,842

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2020	0%	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	1%	2,976	2,993	3,010	6,211	6,291	6,371	9,187	9,284	9,381
	2%	2,888	2,905	2,923	6,284	6,370	6,457	9,172	9,276	9,380
2021	0%	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	1%	3,017	3,033	3,048	6,678	6,758	6,839	9,695	9,791	9,887
	2%	2,900	2,916	2,932	6,788	6,869	6,950	9,688	9,785	9,882
2022	0%	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	1%	3,157	3,179	3,201	7,052	7,161	7,269	10,209	10,340	10,471
	2%	3,023	3,050	3,077	7,147	7,267	7,386	10,169	10,316	10,463
2023	0%	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	1%	3,191	3,212	3,233	7,401	7,530	7,659	10,591	10,742	10,892
	2%	3,047	3,084	3,121	7,477	7,624	7,770	10,524	10,708	10,891
2024	0%	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	1%	3,068	3,087	3,107	7,837	7,946	8,054	10,905	11,033	11,161
	2%	2,958	2,976	2,995	7,888	8,003	8,117	10,846	10,979	11,112

Source: author's own analysis of CLHLS

Table A7. 10 The changes in the average number of people who will and who will not need care between baseline and scenarios of a 1% and 2% increase per year from 2015 to 2024 in urban China (unit:10,000)

Year	Comparisons	Will not need care			Will care		
		-0.95	average	0.95	-0.95	average	0.95
2015	1% and 0%	-6	-6	-7	6	6	6
	2% and 0%	-13	-13	-14	12	12	13
2016	1% and 0%	-17	-17	-20	15	17	19
	2% and 0%	-35	-35	-41	33	35	36
2017	1% and 0%	-35	-35	-38	38	35	32
	2% and 0%	-68	-68	-70	69	68	67
2018	1% and 0%	-59	-59	-45	58	59	61
	2% and 0%	-106	-106	-88	104	106	109
2019	1% and 0%	-71	-70	-59	67	70	73
	2% and 0%	-140	-136	-117	134	136	137
2020	1% and 0%	-87	-90	-77	85	89	93
	2% and 0%	-175	-169	-156	158	168	179
2021	1% and 0%	-100	-84	-108	78	84	90
	2% and 0%	-217	-195	-185	188	195	201
2022	1% and 0%	-121	-98	-116	87	98	108
	2% and 0%	-250	-204	-267	182	204	225
2023	1% and 0%	-132	-92	-173	75	92	109
	2% and 0%	-260	-186	-342	151	186	220
2024	1% and 0%	-112	-59	-120	58	60	60
	2% and 0%	-223	-116	-273	109	117	123

Source: author's own analysis of CLHLS

Table A7. 11 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care in urban China (unit: 10, 000)

Year	Percentage change	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	0%	40%	40%	40%	60%	60%	60%
	1%	40%	40%	40%	60%	60%	60%
	2%	40%	40%	40%	60%	60%	60%
2016	0%	44%	44%	44%	56%	56%	56%
	1%	44%	44%	44%	56%	56%	56%
	2%	43%	44%	44%	56%	56%	57%
2017	0%	36%	36%	36%	64%	64%	64%
	1%	35%	36%	36%	64%	64%	65%
	2%	35%	35%	35%	65%	65%	65%
2018	0%	37%	37%	38%	62%	63%	63%
	1%	36%	37%	37%	63%	63%	64%
	2%	36%	36%	36%	64%	64%	64%
2019	0%	33%	33%	33%	67%	67%	67%
	1%	32%	32%	32%	68%	68%	68%
	2%	31%	31%	31%	69%	69%	69%
2020	0%	33%	33%	33%	67%	67%	67%
	1%	32%	32%	32%	68%	68%	68%
	2%	31%	31%	31%	69%	69%	69%
2021	0%	32%	32%	32%	68%	68%	68%
	1%	31%	31%	31%	69%	69%	69%
	2%	30%	30%	30%	70%	70%	70%
2022	0%	32%	32%	32%	68%	68%	68%
	1%	31%	31%	31%	69%	69%	69%
	2%	29%	30%	30%	70%	70%	71%
2023	0%	31%	31%	31%	69%	69%	69%
	1%	30%	30%	30%	70%	70%	70%
	2%	29%	29%	29%	71%	71%	71%
2024	0%	29%	29%	29%	71%	71%	71%
	1%	28%	28%	28%	72%	72%	72%
	2%	27%	27%	27%	73%	73%	73%

Source: author's own analysis of CLHLS

Table A7. 12 The changes in the average percentage of people who will and who will not need care between baseline, and scenarios of a 1% and 2% increase from 2015 to 2024 in urban China

Year	Comparisons	Will not need care	Will need care
2015	1% and 0%	0%	0%
	2% and 0%	0%	0%
2016	1% and 0%	0%	0%
	2% and 0%	0%	0%
2017	1% and 0%	0%	0%
	2% and 0%	-1%	1%
2018	1% and 0%	-1%	1%
	2% and 0%	-1%	1%
2019	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2020	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2021	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2022	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2023	1% and 0%	-1%	1%
	2% and 0%	-2%	2%
2024	1% and 0%	-1%	1%
	2% and 0%	-2%	2%

Source: author's own analysis of CLHLS

Table A7. 13 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services from 2015 to 2024 for urban China (unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	2,336	2,355	2,373	99	104	109	278	285	291
	1%	2,342	2,361	2,379	99	104	109	278	285	291
	2%	2,348	2,367	2,385	99	104	109	278	285	291
2016	0%	2,299	2,316	2,334	102	107	111	284	289	295
	1%	2,314	2,332	2,351	102	107	111	284	289	295
	2%	2,330	2,349	2,368	102	107	111	284	289	295
2017	0%	2,325	2,349	2,373	105	110	115	434	443	452
	1%	2,361	2,382	2,403	105	110	115	434	443	452
	2%	2,390	2,412	2,434	105	110	115	433	443	452
2018	0%	2,409	2,444	2,480	106	111	116	464	478	493
	1%	2,462	2,498	2,534	106	111	116	463	478	493
	2%	2,506	2,543	2,580	106	111	116	463	477	492
2019	0%	2,548	2,573	2,598	117	123	129	650	665	679
	1%	2,611	2,638	2,664	118	124	130	649	663	677
	2%	2,680	2,707	2,733	117	123	129	647	660	673
2020	0%	2,644	2,664	2,685	127	132	137	702	714	727

	1%	2,736	2,757	2,778	127	133	139	695	709	722
	2%	2,817	2,842	2,868	126	132	138	694	706	719
2021	0%	2,630	2,657	2,684	137	144	151	860	871	882
	1%	2,743	2,767	2,791	140	147	155	857	867	878
	2%	2,851	2,876	2,901	140	147	154	855	870	885
2022	0%	2,666	2,692	2,717	150	155	160	957	977	996
	1%	2,793	2,829	2,865	147	153	159	949	967	984
	2%	2,908	2,948	2,988	145	151	157	931	951	970
2023	0%	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	1%	2,754	2,783	2,813	164	171	177	1,115	1,144	1,173
	2%	2,897	2,949	3,001	163	172	180	1,083	1,110	1,138
2024	0%	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	1%	2,885	2,910	2,935	174	181	189	1,206	1,221	1,237
	2%	3,029	3,056	3,083	174	183	191	1,186	1,204	1,222
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	528	535	541	87	91	95	777	790	803
	1%	529	535	541	87	91	95	777	790	803
	2%	529	535	542	87	91	95	777	790	803
2016	0%	523	531	539	87	92	96	749	762	775
	1%	524	532	540	87	92	96	749	762	775
	2%	525	533	541	87	92	96	749	762	775

2017	0%	834	851	867	102	107	113	1,113	1,124	1,136
	1%	838	854	870	102	107	113	1,112	1,124	1,135
	2%	840	857	874	102	107	113	1,112	1,123	1,135
2018	0%	875	896	918	110	116	122	1,113	1,132	1,150
	1%	882	904	927	110	116	121	1,111	1,129	1,148
	2%	887	910	933	110	115	121	1,109	1,127	1,145
2019	0%	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	1%	1,116	1,129	1,142	128	133	138	1,242	1,258	1,274
	2%	1,123	1,137	1,151	128	133	137	1,235	1,250	1,266
2020	0%	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	1%	1,242	1,257	1,272	144	152	159	1,267	1,284	1,300
	2%	1,243	1,261	1,279	142	150	157	1,261	1,279	1,296
2021	0%	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	1%	1,475	1,494	1,514	164	170	176	1,298	1,312	1,326
	2%	1,487	1,504	1,520	165	169	173	1,290	1,304	1,317
2022	0%	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	1%	1,692	1,709	1,725	189	198	208	1,281	1,305	1,329
	2%	1,699	1,724	1,749	181	190	200	1,282	1,302	1,322
2023	0%	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	1%	1,964	1,993	2,023	213	223	234	1,192	1,216	1,240
	2%	1,968	1,995	2,023	208	215	222	1,158	1,182	1,207
2024	0%	2,099	2,129	2,160	229	240	252	1,260	1,278	1,297
	1%	2,115	2,138	2,162	227	239	251	1,230	1,256	1,281

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	2%	2,137	2,163	2,189	219	228	237	1,181	1,203	1,224

Source: author's own analysis of CLHLS

Table A7. 14 The differences in the average number of people who will require different types of LTC between baseline, and scenarios of a 1% and 2% increase in urban China (unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	1% and 0%	6	0	0	1	0	0
	2% and 0%	12	0	0	1	0	0
2016	1% and 0%	16	0	0	1	0	0
	2% and 0%	33	0	0	2	0	0
2017	1% and 0%	33	0	0	4	0	-1
	2% and 0%	63	0	0	6	0	-1
2018	1% and 0%	54	0	-1	8	0	-2
	2% and 0%	99	0	-1	14	-1	-5
2019	1% and 0%	65	1	-2	12	-1	-4
	2% and 0%	134	0	-5	20	-1	-12
2020	1% and 0%	93	1	-6	9	0	-8
	2% and 0%	178	0	-8	14	-2	-13
2021	1% and 0%	110	3	-4	13	-3	-36

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	2% and 0%	218	3	-1	22	-4	-44
2022	1% and 0%	138	-2	-10	7	-1	-34
	2% and 0%	257	-4	-26	22	-9	-37
2023	1% and 0%	132	1	-5	7	-2	-41
	2% and 0%	298	2	-39	9	-11	-74
2024	1% and 0%	137	-3	-28	9	-1	-23
	2% and 0%	283	-2	-45	34	-12	-76

Source: author's own analysis of CLHLS

Table A7. 15 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services from 2015 to 2024 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	0%	56%	57%	57%	2%	3%	3%	7%	7%	7%
	1%	56%	57%	57%	2%	2%	3%	7%	7%	7%
	2%	56%	57%	57%	2%	2%	3%	7%	7%	7%
2016	0%	56%	57%	57%	3%	3%	3%	7%	7%	7%
	1%	56%	57%	57%	3%	3%	3%	7%	7%	7%
	2%	57%	57%	57%	3%	3%	3%	7%	7%	7%
2017	0%	47%	47%	47%	2%	2%	2%	9%	9%	9%
	1%	47%	47%	48%	2%	2%	2%	9%	9%	9%
	2%	48%	48%	48%	2%	2%	2%	9%	9%	9%
2018	0%	47%	47%	47%	2%	2%	2%	9%	9%	9%
	1%	47%	48%	48%	2%	2%	2%	9%	9%	9%
	2%	48%	48%	48%	2%	2%	2%	9%	9%	9%
2019	0%	44%	44%	44%	2%	2%	2%	11%	11%	11%
	1%	44%	44%	45%	2%	2%	2%	11%	11%	11%
	2%	45%	45%	45%	2%	2%	2%	11%	11%	11%
2020	0%	43%	43%	43%	2%	2%	2%	11%	12%	12%

	1%	44%	44%	44%	2%	2%	2%	11%	11%	11%
	2%	44%	45%	45%	2%	2%	2%	11%	11%	11%
2021	0%	40%	40%	40%	2%	2%	2%	13%	13%	13%
	1%	41%	41%	41%	2%	2%	2%	13%	13%	13%
	2%	42%	42%	42%	2%	2%	2%	13%	13%	13%
2022	0%	38%	38%	38%	2%	2%	2%	14%	14%	14%
	1%	39%	40%	40%	2%	2%	2%	13%	14%	14%
	2%	40%	41%	41%	2%	2%	2%	13%	13%	13%
2023	0%	35%	36%	36%	2%	2%	2%	15%	15%	16%
	1%	37%	37%	37%	2%	2%	2%	15%	15%	15%
	2%	39%	39%	39%	2%	2%	2%	14%	15%	15%
2024	0%	35%	35%	35%	2%	2%	2%	16%	16%	16%
	1%	36%	37%	37%	2%	2%	2%	15%	15%	15%
	2%	38%	38%	38%	2%	2%	2%	15%	15%	15%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	**average**	**95%**	**-95%**	**average**	**95%**	**-95%**	**average**	**95%**
2015	0%	13%	13%	13%	2%	2%	2%	19%	19%	19%
	1%	13%	13%	13%	2%	2%	2%	19%	19%	19%
	2%	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	0%	13%	13%	13%	2%	2%	2%	19%	19%	19%
	1%	13%	13%	13%	2%	2%	2%	18%	19%	19%
	2%	13%	13%	13%	2%	2%	2%	18%	18%	19%

2017	0%	17%	17%	17%	2%	2%	2%	23%	23%	22%
	1%	17%	17%	17%	2%	2%	2%	22%	22%	22%
	2%	17%	17%	17%	2%	2%	2%	22%	22%	22%
2018	0%	17%	17%	17%	2%	2%	2%	22%	22%	22%
	1%	17%	17%	17%	2%	2%	2%	22%	22%	22%
	2%	17%	17%	17%	2%	2%	2%	21%	21%	21%
2019	0%	19%	19%	19%	2%	2%	2%	22%	21%	21%
	1%	19%	19%	19%	2%	2%	2%	21%	21%	21%
	2%	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	0%	20%	20%	20%	2%	2%	3%	21%	21%	21%
	1%	20%	20%	20%	2%	2%	2%	20%	20%	20%
	2%	20%	20%	20%	2%	2%	2%	20%	20%	20%
2021	0%	22%	22%	22%	3%	3%	3%	20%	20%	20%
	1%	22%	22%	22%	2%	3%	3%	19%	19%	19%
	2%	22%	22%	22%	2%	2%	2%	19%	19%	19%
2022	0%	24%	24%	24%	3%	3%	3%	19%	19%	19%
	1%	24%	24%	24%	3%	3%	3%	18%	18%	18%
	2%	24%	24%	24%	3%	3%	3%	18%	18%	18%
2023	0%	27%	27%	27%	3%	3%	3%	17%	17%	17%
	1%	26%	26%	27%	3%	3%	3%	16%	16%	16%
	2%	26%	26%	26%	3%	3%	3%	15%	16%	16%
2024	0%	27%	27%	27%	3%	3%	3%	16%	16%	16%
	1%	27%	27%	27%	3%	3%	3%	16%	16%	16%

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	2%	27%	27%	27%	3%	3%	3%	15%	15%	15%

Source: author's own analysis of CLHLS

Table A7. 16 The changes in the average percentage of people who will require different type of LTC services between baseline and scenarios of a 1% and 2% increase per year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	0%	0%	0%	0%	0%	0%
2016	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	0%	0%	0%	0%	0%	0%
2017	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	1%	0%	0%	0%	0%	0%
2018	1% and 0%	0%	0%	0%	0%	0%	0%
	2% and 0%	1%	0%	0%	0%	0%	-1%
2019	1% and 0%	1%	0%	0%	0%	0%	0%
	2% and 0%	1%	0%	0%	0%	0%	-1%
2020	1% and 0%	1%	0%	0%	0%	0%	0%
	2% and 0%	2%	0%	0%	0%	0%	-1%
2021	1% and 0%	1%	0%	0%	0%	0%	-1%

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	2% and 0%	2%	0%	0%	0%	0%	-1%
2022	1% and 0%	1%	0%	0%	0%	0%	-1%
	2% and 0%	2%	0%	-1%	0%	0%	-1%
2023	1% and 0%	1%	0%	0%	0%	0%	-1%
	2% and 0%	3%	0%	-1%	-1%	0%	-1%
2024	1% and 0%	1%	0%	0%	-1%	0%	0%
	2% and 0%	3%	0%	-1%	-1%	0%	-1%

Source: author's own analysis of CLHLS

Appendix 8 The reduction in the number of children

The mean of the number of living children for people who are aged 65-74, aged 75-84 and aged 85+ in 2015 and in 2024 respectively by residence (rural/urban) can be estimated from CHARLS (2011-2013) and CLHLS (2008-2011) using Stata.

CLARLS (2011-2013) is the most recent data, which can be used to estimate the mean of the number of living children. Older people who are aged 65-74, aged 75-84 and aged 85+ in 2015 are aged 63-72, aged 73-82 and aged 83+ in 2013 respectively; Older people who are aged 65-74, aged 75-84 and aged 85+ in 2024 are aged 54-63, aged 64-73 and aged 74+ in 2013 respectively. The mean of the number of living children for older people by residence and by their age in 2013 are presented in table A11.1.

However, the number of observations for older people who are aged 83+ and who are aged 74+ in 2013 are low. The number of observations of people who are aged 70+ in CLHLS (2008-2011) is higher than the observation in this number in CLARLS, and thus CLHLS (2008-2011) is used to estimate the mean of the number of people who are aged 85+ in 2015 and 2024. Older people who are aged 85+ in 2015 and who are aged 85+ in 2024 are aged 81+ and who are aged 72+ in 2011 respectively. The mean of the number of living children for older people by residence and by their age in 2011 are presented in table A11.2.

Table A8. 1 The mean of the number of living children by age group

Age in 2015	Age in 2013	Mean of the number of living children		Numbers of observation in the CHARLS
		Urban	Rural	
65-74	63-72	2.5	3.3	Over 1,000
75-84	73-82	3.2	4.1	Over 1,000
85+	82+	3.5	4.1	Less than 200
Age in 2024	Age in 2013	Mean of the number of living children		Numbers of observation in the CHARLS
		Urban	Rural	
65-74	54-63	1.7	2.4	Over 1,000
75-84	64-73	2.5	3.3	Over 1,000
85+	74+	3.5	4.1	Less than 600

Source: author's own analysis of CHARLS (2011-2013)

Table A8. 2 The mean of the number of living children by age group

Age in 2015	Age in 2011	Mean of the number of living children		Numbers of observation in the CHARLS
		Urban	Rural	
65-74	61-70	2.8	3.3	Less than 500
75-84	71-80	3.5	4.1	Less than 500
85+	81+	3.5	4.1	Over 1,000
Age in 2024	Age in 2011	Mean of the number of living children		Numbers of observation in the CHARLS
		Urban	Rural	
65-74	52-61	3.1	2.3	Less than 800
75-84	62-71	2.8	3.3	Less than 800
85+	72+	3.5	4.1	Over 5,000

Source: author's own analysis of CLHLS (2008-2011)

It is assumed that for each age group, the reduced number of living children for each year is the same. With this assumption, the decreased number of living children for each year by age group is estimated as one tenth of the differences in numbers of living children for the same age group in two different cohorts.

The reduced numbers of living children for each age group are also presented in TableA11. 3, which is used to estimate reduced amount of provision of informal care for each year, then used to estimate the provision of informal care each year.

Table A8. 3 The mean numbers of living children by age group

Region	Age group	The mean of the number of living children in 2015	The mean of the number of living children in 2024	The difference in the means of number of living children for the same age group in two different years	The estimated decreased number of living children for each year
Urban	65-74	2.5	1.7	0.8	0.08
	75-84	3.2	2.5	0.7	0.07
	85+	3.5	3.5	0	0
Rural	65-74	3.3	2.4	0.9	0.09
	75-84	4.1	3.3	0.8	0.08
	85+	4.1	4.1	0	0

Source: author's own analysis of CHARLS (2011-2013) and CLHLS (2008-2011)

Appendix 9 The results from the scenario 3

9A Informal care which is provided by children decreases proportionally to the reduction in the number of living children for rural China

Table A9A. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care at the baseline and the experiments 1 and 2 from 2015 to 2024 in rural China (unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 1	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 2	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 1	3,901	3,919	3,937	4,555	4,615	4,676	8,456	8,534	8,613
	Experiment 2	3,901	3,919	3,937	4,555	4,615	4,676	8,456	8,534	8,613
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 1	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,050

	Experiment 2	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 1	5,589	5,606	5,623	3,719	3,776	3,834	9,308	9,382	9,457
	Experiment 2	5,589	5,606	5,623	3,719	3,777	3,834	9,308	9,382	9,456
2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 1	4,939	4,978	5,016	4,644	4,761	4,878	9,583	9,739	9,895
	Experiment 2	4,938	4,977	5,017	4,646	4,762	4,878	9,584	9,739	9,894
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 1	5,147	5,166	5,186	4,906	4,986	5,065	10,053	10,152	10,251
	Experiment 2	5,147	5,166	5,185	4,906	4,986	5,065	10,053	10,152	10,251
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 1	5,376	5,415	5,455	4,951	5,075	5,200	10,327	10,491	10,655
	Experiment 2	5,377	5,416	5,456	4,949	5,074	5,199	10,326	10,490	10,655
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 1	5,501	5,530	5,559	5,259	5,342	5,424	10,760	10,871	10,982
	Experiment 2	5,501	5,530	5,560	5,258	5,341	5,423	10,759	10,871	10,983
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 1	5,253	5,285	5,318	5,617	5,732	5,846	10,870	11,017	11,164
	Experiment 2	5,243	5,286	5,329	5,580	5,725	5,870	10,823	11,011	11,199
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 1	5,089	5,121	5,152	5,845	5,947	6,049	10,935	11,068	11,201

	Experiment 2	5,096	5,121	5,146	5,857	5,945	6,033	10,952	11,065	11,179

Source: author's own analysis of CLHLS

Table A9A. 2 The changes in the average number of people who will and who will not need care between the baseline and the experiments 1 and 2 in rural China (Unit: 10,000)

Year	Comparisons	will not need care			will care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2016	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2017	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2018	Experiment 1 and baseline	-1	-1	-1	0	1	1
	Experiment 2 and baseline	-1	-1	-1	1	1	1
2019	Experiment 1 and baseline	-1	-1	-1	0	1	2
	Experiment 2 and baseline	-1	-1	-1	1	1	1
2020	Experiment 1 and baseline	-1	-1	-1	1	1	1
	Experiment 2 and baseline	-1	-1	-1	1	1	1
2021	Experiment 1 and baseline	-2	-2	-3	2	3	4
	Experiment 2 and baseline	0	-1	-2	0	2	3
2022	Experiment 1 and baseline	-7	-5	-3	3	6	10
	Experiment 2 and baseline	-6	-4	-2	1	5	9
2023	Experiment 1 and baseline	-17	-3	11	-27	9	46
	Experiment 2 and baseline	-5	-2	1	-3	3	9
2024	Experiment 1 and baseline	-9	-7	-6	4	9	14
	Experiment 2 and baseline	-15	-7	1	-2	7	15

Source: author's own analysis of CLHLS

Table A9A. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care at the baseline and the experiments1 and 2 for rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 1	42%	42%	42%	58%	58%	58%
	Experiment 2	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 1	46%	46%	46%	54%	54%	54%
	Experiment 2	46%	46%	46%	54%	54%	54%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 1	61%	61%	62%	38%	39%	39%
	Experiment 2	61%	61%	62%	38%	39%	39%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 1	59%	60%	60%	40%	40%	41%
	Experiment 2	59%	60%	60%	40%	40%	41%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 1	51%	51%	52%	48%	49%	49%
	Experiment 2	51%	51%	52%	48%	49%	49%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 1	51%	51%	51%	49%	49%	49%
	Experiment 2	51%	51%	51%	49%	49%	49%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 1	51%	52%	52%	48%	48%	49%
	Experiment 2	51%	52%	52%	48%	48%	49%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 1	51%	51%	51%	49%	49%	49%
	Experiment 2	51%	51%	51%	49%	49%	49%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 1	48%	48%	48%	52%	52%	52%
	Experiment 2	48%	48%	48%	52%	52%	52%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 1	46%	46%	47%	53%	54%	54%
	Experiment 2	46%	46%	47%	53%	54%	54%

Source: author's own analysis of CLHLS

Table A9A. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 1 and 2 from 2015 to 2024 in rural China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2024	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

Table A9A. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services at the baseline and the experiments 1 and 2 for each year from 2015 to 2024 for rural China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 1	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 2	2,773	2,791	2,808	86	90	95	348	356	365
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 1	2,732	2,750	2,769	87	91	95	326	336	346
	Experiment 2	2,732	2,750	2,769	87	91	95	327	337	347
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 1	1,673	1,700	1,727	212	222	233	355	367	379
	Experiment 2	1,673	1,700	1,727	212	222	233	356	369	381
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 1	1,879	1,893	1,906	221	229	238	355	366	378
	Experiment 2	1,879	1,893	1,906	221	229	238	358	369	380
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 1	2,326	2,372	2,418	281	290	300	463	474	485
	Experiment 2	2,326	2,372	2,417	281	290	300	468	478	489
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 1	2,466	2,491	2,515	301	312	323	445	458	471
	Experiment 2	2,466	2,490	2,515	302	312	323	451	464	476

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2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 1	2,312	2,345	2,378	362	379	397	480	494	509
	Experiment 2	2,310	2,344	2,377	362	379	397	485	501	516
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 1	2,457	2,478	2,499	395	402	409	464	475	486
	Experiment 2	2,456	2,477	2,497	395	402	410	472	484	496
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 1	2,599	2,634	2,668	433	451	468	479	484	489
	Experiment 2	2,565	2,623	2,681	433	455	477	485	490	495
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 1	2,710	2,738	2,767	459	476	494	483	500	518
	Experiment 2	2,711	2,735	2,760	465	479	492	490	506	522
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 1	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 2	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 1	218	226	233	98	103	108	1,094	1,109	1,125
	Experiment 2	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 1	253	264	275	137	143	148	747	767	787
	Experiment 2	253	264	275	137	143	148	745	765	786
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 1	290	297	304	128	135	141	846	857	868

	Experiment 2	290	297	304	128	135	141	844	854	865
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 1	356	367	378	191	201	210	1,027	1,057	1,087
	Experiment 2	356	367	378	191	201	210	1,024	1,054	1,083
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 1	412	420	427	171	180	189	1,111	1,126	1,141
	Experiment 2	412	420	427	171	180	189	1,105	1,121	1,136
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 1	467	482	497	178	186	194	1,152	1,189	1,225
	Experiment 2	468	483	498	178	186	194	1,145	1,181	1,217
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 1	541	556	572	157	165	173	1,247	1,266	1,284
	Experiment 2	542	558	573	157	165	173	1,237	1,256	1,275
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 1	598	617	636	156	163	171	1,352	1,383	1,413
	Experiment 2	596	623	650	161	167	174	1,340	1,354	1,393
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 1	677	693	708	137	144	151	1,379	1,396	1,412
	Experiment 2	684	695	707	140	147	154	1,366	1,382	1,398

Source: author's own analysis of CLHLS

Table A9A. 6 The changes in the average number of people who will require different type of LTC between the baseline and experiments 1 and 2 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2016	Experiment 1 and baseline	-1	0	0	0	0	1
	Experiment 2 and baseline	-1	0	1	0	0	0
2017	Experiment 1 and baseline	-1	0	0	0	0	2
	Experiment 2 and baseline	-1	0	1	0	0	0
2018	Experiment 1 and baseline	-2	0	0	0	0	3
	Experiment 2 and baseline	-2	0	3	0	0	0
2019	Experiment 1 and baseline	-4	0	1	0	0	4
	Experiment 2 and baseline	-4	0	5	0	0	0
2020	Experiment 1 and baseline	-5	0	1	0	0	6
	Experiment 2 and baseline	-6	0	7	0	0	0
2021	Experiment 1 and baseline	-5	0	0	0	0	7

	Experiment 2 and baseline	-6	0	6	1	0	0
2022	Experiment 1 and baseline	-7	1	3	-1	1	10
	Experiment 2 and baseline	-8	1	11	0	1	0
2023	Experiment 1 and baseline	-2	-6	1	-3	-3	23
	Experiment 2 and baseline	-13	-2	7	3	1	7
2024	Experiment 1 and baseline	-4	4	2	5	-1	4
	Experiment 2 and baseline	-7	6	8	8	2	-10

Source: author's own analysis of CLHLS

Table A9A. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services at the baseline and the experiments 1 and 2 from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 1	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 2	59%	59%	60%	2%	2%	2%	7%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 1	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 2	60%	60%	61%	2%	2%	2%	7%	7%	7%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 1	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 2	50%	49%	51%	6%	6%	7%	11%	11%	11%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 1	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 2	51%	50%	51%	6%	6%	6%	10%	10%	10%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 1	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 2	50%	50%	52%	6%	6%	6%	10%	10%	10%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 1	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 2	50%	50%	51%	6%	6%	6%	9%	9%	9%

2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 1	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 2	47%	46%	48%	7%	7%	8%	10%	10%	10%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 1	47%	46%	48%	8%	8%	8%	9%	9%	9%
	Experiment 2	47%	46%	48%	8%	8%	8%	9%	9%	9%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 1	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 2	46%	46%	48%	8%	8%	8%	9%	9%	8%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 1	46%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 2	46%	46%	47%	8%	8%	8%	8%	9%	9%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 1	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 2	4%	4%	4%	2%	2%	2%	25%	25%	25%
2016	Baseline	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 1	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 2	5%	5%	5%	2%	2%	2%	24%	24%	24%
2017	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 1	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 2	8%	8%	8%	4%	4%	4%	22%	22%	22%
2018	Baseline	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 1	8%	8%	8%	3%	4%	4%	23%	23%	23%

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	Experiment 2	8%	8%	8%	3%	4%	4%	23%	23%	23%
2019	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 1	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 2	8%	8%	8%	4%	4%	4%	22%	22%	22%
2020	Baseline	8%	8%	8%	3%	4%	4%	23%	22%	22%
	Experiment 1	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 2	8%	8%	8%	3%	4%	4%	23%	22%	22%
2021	Baseline	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 1	9%	9%	10%	4%	4%	4%	23%	23%	24%
	Experiment 2	9%	10%	10%	4%	4%	4%	23%	23%	23%
2022	Baseline	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 1	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 2	10%	10%	11%	3%	3%	3%	24%	24%	24%
2023	Baseline	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 1	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 2	11%	11%	11%	3%	3%	3%	24%	23%	24%
2024	Baseline	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 1	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 2	12%	12%	12%	2%	2%	3%	23%	23%	23%

Source: author's own analysis of CLHLS

Table A9A. 8 The changes in the average percentage of people who will require different type of LTC between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%

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	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2024	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

9B Informal care which is provided by children reduces to none for rural China

Table A9B. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care at the baseline, the experiments 3 and 4 from 2015 to 2024 in rural China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 3	3,403	3,421	3,440	4,683	4,739	4,795	8,086	8,160	8,235
	Experiment 4	3,403	3,421	3,440	4,683	4,739	4,795	8,086	8,160	8,235
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 3	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 4	3,901	3,919	3,937	4,553	4,615	4,678	8,454	8,534	8,615
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 3	5,402	5,448	5,494	3,384	3,473	3,559	8,786	8,921	9,053
	Experiment 4	5,402	5,448	5,493	3,383	3,471	3,561	8,785	8,919	9,054
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 3	5,569	5,587	5,604	3,738	3,796	3,854	9,307	9,382	9,457
	Experiment 4	5,571	5,588	5,606	3,736	3,794	3,852	9,307	9,382	9,458

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2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 3	4,914	4,956	4,998	4,669	4,788	4,907	9,584	9,744	9,905
	Experiment 4	4,915	4,958	5,001	4,664	4,784	4,903	9,579	9,742	9,904
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 3	5,129	5,147	5,166	4,936	5,014	5,092	10,065	10,162	10,258
	Experiment 4	5,130	5,148	5,166	4,929	5,008	5,088	10,058	10,156	10,255
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 3	5,378	5,407	5,437	4,959	5,094	5,229	10,338	10,502	10,666
	Experiment 4	5,376	5,406	5,435	4,954	5,087	5,221	10,330	10,493	10,656
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 3	5,469	5,497	5,525	5,309	5,386	5,463	10,778	10,883	10,988
	Experiment 4	5,481	5,514	5,548	5,280	5,361	5,442	10,761	10,876	10,990
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 3	5,208	5,249	5,289	5,698	5,798	5,899	10,906	11,047	11,188
	Experiment 4	5,193	5,233	5,274	5,671	5,794	5,917	10,864	11,027	11,191
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 3	5,080	5,117	5,154	5,874	5,970	6,067	10,954	11,087	11,221
	Experiment 4	5,082	5,122	5,162	5,860	5,949	6,038	10,942	11,071	11,200

Source: author's own analysis of CLHLS

Table A9B. 2 The changes in the average number of people who will and who will not need care from 2015 to 2024 between the baseline, and the experiments 3 and 4 in rural China (Unit:10, 000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0	0	0	0	0	0
	Experiment 4 and baseline	0	0	0	0	0	0
2016	Experiment 3 and baseline	0	0	0	0	0	0
	Experiment 4 and baseline	0	0	0	-1	0	1
2017	Experiment 3 and baseline	-10	-9	-8	8	9	10
	Experiment 4 and baseline	-10	-9	-9	6	9	12
2018	Experiment 3 and baseline	-20	-20	-20	19	20	21
	Experiment 4 and baseline	-19	-18	-17	17	18	19
2019	Experiment 3 and baseline	-25	-22	-19	25	28	30
	Experiment 4 and baseline	-24	-21	-17	20	23	27
2020	Experiment 3 and baseline	-20	-20	-21	32	30	28
	Experiment 4 and baseline	-18	-19	-20	24	24	24
2021	Experiment 3 and baseline	-1	-12	-21	10	22	33
	Experiment 4 and baseline	-1	-10	-23	5	15	25
2022	Experiment 3 and baseline	-38	-37	-37	53	51	49
	Experiment 4 and baseline	-27	-20	-14	24	26	28
2023	Experiment 3 and baseline	-34	-55	-45	126	76	25
	Experiment 4 and baseline	-49	-39	-61	99	72	44
2024	Experiment 3 and baseline	-15	-11	-7	33	32	31
	Experiment 4 and baseline	-12	-6	1	18	11	3

Source: author's own analysis of CLHLS

Table A9B. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care at the at the baseline, the experiments 3 and 4 from 2015 to 2024 in rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 3	42%	42%	42%	58%	58%	58%
	Experiment 4	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 3	46%	46%	46%	54%	54%	54%
	Experiment 4	46%	46%	46%	54%	54%	54%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 3	61%	61%	61%	39%	39%	39%
	Experiment 4	61%	61%	61%	39%	39%	39%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 3	59%	60%	60%	40%	40%	41%
	Experiment 4	59%	60%	60%	40%	40%	41%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 3	50%	51%	51%	49%	49%	50%
	Experiment 4	50%	51%	51%	49%	49%	50%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 3	50%	51%	51%	49%	49%	50%
	Experiment 4	50%	51%	51%	49%	49%	50%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 3	51%	51%	52%	48%	49%	49%
	Experiment 4	51%	52%	52%	48%	48%	49%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 3	50%	51%	51%	49%	49%	50%
	Experiment 4	50%	51%	51%	49%	49%	50%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 3	47%	47%	48%	52%	53%	53%
	Experiment 4	47%	48%	48%	52%	52%	53%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 3	46%	46%	46%	54%	54%	54%
	Experiment 4	46%	46%	46%	54%	54%	54%

Source: author's own analysis of CLHLS

Table A9B. 4 The changes in the average percentage of people who will and who will not need care between the baseline, and experiments 3 and 4 in rural China from 2015 to 2024

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 3 and baseline	0%	-1%	-1%	1%	1%	0%
	Experiment 4 and baseline	0%	-1%	-1%	1%	1%	0%
2024	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

Table A9B. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services at the baseline, the experiments 3 and 4 for each year from 2015 to 2024 for rural China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 3	2,758	2,776	2,794	86	90	95	348	356	365
	Experiment 4	2,758	2,776	2,794	86	90	95	363	371	379
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 3	2,701	2,720	2,739	87	91	95	325	335	346
	Experiment 4	2,701	2,720	2,739	87	91	95	356	367	378
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 3	1,643	1,669	1,694	213	224	234	355	367	379
	Experiment 4	1,641	1,667	1,693	213	223	234	392	409	426
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 3	1,853	1,866	1,879	223	231	240	352	363	375
	Experiment 4	1,848	1,861	1,874	223	232	241	401	413	424
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 3	2,302	2,347	2,391	286	296	306	459	470	482
	Experiment 4	2,293	2,338	2,384	286	296	306	510	525	540
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 3	2,439	2,462	2,485	307	317	328	440	453	466
	Experiment 4	2,430	2,454	2,478	307	317	328	501	514	527

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2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 3	2,265	2,309	2,353	364	381	399	480	493	507
	Experiment 4	2,264	2,301	2,339	365	384	402	531	551	571
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 3	2,440	2,462	2,484	403	414	424	460	469	479
	Experiment 4	2,417	2,446	2,474	407	413	419	520	528	537
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 3	2,615	2,614	2,670	455	470	485	458	470	481
	Experiment 4	2,581	2,610	2,639	441	462	483	514	531	548
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 3	2,679	2,709	2,739	475	487	500	484	497	511
	Experiment 4	2,677	2,704	2,732	470	479	489	531	545	559
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 3	201	207	213	108	113	119	1,183	1,196	1,195
	Experiment 4	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 3	218	226	233	98	103	108	1,125	1,140	1,125
	Experiment 4	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 3	253	264	275	137	143	148	783	806	787
	Experiment 4	254	265	275	137	143	148	745	765	786
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 3	290	297	304	128	135	141	892	903	868

	Experiment 4	293	299	306	128	135	141	844	854	865
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 3	355	366	377	191	201	210	1,076	1,108	1,087
	Experiment 4	360	370	381	192	201	211	1,023	1,053	1,083
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 3	409	417	425	171	180	188	1,171	1,186	1,141
	Experiment 4	415	423	431	173	182	191	1,103	1,119	1,136
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 3	458	475	492	180	187	195	1,213	1,248	1,225
	Experiment 4	465	486	507	183	192	200	1,146	1,174	1,217
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 3	533	545	556	156	163	171	1,317	1,333	1,284
	Experiment 4	544	557	569	159	167	175	1,234	1,252	1,275
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 3	606	619	632	145	153	160	1,419	1,444	1,413
	Experiment 4	625	630	657	158	166	174	1,352	1,375	1,393
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 3	672	686	699	135	142	149	1,429	1,449	1,412
	Experiment 4	677	691	705	145	152	160	1,360	1,377	1,398

Source: author's own analysis of CLHLS

Table A9B. 6 The changes in the average number of people who will require different type of LTC at the baseline, and the experiments 3 and 4 from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	-15	0	0	0	0	15
	Experiment 4 and baseline	-15	0	15	0	0	0
2016	Experiment 3 and baseline	-31	0	0	0	0	31
	Experiment 4 and baseline	-31	0	31	0	0	0
2017	Experiment 3 and baseline	-33	1	0	0	0	41
	Experiment 4 and baseline	-34	1	42	1	0	0
2018	Experiment 3 and baseline	-28	2	-3	0	0	49
	Experiment 4 and baseline	-34	3	46	3	0	0
2019	Experiment 3 and baseline	-29	6	-3	-1	0	55
	Experiment 4 and baseline	-37	6	51	3	1	-1
2020	Experiment 3 and baseline	-34	5	-4	-3	0	65
	Experiment 4 and baseline	-42	5	57	3	2	-2
2021	Experiment 3 and baseline	-40	2	-1	-7	1	67

	Experiment 4 and baseline	-48	5	56	4	5	-7
2022	Experiment 3 and baseline	-22	12	-3	-13	-1	77
	Experiment 4 and baseline	-39	12	56	-1	3	-4
2023	Experiment 3 and baseline	-22	13	-14	-1	-13	84
	Experiment 4 and baseline	-26	5	48	10	-1	15
2024	Experiment 3 and baseline	-34	15	-2	-2	-3	57
	Experiment 4 and baseline	-38	7	46	4	7	-15

Source: author's own analysis of CLHLS

Table A9B. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 3	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 4	59%	59%	60%	2%	2%	2%	8%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 3	59%	59%	60%	2%	2%	2%	7%	7%	7%
	Experiment 4	59%	59%	60%	2%	2%	2%	8%	8%	8%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 3	49%	48%	50%	6%	6%	7%	10%	11%	11%
	Experiment 4	49%	48%	50%	6%	6%	7%	12%	12%	12%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 3	50%	49%	50%	6%	6%	6%	9%	10%	10%
	Experiment 4	49%	49%	50%	6%	6%	6%	11%	11%	11%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 3	49%	49%	51%	6%	6%	6%	10%	10%	10%
	Experiment 4	49%	49%	51%	6%	6%	6%	11%	11%	11%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 3	49%	49%	50%	6%	6%	7%	9%	9%	9%
	Experiment 4	49%	49%	50%	6%	6%	6%	10%	10%	10%

2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 3	46%	45%	47%	7%	7%	8%	10%	10%	10%
	Experiment 4	46%	45%	47%	7%	8%	8%	11%	11%	11%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 3	46%	46%	47%	8%	8%	8%	9%	9%	9%
	Experiment 4	46%	46%	47%	8%	8%	8%	10%	10%	10%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 3	46%	46%	47%	8%	8%	8%	8%	8%	8%
	Experiment 4	46%	45%	47%	8%	8%	8%	9%	9%	9%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 3	46%	45%	47%	8%	8%	8%	8%	8%	9%
	Experiment 4	46%	45%	47%	8%	8%	8%	9%	9%	9%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 3	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 4	4%	4%	4%	2%	2%	2%	25%	25%	25%
2016	Baseline	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 3	5%	5%	5%	2%	2%	2%	25%	25%	24%
	Experiment 4	5%	5%	5%	2%	2%	2%	24%	24%	24%
2017	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 3	7%	8%	8%	4%	4%	4%	23%	23%	22%
	Experiment 4	8%	8%	8%	4%	4%	4%	22%	22%	22%
2018	Baseline	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 3	8%	8%	8%	3%	4%	4%	24%	24%	23%

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	Experiment 4	8%	8%	8%	3%	4%	4%	23%	23%	22%
2019	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 3	8%	8%	8%	4%	4%	4%	23%	23%	22%
	Experiment 4	8%	8%	8%	4%	4%	4%	22%	22%	22%
2020	Baseline	8%	8%	8%	3%	4%	4%	23%	22%	22%
	Experiment 3	8%	8%	8%	3%	4%	4%	24%	24%	23%
	Experiment 4	8%	8%	8%	4%	4%	4%	22%	22%	22%
2021	Baseline	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 3	9%	9%	10%	4%	4%	4%	24%	25%	24%
	Experiment 4	9%	10%	10%	4%	4%	4%	23%	23%	23%
2022	Baseline	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 3	10%	10%	10%	3%	3%	3%	25%	25%	24%
	Experiment 4	10%	10%	10%	3%	3%	3%	23%	23%	23%
2023	Baseline	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 3	11%	11%	11%	3%	3%	3%	25%	25%	24%
	Experiment 4	11%	11%	11%	3%	3%	3%	24%	24%	24%
2024	Baseline	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 3	11%	11%	12%	2%	2%	2%	24%	24%	23%
	Experiment 4	12%	12%	12%	2%	3%	3%	23%	23%	23%

Source: author's own analysis of CLHLS

Table A9B. 8 The changes in the average percentage of people who will require different type of LTC service between the baseline, and the experiments 3 and 4 from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2017	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2018	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2019	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2020	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2021	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%

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	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2022	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2023	Experiment 3 and baseline	0%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2024	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4and baseline	-1%	0%	1%	0%	0%	0%

Source: author's own analysis of CLHLS

9C Informal care which is provided by children decreases proportionally to the reduction in the number of living children for urban China

Table A9C. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care at the baseline, the experiments 1 and 2 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			W care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 1	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 2	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 1	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,401
	Experiment 2	3,222	3,236	3,251	4,044	4,097	4,150	7,266	7,334	7,402
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 1	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 2	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 1	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391

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	Experiment 2	3,062	3,087	3,112	5,077	5,177	5,278	8,139	8,265	8,390
2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 1	2,863	2,877	2,891	5,797	5,873	5,950	8,660	8,750	8,841
	Experiment 2	2,863	2,877	2,891	5,796	5,873	5,950	8,659	8,750	8,842
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 1	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 2	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 1	3,113	3,132	3,150	6,601	6,676	6,750	9,714	9,807	9,901
	Experiment 2	3,114	3,133	3,151	6,600	6,675	6,749	9,714	9,807	9,900
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 1	3,280	3,299	3,317	6,967	7,065	7,162	10,248	10,363	10,479
	Experiment 2	3,281	3,300	3,318	6,966	7,064	7,161	10,247	10,363	10,479
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 1	3,313	3,342	3,371	7,329	7,441	7,553	10,642	10,783	10,924
	Experiment 2	3,314	3,343	3,372	7,328	7,440	7,551	10,642	10,783	10,923
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 1	3,173	3,194	3,216	7,789	7,893	7,997	10,962	11,087	11,212
	Experiment 2	3,174	3,195	3,217	7,788	7,892	7,996	10,962	11,087	11,212

Source: author's own analysis of CLHLS

Table A9C. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments1 and 2 from 2015 to 2024 in urban China (Unit: 10, 000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2016	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2017	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2018	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	1	0	-1
2019	Experiment 1 and baseline	0	0	0	1	0	-1
	Experiment 2 and baseline	0	0	0	1	0	0
2020	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2021	Experiment 1 and baseline	-1	-1	-1	1	1	1
	Experiment 2 and baseline	-1	-1	-1	1	1	1
2022	Experiment 1 and baseline	-1	-1	-1	2	2	1
	Experiment 2 and baseline	0	0	0	1	1	1
2023	Experiment 1 and baseline	-3	-3	-2	4	4	4
	Experiment 2 and baseline	-1	-1	-1	2	2	2
2024	Experiment 1 and baseline	-5	-5	-5	10	6	2
	Experiment 2 and baseline	-4	-4	-4	10	6	2

Source: author's own analysis of CLHLS

Table A9C. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care at the baseline, the experiments1and 2 from 2015 to 2024 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 1	40%	40%	40%	60%	60%	60%
	Experiment 2	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 1	44%	44%	44%	56%	56%	56%
	Experiment 2	44%	44%	44%	56%	56%	56%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 1	36%	36%	36%	64%	64%	64%
	Experiment 2	36%	36%	36%	64%	64%	64%
2018	Baseline scenario	37%	37%	38%	62%	63%	63%
	Experiment 1	37%	37%	38%	62%	63%	63%
	Experiment 2	37%	37%	38%	62%	63%	63%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 1	33%	33%	33%	67%	67%	67%
	Experiment 2	33%	33%	33%	67%	67%	67%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 1	33%	33%	33%	67%	67%	67%
	Experiment 2	33%	33%	33%	67%	67%	67%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 1	32%	32%	32%	68%	68%	68%
	Experiment 2	32%	32%	32%	68%	68%	68%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 1	32%	32%	32%	68%	68%	68%
	Experiment 2	32%	32%	32%	68%	68%	68%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 1	31%	31%	31%	69%	69%	69%
	Experiment 2	31%	31%	31%	69%	69%	69%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 1	29%	29%	29%	71%	71%	71%
	Experiment 2	29%	29%	29%	71%	71%	71%

Source: author's own analysis of CLHLS

Table A9C. 4 The changes in the average percentage of people who will and who will not need care between the baseline, and the experiments 1and 2 from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2024	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

Table A9C. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services at the baseline, the experiments 1 and 2 for each year from 2015 to 2024 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 1	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 2	2,336	2,355	2,373	99	104	109	278	285	291
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 1	2,298	2,316	2,333	102	107	111	284	289	295
	Experiment 2	2,298	2,316	2,333	102	107	111	284	290	296
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 1	2,324	2,347	2,371	105	110	115	433	442	452
	Experiment 2	2,324	2,347	2,371	105	110	115	435	445	454
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 1	2,405	2,441	2,476	106	111	116	464	478	493
	Experiment 2	2,405	2,440	2,476	106	111	116	468	483	497
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 1	2,543	2,567	2,592	117	123	129	650	664	678
	Experiment 2	2,543	2,567	2,591	117	123	129	657	671	686
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 1	2,637	2,657	2,677	127	132	137	701	714	726
	Experiment 2	2,636	2,656	2,676	127	132	137	711	724	736

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2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 1	2,621	2,648	2,674	137	144	151	860	871	882
	Experiment 2	2,619	2,645	2,672	137	144	151	874	885	897
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 1	2,655	2,679	2,704	150	155	160	957	976	995
	Experiment 2	2,651	2,676	2,700	150	155	160	976	996	1,015
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 1	2,611	2,639	2,667	161	170	178	1,124	1,149	1,173
	Experiment 2	2,606	2,634	2,661	161	170	178	1,148	1,172	1,197
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 1	2,735	2,758	2,781	176	184	193	1,230	1,247	1,263
	Experiment 2	2,730	2,753	2,776	176	184	193	1,257	1,275	1,293
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-1	average	1	-1	average	1	-1	average	1
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 1	528	535	541	87	91	95	777	790	803
	Experiment 2	528	535	541	87	91	95	777	790	803
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 1	523	531	539	87	92	96	750	763	776
	Experiment 2	523	531	539	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 1	835	851	868	102	107	113	1,115	1,126	1,137
	Experiment 2	834	851	867	102	107	113	1,113	1,124	1,136
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 1	875	897	918	110	116	122	1,117	1,135	1,154

	Experiment 2	875	896	917	110	116	122	1,113	1,132	1,150
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 1	1,106	1,117	1,129	128	133	138	1,253	1,268	1,283
	Experiment 2	1,105	1,117	1,129	128	133	138	1,247	1,262	1,277
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 1	1,233	1,248	1,262	144	152	159	1,283	1,300	1,316
	Experiment 2	1,233	1,247	1,262	144	152	159	1,275	1,291	1,307
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 1	1,466	1,481	1,496	168	173	178	1,349	1,359	1,369
	Experiment 2	1,466	1,480	1,495	168	173	178	1,337	1,347	1,357
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 1	1,679	1,702	1,725	190	200	209	1,337	1,353	1,370
	Experiment 2	1,678	1,700	1,723	190	200	209	1,322	1,338	1,354
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 1	1,958	1,985	2,012	216	226	235	1,259	1,274	1,288
	Experiment 2	1,957	1,984	2,011	216	226	235	1,240	1,255	1,270
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 1	2,131	2,160	2,188	230	240	251	1,288	1,304	1,321
	Experiment 2	2,131	2,159	2,186	230	240	251	1,265	1,281	1,298

Source: author's own analysis of CLHLS

Table A9C. 6 The changes in the average number of people who will require different type of LTC at the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	0	0	0	0	0	0
	Experiment 2 and baseline	0	0	0	0	0	0
2016	Experiment 1 and baseline	-1	0	0	0	0	1
	Experiment 2 and baseline	-1	0	1	0	0	0
2017	Experiment 1 and baseline	-2	0	0	1	0	2
	Experiment 2 and baseline	-2	0	2	0	0	0
2018	Experiment 1 and baseline	-4	0	0	1	0	4
	Experiment 2 and baseline	-4	0	4	0	0	0
2019	Experiment 1 and baseline	-6	0	-1	1	0	6
	Experiment 2 and baseline	-6	0	6	0	0	0
2020	Experiment 1 and baseline	-7	0	-1	0	0	8
	Experiment 2 and baseline	-8	0	10	0	0	-1

2021	Experiment 1 and baseline	-10	0	0	0	0	11
	Experiment 2 and baseline	-12	0	14	-1	0	-1
2022	Experiment 1 and baseline	-12	0	0	0	0	14
	Experiment 2 and baseline	-16	0	19	-1	0	-1
2023	Experiment 1 and baseline	-12	0	0	-2	0	17
	Experiment 2 and baseline	-17	0	23	-3	0	-1
2024	Experiment 1 and baseline	-15	0	-2	-3	0	26
	Experiment 2 and baseline	-20	0	26	-4	0	3

Source: author's own analysis of CLHLS

Table A9C. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services between the baseline, and the experiments 1 and 2 from 2015 to 2024 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	56%	2%	3%	3%	7%	7%	7%
	Experiment 1	57%	57%	56%	2%	3%	3%	7%	7%	7%
	Experiment 2	57%	57%	56%	2%	3%	3%	7%	7%	7%
2016	Baseline	57%	57%	56%	3%	3%	3%	7%	7%	7%
	Experiment 1	57%	57%	56%	3%	3%	3%	7%	7%	7%
	Experiment 2	57%	57%	56%	3%	3%	3%	7%	7%	7%
2017	Baseline	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 1	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 2	47%	47%	47%	2%	2%	2%	9%	9%	9%
2018	Baseline	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 1	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 2	47%	47%	47%	2%	2%	2%	9%	9%	9%
2019	Baseline	44%	44%	44%	2%	2%	2%	11%	11%	11%
	Experiment 1	44%	44%	44%	2%	2%	2%	11%	11%	11%
	Experiment 2	44%	44%	44%	2%	2%	2%	11%	11%	12%
2020	Baseline	43%	43%	43%	2%	2%	2%	11%	12%	12%
	Experiment 1	43%	43%	43%	2%	2%	2%	11%	12%	12%
	Experiment 2	43%	43%	43%	2%	2%	2%	12%	12%	12%

2021	Baseline	40%	40%	40%	2%	2%	2%	13%	13%	13%
	Experiment 1	40%	40%	40%	2%	2%	2%	13%	13%	13%
	Experiment 2	40%	40%	40%	2%	2%	2%	13%	13%	13%
2022	Baseline	38%	38%	38%	2%	2%	2%	14%	14%	14%
	Experiment 1	38%	38%	38%	2%	2%	2%	14%	14%	14%
	Experiment 2	38%	38%	38%	2%	2%	2%	14%	14%	14%
2023	Baseline	36%	36%	35%	2%	2%	2%	15%	15%	16%
	Experiment 1	36%	35%	35%	2%	2%	2%	15%	15%	16%
	Experiment 2	36%	35%	35%	2%	2%	2%	16%	16%	16%
2024	Baseline	35%	35%	35%	2%	2%	2%	16%	16%	16%
	Experiment 1	35%	35%	35%	2%	2%	2%	16%	16%	16%
	Experiment 2	35%	35%	35%	2%	2%	2%	16%	16%	16%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 1	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 2	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 1	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 2	13%	13%	13%	2%	2%	2%	19%	19%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 1	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 2	17%	17%	17%	2%	2%	2%	23%	23%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 1	17%	17%	17%	2%	2%	2%	22%	22%	22%

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	Experiment 2	17%	17%	17%	2%	2%	2%	22%	22%	22%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 1	19%	19%	19%	2%	2%	2%	22%	22%	22%
	Experiment 2	19%	19%	19%	2%	2%	2%	22%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 1	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 2	20%	20%	20%	2%	2%	3%	21%	21%	21%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 1	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 2	22%	22%	22%	3%	3%	3%	20%	20%	20%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 1	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 2	24%	24%	24%	3%	3%	3%	19%	19%	19%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 1	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 2	27%	27%	27%	3%	3%	3%	17%	17%	17%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 1	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 2	27%	27%	27%	3%	3%	3%	16%	16%	16%

Source: author's own analysis of CLHLS

Table A9C. 8 The changes in the average percentage of people who will different type of LTC between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%

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	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2024	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

9D Informal care provided by children reduces to none for urban China

Table A9D. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 3	2,789	2,806	2,823	4,104	4,159	4,213	6,893	6,965	7,036
	Experiment 4	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,035
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 3	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,401
	Experiment 4	3,222	3,236	3,251	4,043	4,097	4,152	7,265	7,334	7,403
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 3	2,781	2,802	2,823	4,916	4,987	5,057	7,697	7,788	7,880
	Experiment 4	2,782	2,803	2,824	4,917	4,986	5,054	7,699	7,788	7,878
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 3	3,058	3,082	3,107	5,084	5,182	5,281	8,141	8,265	8,388
	Experiment 4	3,060	3,085	3,109	5,082	5,180	5,277	8,143	8,265	8,386

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2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 3	2,855	2,869	2,883	5,803	5,882	5,961	8,658	8,751	8,845
	Experiment 4	2,858	2,872	2,887	5,803	5,879	5,955	8,661	8,751	8,842
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 3	3,053	3,072	3,090	6,137	6,213	6,289	9,190	9,285	9,379
	Experiment 4	3,058	3,077	3,096	6,132	6,208	6,284	9,190	9,285	9,379
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 3	3,103	3,122	3,142	6,622	6,689	6,756	9,725	9,811	9,898
	Experiment 4	3,110	3,130	3,149	6,611	6,682	6,753	9,721	9,811	9,902
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 3	3,271	3,295	3,319	6,967	7,075	7,183	10,238	10,370	10,501
	Experiment 4	3,280	3,304	3,328	6,963	7,066	7,168	10,243	10,370	10,496
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 3	3,296	3,322	3,347	7,342	7,465	7,588	10,638	10,787	10,935
	Experiment 4	3,311	3,334	3,358	7,344	7,453	7,562	10,655	10,787	10,920
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 3	3,174	3,185	3,195	7,784	7,911	8,038	10,958	11,096	11,234
	Experiment 4	3,186	3,197	3,209	7,803	7,908	8,013	10,989	11,105	11,222

Source: author's own analysis of CLHLS

Table A9D. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in urban China (Unit:10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0	0	0	-1	0	1
	Experiment 4 and baseline	0	0	0	0	0	0
2016	Experiment 3 and baseline	0	0	0	1	0	-1
	Experiment 4 and baseline	0	0	0	-1	0	1
2017	Experiment 3 and baseline	-3	-3	-3	3	3	2
	Experiment 4 and baseline	-1	-1	-2	4	1	-1
2018	Experiment 3 and baseline	-5	-5	-5	8	5	3
	Experiment 4 and baseline	-2	-3	-3	6	3	-1
2019	Experiment 3 and baseline	-8	-8	-8	7	9	11
	Experiment 4 and baseline	-5	-5	-5	7	6	5
2020	Experiment 3 and baseline	-9	-9	-8	12	12	12
	Experiment 4 and baseline	-4	-4	-3	7	7	6
2021	Experiment 3 and baseline	-12	-11	-10	22	15	7
	Experiment 4 and baseline	-5	-4	-2	11	10	4
2022	Experiment 3 and baseline	-11	-5	0	2	12	22
	Experiment 4 and baseline	-2	-4	9	-2	3	8
2023	Experiment 3 and baseline	-19	-22	-26	17	27	38
	Experiment 4 and baseline	-5	-10	-15	18	15	13
2024	Experiment 3 and baseline	-4	-15	-25	6	25	44
	Experiment 4 and baseline	-8	-2	-12	25	22	19

Source: author's own analysis of CLHLS

Table A9D. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care at the baseline, the experiments 3 and 4 from 2015 to 2024 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 3	40%	40%	40%	60%	60%	60%
	Experiment 4	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 3	44%	44%	44%	56%	56%	56%
	Experiment 4	44%	44%	44%	56%	56%	56%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 3	36%	36%	36%	64%	64%	64%
	Experiment 4	36%	36%	36%	64%	64%	64%
2018	Baseline scenario	38%	37%	37%	62%	63%	63%
	Experiment 3	38%	37%	37%	62%	63%	63%
	Experiment 4	38%	37%	37%	62%	63%	63%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 3	33%	33%	33%	67%	67%	67%
	Experiment 4	33%	33%	33%	67%	67%	67%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 3	33%	33%	33%	67%	67%	67%
	Experiment 4	33%	33%	33%	67%	67%	67%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 3	32%	32%	32%	68%	68%	68%
	Experiment 4	32%	32%	32%	68%	68%	68%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 3	32%	32%	32%	68%	68%	68%
	Experiment 4	32%	32%	32%	68%	68%	68%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 3	31%	31%	31%	69%	69%	69%
	Experiment 4	31%	31%	31%	69%	69%	69%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 3	29%	29%	28%	71%	71%	72%
	Experiment 4	29%	29%	29%	71%	71%	71%

Source: author's own analysis of CLHLS

Table A9D. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 3 and 4 for each year from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2021	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2022	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2023	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2024	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%

Source: author's own analysis of CLHLS

Table A9D. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 3	2,317	2,336	2,355	99	104	109	278	284	291
	Experiment 4	2,317	2,336	2,355	99	104	109	297	303	309
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 3	2,262	2,280	2,297	102	107	111	283	289	295
	Experiment 4	2,262	2,280	2,297	102	107	111	320	326	333
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 3	2,280	2,303	2,325	105	110	115	433	442	451
	Experiment 4	2,276	2,299	2,322	105	110	115	493	500	508
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 3	2,356	2,390	2,423	106	111	116	463	477	490
	Experiment 4	2,348	2,382	2,415	106	111	116	541	555	569
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 3	2,492	2,515	2,539	117	123	129	649	662	676
	Experiment 4	2,481	2,504	2,527	117	123	129	742	757	771
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 3	2,582	2,602	2,622	127	132	137	698	710	722
	Experiment 4	2,566	2,585	2,604	127	132	137	808	823	837

2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 3	2,572	2,597	2,623	138	146	153	858	866	875
	Experiment 4	2,548	2,573	2,598	138	146	153	982	995	1,007
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 3	2,600	2,627	2,655	152	155	158	950	973	996
	Experiment 4	2,571	2,597	2,623	152	155	158	1,095	1,116	1,138
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 3	2,576	2,596	2,616	166	174	182	1,117	1,142	1,168
	Experiment 4	2,532	2,552	2,572	166	173	181	1,271	1,293	1,314
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 3	2,685	2,715	2,744	175	184	193	1,213	1,235	1,257
	Experiment 4	2,657	2,683	2,709	176	184	191	1,376	1,393	1,411
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 3	528	535	541	87	91	95	795	809	822
	Experiment 4	528	535	541	87	91	95	777	790	803
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 3	523	531	539	87	92	96	788	800	812
	Experiment 4	523	531	539	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 3	831	847	864	102	107	113	1,166	1,178	1,190
	Experiment 4	831	847	863	102	107	113	1,110	1,122	1,153
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 3	869	890	911	110	116	122	1,179	1,199	1,218

	Experiment 4	869	890	911	110	116	122	1,108	1,126	1,144
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 3	1,096	1,109	1,121	128	133	138	1,320	1,339	1,358
	Experiment 4	1,096	1,108	1,120	128	133	138	1,238	1,254	1,270
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 3	1,224	1,238	1,252	144	152	159	1,361	1,379	1,396
	Experiment 4	1,222	1,236	1,250	144	152	159	1,265	1,281	1,296
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 3	1,456	1,468	1,481	168	173	177	1,431	1,439	1,448
	Experiment 4	1,454	1,466	1,478	168	173	177	1,320	1,330	1,339
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 3	1,655	1,675	1,696	189	198	207	1,423	1,447	1,472
	Experiment 4	1,649	1,670	1,690	189	198	207	1,309	1,330	1,352
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 3	1,948	1,973	1,997	211	220	230	1,324	1,360	1,396
	Experiment 4	1,946	1,968	1,990	212	221	230	1,217	1,246	1,274
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 3	2,094	2,128	2,162	239	250	260	1,378	1,400	1,422
	Experiment 4	2,094	2,119	2,143	234	246	258	1,266	1,284	1,302

Source: author's own analysis of CLHLS

Table A9D. 6 The changes in the average number of people who require different type of LTC between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	-19	0	0	0	0	19
	Experiment 4 and baseline	-19	0	19	0	0	0
2016	Experiment 3 and baseline	-37	0	0	0	0	37
	Experiment 4 and baseline	-37	0	37	0	0	0
2017	Experiment 3 and baseline	-47	0	-1	-4	0	54
	Experiment 4 and baseline	-50	0	58	-4	0	-2
2018	Experiment 3 and baseline	-55	0	-2	-6	0	67
	Experiment 4 and baseline	-63	0	77	-6	0	-6
2019	Experiment 3 and baseline	-57	0	-3	-8	0	77
	Experiment 4 and baseline	-69	0	92	-9	0	-9
2020	Experiment 3 and baseline	-62	0	-4	-10	0	87
	Experiment 4 and baseline	-79	0	108	-12	0	-11
2021	Experiment 3 and baseline	-60	2	-5	-13	0	91

	Experiment 4 and baseline	-84	2	124	-15	-1	-18
2022	Experiment 3 and baseline	-64	0	-4	-27	-2	108
	Experiment 4 and baseline	-95	0	140	-11	-2	-8
2023	Experiment 3 and baseline	-55	5	-7	-14	-6	104
	Experiment 4 and baseline	-99	4	144	-18	-5	-11
2024	Experiment 3 and baseline	-58	0	-14	-35	10	122
	Experiment 4 and baseline	-90	-1	145	-44	6	5

Source: author's own analysis of CLHLS

Table A9D. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services from 2015 to 2024 at the baseline, the experiments 3 and 4 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	56%	2%	3%	3%	7%	7%	7%
	Experiment 3	56%	56%	56%	2%	3%	3%	7%	7%	7%
	Experiment 4	56%	56%	56%	2%	3%	3%	7%	7%	7%
2016	Baseline	57%	57%	56%	3%	3%	3%	7%	7%	7%
	Experiment 3	56%	56%	55%	3%	3%	3%	7%	7%	7%
	Experiment 4	56%	56%	55%	3%	3%	3%	8%	8%	8%
2017	Baseline	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 3	46%	46%	46%	2%	2%	2%	9%	9%	9%
	Experiment 4	46%	46%	46%	2%	2%	2%	10%	10%	10%
2018	Baseline	47%	47%	47%	2%	2%	2%	9%	9%	9%
	Experiment 3	46%	46%	46%	2%	2%	2%	9%	9%	9%
	Experiment 4	46%	46%	46%	2%	2%	2%	11%	11%	11%
2019	Baseline	44%	44%	44%	2%	2%	2%	11%	11%	11%
	Experiment 3	43%	43%	43%	2%	2%	2%	11%	11%	11%
	Experiment 4	43%	43%	42%	2%	2%	2%	13%	13%	13%
2020	Baseline	43%	43%	43%	2%	2%	2%	11%	12%	12%
	Experiment 3	42%	42%	42%	2%	2%	2%	11%	11%	11%
	Experiment 4	42%	42%	41%	2%	2%	2%	13%	13%	13%

2021	Baseline	40%	40%	40%	2%	2%	2%	13%	13%	13%
	Experiment 3	39%	39%	39%	2%	2%	2%	13%	13%	13%
	Experiment 4	39%	39%	38%	2%	2%	2%	15%	15%	15%
2022	Baseline	38%	38%	38%	2%	2%	2%	14%	14%	14%
	Experiment 3	37%	37%	37%	2%	2%	2%	14%	14%	14%
	Experiment 4	37%	37%	37%	2%	2%	2%	16%	16%	16%
2023	Baseline	36%	36%	35%	2%	2%	2%	15%	15%	16%
	Experiment 3	35%	35%	34%	2%	2%	2%	15%	15%	15%
	Experiment 4	34%	34%	34%	2%	2%	2%	17%	17%	17%
2024	Baseline	35%	35%	35%	2%	2%	2%	16%	16%	16%
	Experiment 3	34%	34%	34%	2%	2%	2%	16%	16%	16%
	Experiment 4	34%	34%	34%	2%	2%	2%	18%	18%	18%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 3	13%	13%	13%	2%	2%	2%	19%	19%	20%
	Experiment 4	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 3	13%	13%	13%	2%	2%	2%	19%	20%	20%
	Experiment 4	13%	13%	13%	2%	2%	2%	19%	19%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 3	17%	17%	17%	2%	2%	2%	24%	24%	24%
	Experiment 4	17%	17%	17%	2%	2%	2%	23%	23%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 3	17%	17%	17%	2%	2%	2%	23%	23%	23%

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	Experiment 4	17%	17%	17%	2%	2%	2%	22%	22%	22%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 3	19%	19%	19%	2%	2%	2%	23%	23%	23%
	Experiment 4	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 3	20%	20%	20%	2%	2%	3%	22%	22%	22%
	Experiment 4	20%	20%	20%	2%	2%	3%	21%	21%	21%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 3	22%	22%	22%	3%	3%	3%	22%	22%	21%
	Experiment 4	22%	22%	22%	3%	3%	3%	20%	20%	20%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 3	24%	24%	24%	3%	3%	3%	20%	20%	20%
	Experiment 4	24%	24%	24%	3%	3%	3%	19%	19%	19%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 3	27%	26%	26%	3%	3%	3%	18%	18%	18%
	Experiment 4	27%	26%	26%	3%	3%	3%	17%	17%	17%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 3	27%	27%	27%	3%	3%	3%	18%	18%	18%
	Experiment 4	27%	27%	27%	3%	3%	3%	16%	16%	16%

Source: author's own analysis of CLHLS

Table A9D. 8 The changes in the average percentage of people who will require different type of LTC between the baseline and the experiments 3 and 4 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2017	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2018	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2019	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2020	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2021	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%

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	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2022	Experiment 3 and baseline	-1%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2023	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2024	Experiment 3 and baseline	-1%	0%	0%	-1%	0%	1%
	Experiment 4 and baseline	-1%	0%	2%	-1%	0%	0%

Source: author's own analysis of CLHLS

Appendix 10 The results from scenario 4

10A An increase in the proportion of individual with disability by 1% per year is accompanied by a reduction in informal care provided by children that is proportional to the number of living children for rural China

Table A10A. 1Population projection: the average number (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 in rural China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 1	3,395	3,414	3,433	4,691	4,746	4,802	8,086	8,160	8,235
	Experiment 2	3,395	3,414	3,433	4,691	4,746	4,802	8,086	8,160	8,235
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 1	3,881	3,899	3,917	4,574	4,635	4,696	8,456	8,534	8,613
	Experiment 2	3,881	3,899	3,917	4,574	4,635	4,696	8,456	8,534	8,613
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 1	5,377	5,420	5,464	3,416	3,499	3,583	8,793	8,920	9,047

	Experiment 2	5,377	5,420	5,464	3,415	3,499	3,584	8,792	8,920	9,047
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 1	5,543	5,560	5,577	3,766	3,822	3,879	9,309	9,382	9,456
	Experiment 2	5,543	5,560	5,577	3,766	3,822	3,878	9,309	9,382	9,456
2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 1	4,885	4,920	4,956	4,697	4,814	4,931	9,582	9,734	9,887
	Experiment 2	4,884	4,921	4,957	4,698	4,814	4,930	9,582	9,734	9,887
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 1	5,058	5,083	5,107	4,975	5,052	5,129	10,033	10,135	10,236
	Experiment 2	5,059	5,083	5,107	4,976	5,052	5,127	10,034	10,134	10,234
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 1	5,275	5,310	5,345	5,045	5,151	5,256	10,321	10,461	10,601
	Experiment 2	5,276	5,311	5,346	5,045	5,149	5,253	10,321	10,460	10,600
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 1	5,352	5,394	5,436	5,309	5,422	5,536	10,661	10,816	10,972
	Experiment 2	5,350	5,395	5,439	5,307	5,421	5,535	10,657	10,815	10,974
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 1	5,079	5,118	5,157	5,741	5,866	5,991	10,820	10,984	11,148
	Experiment 2	5,060	5,106	5,151	5,736	5,870	6,004	10,796	10,976	11,156
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 1	4,946	4,982	5,017	5,922	6,022	6,122	10,869	11,004	11,139

	Experiment 2	4,952	4,994	5,037	5,889	5,995	6,102	10,840	10,989	11,139

Source: model results

Table A10A. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 1 and 2 in rural China (unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	-8	-7	-7	7	7	8
	Experiment 2 and baseline	-8	-7	-7	7	7	8
2016	Experiment 1 and baseline	-20	-20	-20	20	20	20
	Experiment 2 and baseline	-20	-20	-20	20	20	20
2017	Experiment 1 and baseline	-35	-37	-38	39	37	34
	Experiment 2 and baseline	-35	-37	-38	38	37	35
2018	Experiment 1 and baseline	-46	-46	-46	47	46	46
	Experiment 2 and baseline	-46	-46	-46	47	46	45
2019	Experiment 1 and baseline	-55	-58	-61	53	54	54
	Experiment 2 and baseline	-55	-58	-61	53	53	54
2020	Experiment 1 and baseline	-90	-85	-80	71	68	64
	Experiment 2 and baseline	-90	-85	-79	71	67	63
2021	Experiment 1 and baseline	-102	-108	-113	97	78	60
	Experiment 2 and baseline	-102	-107	-111	96	76	57
2022	Experiment 1 and baseline	-155	-140	-125	52	87	122
	Experiment 2 and baseline	-157	-140	-122	50	85	121
2023	Experiment 1 and baseline	-163	-170	-177	170	144	117
	Experiment 2 and baseline	-182	-183	-183	164	148	131
2024	Experiment 1 and baseline	-148	-146	-144	81	84	87
	Experiment 2 and baseline	-143	-134	-124	47	57	67

Source: model results

Table A10A. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 in rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 1	42%	42%	42%	58%	58%	58%
	Experiment 2	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 1	45%	46%	46%	54%	54%	55%
	Experiment 2	45%	46%	46%	54%	54%	55%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 1	60%	61%	61%	39%	39%	40%
	Experiment 2	60%	61%	61%	39%	39%	40%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 1	59%	59%	60%	40%	41%	41%
	Experiment 2	59%	59%	60%	40%	41%	41%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 1	50%	51%	51%	49%	49%	50%
	Experiment 2	50%	51%	51%	49%	49%	50%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 1	50%	50%	50%	50%	50%	50%
	Experiment 2	50%	50%	50%	50%	50%	50%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 1	50%	51%	51%	49%	49%	50%
	Experiment 2	50%	51%	51%	49%	49%	50%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 1	50%	50%	50%	50%	50%	50%
	Experiment 2	50%	50%	50%	50%	50%	50%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 1	46%	47%	47%	53%	53%	54%
	Experiment 2	46%	47%	47%	53%	53%	54%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 1	45%	45%	46%	54%	55%	55%
	Experiment 2	45%	45%	46%	54%	55%	55%

Source: model results

Table A10A. 4 The changes in the average percentage of people who will and who will not need care between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in rural China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	-1%	1%	0%	0%
	Experiment 2 and baseline	0%	0%	-1%	1%	0%	0%
2019	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2020	Experiment1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2021	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2022	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2023	Experiment 1 and baseline	-1%	-1%	-2%	2%	1%	1%
	Experiment 2 and baseline	-1%	-2%	-2%	2%	2%	1%
2024	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%

Source: model results

Table A10A. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 for rural China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 1	2,780	2,798	2,816	86	90	95	348	357	365
	Experiment 2	2,780	2,798	2,816	86	90	95	348	357	365
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 1	2,750	2,769	2,788	87	91	95	327	337	347
	Experiment 2	2,750	2,769	2,788	87	91	95	328	338	348
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 1	1,709	1,734	1,759	212	222	232	358	370	382
	Experiment 2	1,709	1,734	1,759	212	222	232	361	373	386
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 1	1,922	1,934	1,946	221	229	237	361	372	383
	Experiment 2	1,922	1,934	1,946	221	229	237	367	379	390
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 1	2,369	2,414	2,460	281	291	301	477	488	498
	Experiment 2	2,369	2,414	2,459	281	291	301	487	497	507
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 1	2,516	2,540	2,564	301	311	322	470	481	491
	Experiment 2	2,515	2,539	2,564	301	311	322	485	495	505

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2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 1	2,350	2,386	2,421	363	381	399	505	523	542
	Experiment 2	2,349	2,385	2,421	363	381	399	525	544	563
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 1	2,479	2,521	2,562	399	415	431	496	509	522
	Experiment 2	2,480	2,520	2,561	399	415	431	522	537	552
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 1	2,644	2,689	2,734	441	462	484	499	523	547
	Experiment 2	2,661	2,701	2,741	445	467	490	535	557	579
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 1	2,722	2,751	2,780	466	478	490	537	550	563
	Experiment 2	2,702	2,735	2,768	464	476	488	561	578	595
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 1	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 2	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 1	218	226	233	98	103	108	1,094	1,110	1,126
	Experiment 2	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 1	253	264	275	137	143	148	747	767	787
	Experiment 2	253	264	275	137	143	148	743	763	784
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 1	289	296	303	128	134	140	846	857	868

	Experiment 2	289	296	303	128	134	140	840	851	861
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 1	357	368	379	191	200	209	1,022	1,053	1,084
	Experiment 2	357	369	380	191	200	209	1,011	1,043	1,074
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 1	412	420	429	167	176	184	1,110	1,125	1,139
	Experiment 2	413	422	430	167	176	184	1,095	1,109	1,123
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 1	478	492	506	177	183	188	1,173	1,186	1,200
	Experiment 2	480	494	509	178	183	188	1,150	1,162	1,174
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 1	538	555	572	153	161	169	1,242	1,262	1,281
	Experiment 2	541	558	574	155	163	171	1,210	1,229	1,247
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 1	623	639	656	160	165	170	1,375	1,388	1,401
	Experiment 2	629	647	664	161	167	173	1,305	1,331	1,357
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 1	677	695	712	143	150	157	1,378	1,398	1,419
	Experiment 2	682	698	714	149	156	163	1,331	1,352	1,374

Source: model results

Table A10A. 6 The changes in the average number of people who will require different type of LTC between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	7	0	0	0	0	0
	Experiment 2 and baseline	7	0	0	0	0	0
2016	Experiment 1 and baseline	18	0	1	0	0	1
	Experiment 2 and baseline	18	0	2	0	0	0
2017	Experiment 1 and baseline	33	0	3	0	0	1
	Experiment 2 and baseline	33	0	6	0	0	-2
2018	Experiment 1 and baseline	39	0	6	0	-1	2
	Experiment 2 and baseline	39	0	12	0	-1	-4
2019	Experiment 1 and baseline	39	1	14	1	0	-1
	Experiment 2 and baseline	39	1	24	1	0	-11
2020	Experiment 1 and baseline	44	-1	23	1	-4	4
	Experiment 2 and baseline	44	-1	38	2	-4	-12
2021	Experiment 1 and baseline	36	2	29	10	-4	5

	Experiment 2 and baseline	35	2	49	12	-3	-20
2022	Experiment 1 and baseline	36	14	37	-3	-3	6
	Experiment 2 and baseline	36	14	65	0	-1	-27
2023	Experiment 1 and baseline	53	5	40	19	-1	28
	Experiment 2 and baseline	65	10	74	26	1	-29
2024	Experiment 1 and baseline	8	6	51	7	5	7
	Experiment 2 and baseline	-8	4	80	10	11	-40

Source: model results

Table A10A. 7 Population projection: the average percentage (with 95% confidence interval) of people who require different types of LTC services at the baseline, the experiments 1 and 2 for each year from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 1	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 2	59%	59%	60%	2%	2%	2%	7%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 1	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 2	60%	60%	61%	2%	2%	2%	7%	7%	7%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 1	50%	50%	52%	6%	6%	6%	10%	11%	11%
	Experiment 2	50%	50%	52%	6%	6%	6%	11%	11%	11%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 1	51%	51%	52%	6%	6%	6%	10%	10%	10%
	Experiment 2	51%	51%	52%	6%	6%	6%	10%	10%	10%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 1	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 2	50%	50%	52%	6%	6%	6%	10%	10%	10%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 1	51%	50%	52%	6%	6%	6%	9%	10%	10%
	Experiment 2	51%	50%	52%	6%	6%	6%	10%	10%	10%

2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 1	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 2	47%	46%	48%	7%	7%	8%	10%	11%	11%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 1	47%	46%	48%	8%	8%	8%	9%	9%	9%
	Experiment 2	47%	46%	48%	8%	8%	8%	10%	10%	10%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 1	46%	46%	48%	8%	8%	8%	9%	9%	9%
	Experiment 2	46%	46%	48%	8%	8%	8%	9%	9%	10%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 1	46%	46%	47%	8%	8%	8%	9%	9%	9%
	Experiment 2	46%	46%	47%	8%	8%	8%	10%	10%	10%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 1	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 2	4%	4%	4%	2%	2%	2%	25%	25%	25%
2016	Baseline	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 1	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 2	5%	5%	5%	2%	2%	2%	24%	24%	24%
2017	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 1	7%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 2	7%	8%	8%	4%	4%	4%	22%	22%	22%
2018	Baseline	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 1	8%	8%	8%	3%	4%	4%	22%	22%	22%

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	Experiment 2	8%	8%	8%	3%	4%	4%	22%	22%	22%
2019	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 1	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 2	8%	8%	8%	4%	4%	4%	22%	22%	22%
2020	Baseline	8%	8%	8%	3%	4%	4%	23%	22%	22%
	Experiment 1	8%	8%	8%	3%	3%	4%	22%	22%	22%
	Experiment 2	8%	8%	8%	3%	3%	4%	22%	22%	22%
2021	Baseline	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 1	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 2	10%	10%	10%	4%	4%	4%	23%	23%	22%
2022	Baseline	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 1	10%	10%	10%	3%	3%	3%	23%	23%	23%
	Experiment 2	10%	10%	10%	3%	3%	3%	23%	23%	23%
2023	Baseline	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 1	11%	11%	11%	3%	3%	3%	24%	24%	23%
	Experiment 2	11%	11%	11%	3%	3%	3%	23%	23%	23%
2024	Baseline	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 1	11%	12%	12%	2%	3%	3%	23%	23%	23%
	Experiment 2	12%	12%	12%	3%	3%	3%	23%	23%	23%

Source: model results

Table A10A. 8 The changes in the average percentage of people who will require different type of LTC services between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2019	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2020	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	1%	0%	0%	-1%
2021	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%

	Experiment 2 and baseline	0%	0%	1%	0%	0%	-1%
2022	Experiment 1 and baseline	0%	0%	1%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	1%	0%	0%	-1%
2023	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	1%	0%	0%	-1%
2024	Experiment 1 and baseline	-1%	0%	1%	0%	0%	0%
	Experiment 2 and baseline	-1%	0%	1%	0%	0%	-1%

Source: model results

10B An increase in the proportion of individual with disability by 1% per year is accompanied by a reduction of informal provided by children to none for rural China

Table A10B. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in rural China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 3	3,395	3,414	3,433	4,691	4,746	4,802	8,086	8,160	8,235
	Experiment 4	3,395	3,414	3,433	4,691	4,746	4,802	8,086	8,160	8,235
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 3	3,881	3,899	3,917	4,575	4,635	4,696	8,456	8,534	8,613
	Experiment 4	3,881	3,899	3,917	4,573	4,635	4,698	8,454	8,534	8,615
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 3	5,361	5,406	5,452	3,428	3,513	3,599	8,789	8,920	9,050
	Experiment 4	5,364	5,408	5,452	3,423	3,512	3,602	8,786	8,920	9,053
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 3	5,511	5,528	5,546	3,793	3,854	3,915	9,304	9,382	9,461

	Experiment 4	5,517	5,534	5,552	3,790	3,848	3,906	9,307	9,382	9,458
2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 3	4,839	4,879	4,918	4,747	4,865	4,983	9,586	9,744	9,902
	Experiment 4	4,871	4,899	4,928	4,723	4,846	4,968	9,594	9,745	9,897
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 3	5,016	5,041	5,066	5,037	5,115	5,194	10,052	10,156	10,259
	Experiment 4	5,028	5,052	5,075	5,007	5,091	5,175	10,035	10,143	10,251
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 3	5,212	5,271	5,330	5,109	5,238	5,368	10,320	10,509	10,698
	Experiment 4	5,232	5,285	5,339	5,085	5,205	5,326	10,317	10,491	10,664
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 3	5,311	5,349	5,387	5,439	5,520	5,602	10,749	10,869	10,989
	Experiment 4	5,299	5,340	5,381	5,428	5,517	5,606	10,727	10,857	10,987
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 3	5,022	5,060	5,098	5,863	5,972	6,082	10,885	11,033	11,180
	Experiment 4	5,030	5,063	5,097	5,832	5,952	6,071	10,863	11,015	11,168
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 3	4,894	4,924	4,955	6,062	6,155	6,249	10,955	11,079	11,203
	Experiment 4	4,872	4,925	4,979	6,011	6,124	6,237	10,883	11,049	11,215

Source: model results

Table A10B. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	-8	-7	-7	7	7	7
	Experiment 4 and baseline	-8	-7	-7	7	7	8
2016	Experiment 3 and baseline	-20	-20	-20	20	20	20
	Experiment 4 and baseline	-20	-20	-20	18	20	21
2017	Experiment 3 and baseline	-51	-50	-50	51	50	50
	Experiment 4 and baseline	-48	-49	-50	46	49	53
2018	Experiment 3 and baseline	-79	-78	-77	74	78	82
	Experiment 4 and baseline	-73	-72	-71	71	72	73
2019	Experiment 3 and baseline	-101	-100	-99	103	105	107
	Experiment 4 and baseline	-69	-79	-89	79	86	92
2020	Experiment 3 and baseline	-133	-127	-121	132	131	129
	Experiment 4 and baseline	-120	-116	-111	102	107	111
2021	Experiment 3 and baseline	-166	-147	-128	160	166	172
	Experiment 4 and baseline	-146	-132	-119	137	133	129
2022	Experiment 3 and baseline	-197	-186	-175	182	185	188
	Experiment 4 and baseline	-209	-195	-181	171	182	192
2023	Experiment 3 and baseline	-220	-228	-236	292	250	208
	Experiment 4 and baseline	-212	-225	-237	261	229	197
2024	Experiment 3 and baseline	-201	-204	-206	221	217	213
	Experiment 4 and baseline	-223	-203	-183	170	186	202

Source: model results

Table A10B. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care from 2015 to 2024 at the baseline, the experiments 3 and 4 in rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 3	42%	42%	42%	58%	58%	58%
	Experiment 4	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 3	45%	46%	46%	54%	54%	55%
	Experiment 4	45%	46%	46%	54%	54%	55%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 3	60%	61%	61%	39%	39%	40%
	Experiment 4	60%	61%	61%	39%	39%	40%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 3	59%	59%	59%	41%	41%	41%
	Experiment 4	59%	59%	59%	41%	41%	41%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 3	50%	50%	50%	50%	50%	50%
	Experiment 4	50%	50%	51%	49%	50%	50%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 3	49%	50%	50%	50%	50%	51%
	Experiment 4	50%	50%	50%	50%	50%	50%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 3	50%	50%	51%	50%	50%	50%
	Experiment 4	50%	50%	51%	49%	50%	50%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 3	49%	49%	49%	51%	51%	51%
	Experiment 4	49%	49%	49%	51%	51%	51%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 3	46%	46%	46%	54%	54%	54%
	Experiment 4	46%	46%	46%	54%	54%	54%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 3	44%	44%	45%	55%	56%	56%
	Experiment 4	44%	45%	45%	55%	55%	56%

Source: model results

Table A10B. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 3 and 4 from 2015 to 2024 in rural China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2018	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2020	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2021	Experiment 3 and baseline	-1%	-1%	-2%	2%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2022	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%
2023	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%
2024	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%

Source: model results

Table A10B. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 for rural China (unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 3	2,759	2,777	2,795	86	90	95	349	357	365
	Experiment 4	2,759	2,777	2,795	86	90	95	369	378	386
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 3	2,703	2,722	2,741	87	91	95	327	337	347
	Experiment 4	2,703	2,722	2,741	87	91	95	374	385	396
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 3	1,644	1,669	1,695	214	224	234	356	368	381
	Experiment 4	1,642	1,668	1,693	213	223	233	432	449	467
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 3	1,850	1,864	1,877	224	233	242	355	366	378
	Experiment 4	1,845	1,858	1,872	223	233	242	460	471	482
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 3	2,292	2,337	2,381	290	300	311	464	475	486
	Experiment 4	2,272	2,318	2,364	290	301	312	588	597	606
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 3	2,423	2,445	2,466	314	324	335	449	461	473
	Experiment 4	2,409	2,433	2,456	309	320	331	600	615	630

2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 3	2,268	2,311	2,354	376	396	415	480	496	512
	Experiment 4	2,257	2,289	2,321	369	388	406	641	667	694
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 3	2,381	2,411	2,440	418	424	430	472	483	494
	Experiment 4	2,372	2,403	2,434	417	426	435	663	674	686
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 3	2,554	2,584	2,614	486	498	509	472	482	492
	Experiment 4	2,545	2,568	2,591	467	486	506	668	681	694
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 3	2,618	2,648	2,679	499	513	527	491	504	516
	Experiment 4	2,586	2,630	2,674	507	522	537	680	696	711
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 3	201	207	213	108	113	119	1,189	1,203	1,216
	Experiment 4	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 3	218	226	233	98	103	108	1,142	1,157	1,172
	Experiment 4	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 3	253	264	275	137	143	148	824	845	867
	Experiment 4	255	266	276	137	143	148	743	763	784
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 3	289	296	303	128	134	140	947	961	974

	Experiment 4	294	302	309	128	134	140	840	851	861
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 3	355	366	377	191	200	209	1,155	1,188	1,220
	Experiment 4	365	379	394	192	202	212	1,016	1,049	1,081
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 3	407	416	424	167	176	184	1,277	1,294	1,312
	Experiment 4	427	438	449	172	180	189	1,091	1,106	1,122
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 3	460	469	477	177	186	195	1,347	1,381	1,415
	Experiment 4	494	508	521	188	195	202	1,137	1,159	1,181
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 3	535	548	562	150	158	165	1,483	1,497	1,511
	Experiment 4	583	592	601	170	178	186	1,223	1,244	1,264
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 3	597	620	643	150	158	165	1,603	1,631	1,658
	Experiment 4	662	689	715	177	186	195	1,314	1,342	1,371
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 3	663	678	693	136	143	150	1,655	1,669	1,684
	Experiment 4	713	728	743	170	179	187	1,356	1,370	1,385

Source: model results

Table A10B. 6 The changes in the average number of people who will require different type of LTC services between the baseline, and the experiments 3 and 4 from 2015 to 2024 in rural China (unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	-14	0	0	0	0	21
	Experiment 4 and baseline	-14	0	21	0	0	0
2016	Experiment 3 and baseline	-29	0	1	0	0	48
	Experiment 4 and baseline	-29	0	49	0	0	0
2017	Experiment 3 and baseline	-32	2	1	0	0	80
	Experiment 4 and baseline	-34	1	82	2	0	-2
2018	Experiment 3 and baseline	-31	4	0	0	-1	106
	Experiment 4 and baseline	-37	3	105	5	-1	-4
2019	Experiment 3 and baseline	-39	10	1	-1	0	134
	Experiment 4 and baseline	-57	11	124	12	1	-5
2020	Experiment 3 and baseline	-51	12	4	-4	-4	174
	Experiment 4 and baseline	-63	8	158	18	1	-15
2021	Experiment 3 and baseline	-39	17	1	-13	0	200

	Experiment 4 and baseline	-61	9	173	26	9	-22
2022	Experiment 3 and baseline	-74	23	10	-10	-6	241
	Experiment 4 and baseline	-82	25	202	34	14	-12
2023	Experiment 3 and baseline	-52	41	-1	0	-8	271
	Experiment 4 and baseline	-68	29	198	68	20	-18
2024	Experiment 3 and baseline	-95	40	5	-10	-2	278
	Experiment 4 and baseline	-113	49	197	40	34	-22

Source: model results

Table A10B. 7 Population projection: the average percentage (with 95% confidence interval) of people who require different types of LTC services for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 3	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 4	59%	59%	60%	2%	2%	2%	8%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 3	59%	59%	60%	2%	2%	2%	7%	7%	7%
	Experiment 4	59%	59%	60%	2%	2%	2%	8%	8%	8%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 3	48%	48%	49%	6%	6%	7%	10%	10%	11%
	Experiment 4	48%	47%	49%	6%	6%	6%	13%	13%	13%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 3	49%	48%	49%	6%	6%	6%	9%	10%	10%
	Experiment 4	49%	48%	49%	6%	6%	6%	12%	12%	12%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 3	48%	48%	50%	6%	6%	6%	10%	10%	10%
	Experiment 4	48%	48%	50%	6%	6%	6%	12%	12%	12%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 3	48%	48%	49%	6%	6%	6%	9%	9%	9%
	Experiment 4	48%	48%	49%	6%	6%	6%	12%	12%	12%
2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%

	Experiment 3	44%	44%	46%	7%	8%	8%	9%	9%	10%
	Experiment 4	44%	44%	46%	7%	7%	8%	13%	13%	13%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 3	44%	44%	45%	8%	8%	8%	9%	9%	9%
	Experiment 4	44%	44%	45%	8%	8%	8%	12%	12%	12%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 3	44%	43%	45%	8%	8%	8%	8%	8%	8%
	Experiment 4	44%	43%	44%	8%	8%	8%	11%	11%	11%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 3	43%	43%	44%	8%	8%	8%	8%	8%	8%
	Experiment 4	43%	43%	44%	8%	9%	9%	11%	11%	11%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4.29%	4.37%	4.44%	2.30%	2.39%	2.48%	24.93%	24.93%	24.93%
	Experiment 3	4.28%	4.36%	4.43%	2.29%	2.38%	2.47%	25.35%	25.34%	25.33%
	Experiment 4	4.29%	4.36%	4.43%	2.29%	2.38%	2.47%	24.90%	24.89%	24.89%
2016	Baseline	4.80%	4.89%	4.99%	2.15%	2.23%	2.31%	24.00%	24.02%	24.05%
	Experiment 3	4.77%	4.87%	4.96%	2.14%	2.22%	2.30%	24.96%	24.96%	24.97%
	Experiment 4	4.78%	4.87%	4.96%	2.14%	2.22%	2.30%	23.90%	23.92%	23.94%
2017	Baseline	7.50%	7.62%	7.74%	4.06%	4.12%	4.17%	22.07%	22.10%	22.14%
	Experiment 3	7.39%	7.51%	7.63%	4.00%	4.06%	4.11%	24.05%	24.06%	24.08%
	Experiment 4	7.45%	7.56%	7.67%	4.01%	4.06%	4.11%	21.72%	21.74%	21.76%
2018	Baseline	7.79%	7.86%	7.92%	3.45%	3.56%	3.68%	22.69%	22.63%	22.56%
	Experiment 3	7.62%	7.69%	7.75%	3.37%	3.48%	3.59%	24.97%	24.93%	24.89%
	Experiment 4	7.76%	7.84%	7.91%	3.37%	3.48%	3.60%	22.17%	22.10%	22.04%

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2019	Baseline	7.67%	7.71%	7.76%	4.11%	4.21%	4.30%	22.05%	22.13%	22.21%
	Experiment 3	7.47%	7.52%	7.56%	4.03%	4.11%	4.19%	24.33%	24.41%	24.48%
	Experiment 4	7.72%	7.82%	7.92%	4.07%	4.17%	4.26%	21.51%	21.64%	21.76%
2020	Baseline	8.40%	8.42%	8.43%	3.48%	3.60%	3.72%	22.53%	22.48%	22.43%
	Experiment 3	8.08%	8.13%	8.17%	3.32%	3.43%	3.54%	25.35%	25.30%	25.26%
	Experiment 4	8.52%	8.60%	8.67%	3.42%	3.54%	3.65%	21.78%	21.73%	21.67%
2021	Baseline	9.44%	9.50%	9.56%	3.60%	3.67%	3.73%	23.14%	23.29%	23.43%
	Experiment 3	9.00%	8.94%	8.89%	3.47%	3.55%	3.63%	26.38%	26.37%	26.36%
	Experiment 4	9.72%	9.75%	9.78%	3.69%	3.74%	3.79%	22.35%	22.27%	22.18%
2022	Baseline	10.33%	10.45%	10.57%	2.96%	3.07%	3.17%	23.56%	23.54%	23.51%
	Experiment 3	9.83%	9.93%	10.02%	2.77%	2.86%	2.95%	27.26%	27.12%	26.98%
	Experiment 4	10.75%	10.73%	10.72%	3.12%	3.23%	3.32%	22.54%	22.54%	22.54%
2023	Baseline	10.63%	10.84%	11.04%	2.88%	2.90%	2.93%	23.85%	23.76%	23.69%
	Experiment 3	10.19%	10.39%	10.57%	2.56%	2.64%	2.72%	27.34%	27.30%	27.27%
	Experiment 4	11.35%	11.57%	11.78%	3.03%	3.12%	3.20%	22.53%	22.55%	22.58%
2024	Baseline	11.53%	11.58%	11.63%	2.36%	2.44%	2.52%	23.51%	23.44%	23.37%
	Experiment 3	10.94%	11.01%	11.08%	2.25%	2.33%	2.40%	27.30%	27.12%	26.95%
	Experiment 4	11.86%	11.89%	11.91%	2.83%	2.92%	3.00%	22.55%	22.37%	22.20%

Source: model results

Table A10B. 8 The changes in the average percentage of people who will require different type of LTC services between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2017	Experiment 3 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-2%	0%	2%	0%	0%	0%
2018	Experiment 3 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-2%	0%	3%	0%	0%	-1%
2019	Experiment 3 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-2%	0%	2%	0%	0%	0%
2020	Experiment 3 and baseline	-2%	0%	0%	0%	0%	3%
	Experiment 4 and baseline	-2%	0%	3%	0%	0%	-1%
2021	Experiment 3 and baseline	-2%	0%	0%	-1%	0%	3%

	Experiment 4 and baseline	-2%	0%	3%	0%	0%	-1%
2022	Experiment 3 and baseline	-3%	0%	0%	-1%	0%	4%
	Experiment 4 and baseline	-3%	0%	3%	0%	0%	-1%
2023	Experiment 3 and baseline	-3%	0%	0%	0%	0%	4%
	Experiment 4 and baseline	-3%	0%	3%	1%	0%	-1%
2024	Experiment 3 and baseline	-3%	0%	0%	-1%	0%	4%
	Experiment 4and baseline	-3%	1%	3%	0%	0%	-1%

Source: model results

10C An increase in the proportion of individual with disabilities by 2% per year is accompanied by a reduction in informal care provided by children that is proportional to the number of living children for rural China

Table A10C. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 in rural China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 5	3,388	3,407	3,426	4,698	4,754	4,810	8,085	8,160	8,235
	Experiment 6	3,388	3,407	3,426	4,699	4,754	4,809	8,086	8,160	8,234
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 5	3,861	3,878	3,896	4,595	4,656	4,718	8,456	8,534	8,613
	Experiment 6	3,861	3,878	3,896	4,595	4,656	4,718	8,456	8,534	8,613
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 5	5,343	5,387	5,432	3,450	3,532	3,615	8,793	8,920	9,046
	Experiment 6	5,343	5,387	5,432	3,445	3,532	3,619	8,789	8,920	9,051
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 5	5,499	5,517	5,535	3,807	3,865	3,924	9,305	9,382	9,459

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	Experiment 6	5,499	5,517	5,535	3,810	3,866	3,921	9,308	9,382	9,456
2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 5	4,833	4,865	4,898	4,748	4,872	4,995	9,582	9,737	9,892
	Experiment 6	4,835	4,866	4,898	4,750	4,872	4,995	9,584	9,739	9,894
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 5	4,966	4,997	5,028	5,037	5,124	5,211	10,003	10,120	10,238
	Experiment 6	4,969	5,001	5,034	5,084	5,151	5,217	10,053	10,152	10,251
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 5	5,181	5,222	5,264	5,108	5,217	5,325	10,289	10,439	10,589
	Experiment 6	5,184	5,224	5,265	5,141	5,266	5,391	10,325	10,490	10,656
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 5	5,207	5,250	5,292	5,418	5,527	5,635	10,625	10,776	10,928
	Experiment 6	5,212	5,253	5,294	5,547	5,618	5,689	10,759	10,871	10,983
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 5	4,918	4,949	4,980	5,861	5,967	6,073	10,779	10,916	11,053
	Experiment 6	4,913	4,942	4,971	5,909	6,069	6,229	10,822	11,011	11,200
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 5	4,793	4,834	4,875	5,992	6,096	6,200	10,785	10,931	11,076
	Experiment 6	4,783	4,815	4,848	6,169	6,250	6,331	10,952	11,065	11,179

Source: model results

Table A10C. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 5 and 6 for each year from 2015 to 2024 in rural China (unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 5 and baseline	-15	-15	-14	14	15	15
	Experiment 6 and baseline	-15	-15	-14	14	15	15
2016	Experiment 5 and baseline	-41	-41	-41	41	41	41
	Experiment 6 and baseline	-41	-41	-41	41	41	41
2017	Experiment 5 and baseline	-69	-69	-70	73	69	66
	Experiment 6 and baseline	-69	-69	-70	72	69	66
2018	Experiment 5 and baseline	-91	-90	-88	88	89	91
	Experiment 6 and baseline	-91	-90	-88	88	89	91
2019	Experiment 5 and baseline	-106	-113	-120	104	111	118
	Experiment 6 and baseline	-105	-112	-119	103	110	118
2020	Experiment 5 and baseline	-183	-171	-159	132	139	146
	Experiment 6 and baseline	-179	-166	-153	120	131	141
2021	Experiment 5 and baseline	-197	-195	-194	159	144	129
	Experiment 6 and baseline	-194	-193	-193	160	141	122
2022	Experiment 5 and baseline	-300	-285	-269	161	191	221
	Experiment 6 and baseline	-295	-282	-268	158	188	218
2023	Experiment 5 and baseline	-324	-339	-354	290	245	199
	Experiment 6 and baseline	-329	-346	-363	298	252	205
2024	Experiment 5 and baseline	-302	-294	-286	151	158	165
	Experiment 6 and baseline	-312	-313	-313	195	185	175

Source: model results

Table A10C. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 in rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 5	42%	42%	42%	58%	58%	58%
	Experiment 6	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 5	45%	45%	46%	54%	55%	55%
	Experiment 6	45%	45%	46%	54%	55%	55%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 5	60%	60%	61%	39%	40%	40%
	Experiment 6	60%	60%	61%	39%	40%	40%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 5	59%	59%	59%	41%	41%	41%
	Experiment 6	59%	59%	59%	41%	41%	41%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 5	50%	50%	50%	50%	50%	50%
	Experiment 6	50%	50%	50%	50%	50%	50%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 5	49%	49%	50%	50%	51%	51%
	Experiment 6	49%	49%	49%	51%	51%	51%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 5	50%	50%	50%	50%	50%	50%
	Experiment 6	49%	50%	50%	50%	50%	51%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 5	48%	49%	49%	51%	51%	52%
	Experiment 6	48%	48%	48%	52%	52%	52%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 5	45%	45%	46%	54%	55%	55%
	Experiment 6	44%	45%	45%	55%	55%	56%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 5	44%	44%	44%	56%	56%	56%
	Experiment 6	43%	44%	44%	56%	56%	57%

Source: model results

Table A10C. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024 in rural China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 5 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2018	Experiment 5 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 5 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2020	Experiment 5 and baseline	-1%	-2%	-2%	2%	2%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2021	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-1%	-2%	-2%	2%	2%	1%
2022	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2023	Experiment 5 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 6 and baseline	-3%	-3%	-3%	3%	3%	3%
2024	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%

Source: model results

Table A10C. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services at the baseline, the experiments 5 and 6 from 2015 to 2024 for rural China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 5	2,786	2,804	2,822	86	90	94	349	357	366
	Experiment 6	2,786	2,804	2,822	86	90	94	349	357	366
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 5	2,769	2,788	2,807	87	91	95	329	339	349
	Experiment 6	2,769	2,788	2,807	87	91	95	330	340	350
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 5	1,740	1,764	1,789	211	221	231	361	374	386
	Experiment 6	1,740	1,764	1,789	211	221	231	365	378	391
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 5	1,957	1,971	1,985	220	229	237	368	380	391
	Experiment 6	1,957	1,971	1,985	220	229	237	377	389	401
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 5	2,411	2,458	2,504	282	291	300	478	491	505
	Experiment 6	2,411	2,457	2,503	282	291	300	496	508	519
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 5	2,560	2,592	2,623	301	313	324	490	499	509
	Experiment 6	2,554	2,586	2,619	299	311	323	513	524	535

2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 5	2,391	2,418	2,446	367	382	396	524	542	559
	Experiment 6	2,389	2,417	2,445	367	382	396	561	578	596
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 5	2,537	2,571	2,604	384	404	423	546	558	569
	Experiment 6	2,537	2,570	2,603	384	403	421	595	607	620
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 5	2,709	2,728	2,748	445	464	483	556	575	594
	Experiment 6	2,715	2,733	2,751	448	460	472	617	639	662
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 5	2,715	2,750	2,784	475	489	503	584	597	609
	Experiment 6	2,745	2,771	2,796	467	479	491	654	662	671
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 5	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 6	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 5	218	226	233	98	103	108	1,094	1,110	1,126
	Experiment 6	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 5	253	264	275	137	143	148	747	766	786
	Experiment 6	253	264	275	137	143	148	742	762	782
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 5	289	296	303	127	134	140	846	857	867

	Experiment 6	289	296	303	127	134	140	837	847	857
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 5	355	368	380	189	199	209	1,033	1,066	1,098
	Experiment 6	355	368	382	189	199	209	1,013	1,048	1,082
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 5	409	418	428	168	176	184	1,110	1,126	1,142
	Experiment 6	409	419	429	167	176	185	1,083	1,099	1,115
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 5	478	489	501	176	185	193	1,174	1,202	1,229
	Experiment 6	482	494	505	177	185	194	1,133	1,158	1,183
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 5	542	556	571	156	164	172	1,254	1,275	1,296
	Experiment 6	550	566	582	158	166	174	1,192	1,212	1,233
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 5	624	646	669	162	170	178	1,366	1,384	1,402
	Experiment 6	638	662	686	168	176	184	1,284	1,304	1,325
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 5	694	704	714	149	156	164	1,376	1,401	1,427
	Experiment 6	722	734	746	156	164	172	1,292	1,313	1,334

Source: model results

Table A10C. 6 The changes in the average number of people who will require different type of LTC between the baseline, and the experiments 5 and 6 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 5 and baseline	14	0	1	0	0	0
	Experiment 6 and baseline	14	0	1	0	0	0
2016	Experiment 5 and baseline	37	0	3	0	0	1
	Experiment 6 and baseline	37	0	4	0	0	0
2017	Experiment 5 and baseline	63	-1	6	0	0	1
	Experiment 6 and baseline	63	-1	11	0	0	-4
2018	Experiment 5 and baseline	76	0	13	-1	-1	2
	Experiment 6 and baseline	76	0	23	-1	-1	-8
2019	Experiment 5 and baseline	82	0	18	0	-2	12
	Experiment 6 and baseline	82	0	34	1	-2	-6
2020	Experiment 5 and baseline	96	1	42	-1	-4	6
	Experiment 6 and baseline	91	-1	67	0	-4	-22
2021	Experiment 5 and baseline	69	3	47	7	-2	20

	Experiment 6 and baseline	67	3	84	12	-1	-23
2022	Experiment 5 and baseline	86	2	85	-2	0	20
	Experiment 6 and baseline	85	1	135	8	2	-44
2023	Experiment 5 and baseline	93	7	91	26	4	24
	Experiment 6 and baseline	97	3	156	42	10	-56
2024	Experiment 5 and baseline	27	16	98	17	11	9
	Experiment 6 and baseline	28	7	163	46	19	-79

Source: model results

Table A10C. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services at the baseline, the experiments 5 and 6 from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 5	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 6	59%	59%	60%	2%	2%	2%	7%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 5	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 6	60%	60%	61%	2%	2%	2%	7%	7%	7%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 5	50%	50%	52%	6%	6%	6%	10%	11%	11%
	Experiment 6	50%	50%	52%	6%	6%	6%	11%	11%	11%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 5	51%	51%	52%	6%	6%	6%	10%	10%	10%
	Experiment 6	51%	51%	52%	6%	6%	6%	10%	10%	10%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 5	51%	50%	53%	6%	6%	6%	10%	10%	10%
	Experiment 6	51%	50%	53%	6%	6%	6%	10%	10%	10%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 5	51%	51%	52%	6%	6%	6%	10%	10%	10%

	Experiment 6	51%	51%	52%	6%	6%	6%	10%	10%	10%
2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 5	47%	46%	48%	7%	7%	7%	10%	10%	11%
	Experiment 6	47%	46%	48%	7%	7%	7%	11%	11%	11%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 5	47%	47%	48%	7%	7%	8%	10%	10%	10%
	Experiment 6	47%	47%	48%	7%	7%	7%	11%	11%	11%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 5	46%	46%	47%	8%	8%	8%	9%	10%	10%
	Experiment 6	46%	46%	47%	8%	8%	8%	11%	11%	11%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 5	45%	45%	46%	8%	8%	8%	10%	10%	10%
	Experiment 6	45%	45%	46%	8%	8%	8%	11%	11%	11%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 5	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 6	4%	4%	4%	2%	2%	2%	25%	25%	25%
2016	Baseline	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 5	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 6	5%	5%	5%	2%	2%	2%	24%	24%	24%
2017	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 5	7%	7%	8%	4%	4%	4%	22%	22%	22%

	Experiment 6	7%	7%	8%	4%	4%	4%	22%	22%	22%
2018	Baseline	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 5	8%	8%	8%	3%	3%	4%	22%	22%	22%
	Experiment 6	8%	8%	8%	3%	3%	4%	22%	22%	22%
2019	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 5	7%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 6	7%	8%	8%	4%	4%	4%	21%	22%	22%
2020	Baseline	8%	8%	8%	3%	4%	4%	23%	22%	22%
	Experiment 5	8%	8%	8%	3%	3%	4%	22%	22%	22%
	Experiment 6	8%	8%	8%	3%	3%	4%	22%	21%	21%
2021	Baseline	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 5	9%	9%	9%	3%	4%	4%	23%	23%	23%
	Experiment 6	9%	9%	9%	3%	4%	4%	22%	22%	22%
2022	Baseline	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 5	10%	10%	10%	3%	3%	3%	23%	23%	23%
	Experiment 6	10%	10%	10%	3%	3%	3%	22%	22%	22%
2023	Baseline	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 5	11%	11%	11%	3%	3%	3%	23%	23%	23%
	Experiment 6	11%	11%	11%	3%	3%	3%	22%	22%	22%
2024	Baseline	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 5	12%	12%	12%	2%	3%	3%	23%	23%	23%
	Experiment 6	12%	12%	12%	3%	3%	3%	21%	21%	21%

Source: model results

Table A10C. 8 The changes in the average percentage of people who will require different types of LTC service between the baseline, and the experiments 5 and 6 for each year from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2018	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2019	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2020	Experiment 5 and baseline	1%	0%	1%	0%	0%	-1%
	Experiment 6 and baseline	0%	0%	1%	0%	0%	-1%

2021	Experiment 5 and baseline	0%	0%	1%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	1%	0%	0%	-1%
2022	Experiment 5 and baseline	0%	0%	1%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	2%	0%	0%	-2%
2023	Experiment 5 and baseline	0%	0%	1%	0%	0%	-1%
	Experiment 6 and baseline	0%	0%	2%	0%	0%	-2%
2024	Experiment 5 and baseline	-1%	0%	1%	0%	0%	0%
	Experiment 6 and baseline	-1%	0%	2%	0%	0%	-2%

Source: model results

10D An increase in the proportion of individual with disabilities by 2% per is accompanied by a reduction in informal care provided by children to none for rural China

Table A10D. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 7 and 8 in rural China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	3,403	3,421	3,440	4,684	4,739	4,795	8,086	8,160	8,234
	Experiment 7	3,388	3,407	3,426	4,699	4,754	4,339	8,086	8,160	7,765
	Experiment 8	3,388	3,407	3,426	4,697	4,754	4,810	8,085	8,160	8,236
2016	Baseline scenario	3,901	3,919	3,937	4,554	4,615	4,676	8,456	8,534	8,613
	Experiment 7	3,861	3,878	3,896	4,596	4,656	4,717	8,456	8,534	8,613
	Experiment 8	3,861	3,878	3,896	4,593	4,656	4,720	8,454	8,534	8,615
2017	Baseline scenario	5,412	5,457	5,502	3,377	3,463	3,549	8,789	8,920	9,051
	Experiment 7	5,314	5,368	5,423	3,468	3,548	3,628	8,782	8,916	9,050
	Experiment 8	5,328	5,373	5,418	3,456	3,547	3,638	8,784	8,920	9,055
2018	Baseline scenario	5,589	5,606	5,623	3,719	3,776	3,833	9,308	9,382	9,456
	Experiment 7	5,453	5,472	5,491	3,849	3,910	3,972	9,302	9,382	9,462

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	Experiment 8	5,463	5,483	5,502	3,838	3,899	3,960	9,302	9,382	9,462
2019	Baseline scenario	4,940	4,979	5,017	4,644	4,760	4,877	9,584	9,739	9,894
	Experiment 7	4,774	4,805	4,836	4,818	4,945	5,071	9,592	9,749	9,907
	Experiment 8	4,788	4,818	4,849	4,796	4,925	5,054	9,584	9,744	9,904
2020	Baseline scenario	5,148	5,167	5,187	4,905	4,985	5,064	10,053	10,152	10,251
	Experiment 7	4,900	4,930	4,960	5,133	5,224	5,314	10,032	10,153	10,274
	Experiment 8	4,910	4,941	4,971	5,088	5,191	5,294	9,998	10,132	10,266
2021	Baseline scenario	5,378	5,418	5,458	4,949	5,073	5,196	10,327	10,490	10,654
	Experiment 7	5,106	5,142	5,178	5,237	5,352	5,468	10,343	10,494	10,646
	Experiment 8	5,099	5,146	5,193	5,193	5,332	5,472	10,292	10,478	10,664
2022	Baseline scenario	5,507	5,534	5,561	5,257	5,335	5,414	10,764	10,870	10,975
	Experiment 7	5,141	5,180	5,220	5,611	5,695	5,779	10,751	10,875	10,998
	Experiment 8	5,160	5,194	5,228	5,555	5,649	5,743	10,714	10,843	10,971
2023	Baseline scenario	5,242	5,288	5,334	5,571	5,722	5,873	10,813	11,011	11,208
	Experiment 7	4,844	4,875	4,905	6,070	6,162	6,255	10,914	11,037	11,160
	Experiment 8	4,833	4,882	4,932	5,944	6,111	6,278	10,777	10,993	11,210
2024	Baseline scenario	5,095	5,128	5,161	5,841	5,938	6,035	10,936	11,066	11,196
	Experiment 7	4,650	4,691	4,733	6,230	6,342	6,453	10,880	11,033	11,186
	Experiment 8	4,686	4,733	4,780	6,224	6,337	6,450	10,910	11,070	11,230

Source: model results

Table A10D. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 7 and baseline	-15	-15	-14	15	15	-456
	Experiment 8 and baseline	-15	-15	-14	14	15	15
2016	Experiment 7 and baseline	-41	-41	-41	41	41	41
	Experiment 8 and baseline	-41	-41	-41	39	41	44
2017	Experiment 7 and baseline	-97	-88	-79	91	85	79
	Experiment 8 and baseline	-84	-84	-84	79	84	89
2018	Experiment 7 and baseline	-136	-134	-133	130	134	139
	Experiment 8 and baseline	-126	-124	-121	119	123	127
2019	Experiment 7 and baseline	-166	-174	-182	174	184	195
	Experiment 8 and baseline	-152	-160	-168	152	165	178
2020	Experiment 7 and baseline	-249	-238	-227	228	239	250
	Experiment 8 and baseline	-238	-227	-215	183	207	230
2021	Experiment 7 and baseline	-272	-276	-279	288	280	271
	Experiment 8 and baseline	-279	-272	-265	244	259	275
2022	Experiment 7 and baseline	-367	-354	-342	354	359	365
	Experiment 8 and baseline	-348	-341	-333	298	314	329
2023	Experiment 7 and baseline	-398	-413	-429	499	440	382
	Experiment 8 and baseline	-409	-406	-402	373	389	404
2024	Experiment 7 and baseline	-445	-437	-428	389	403	418
	Experiment 8 and baseline	-409	-395	-381	382	399	415

Source: model results

Table A10D. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 7 and 8 in rural China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	42%	42%	42%	58%	58%	58%
	Experiment 7	44%	42%	42%	58%	58%	56%
	Experiment 8	42%	42%	42%	58%	58%	58%
2016	Baseline scenario	46%	46%	46%	54%	54%	54%
	Experiment 7	45%	45%	46%	54%	55%	55%
	Experiment 8	45%	45%	46%	54%	55%	55%
2017	Baseline scenario	61%	61%	62%	38%	39%	39%
	Experiment 7	60%	60%	61%	39%	40%	40%
	Experiment 8	60%	60%	61%	39%	40%	40%
2018	Baseline scenario	59%	60%	60%	40%	40%	41%
	Experiment 7	58%	58%	59%	41%	42%	42%
	Experiment 8	58%	58%	59%	41%	42%	42%
2019	Baseline scenario	51%	51%	52%	48%	49%	49%
	Experiment 7	49%	49%	50%	50%	51%	51%
	Experiment 8	49%	49%	50%	50%	51%	51%
2020	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 7	48%	49%	49%	51%	51%	52%
	Experiment 8	48%	49%	49%	51%	51%	52%
2021	Baseline scenario	51%	52%	52%	48%	48%	49%
	Experiment 7	49%	49%	49%	51%	51%	51%
	Experiment 8	49%	49%	50%	50%	51%	51%
2022	Baseline scenario	51%	51%	51%	49%	49%	49%
	Experiment 7	47%	48%	48%	52%	52%	53%
	Experiment 8	48%	48%	48%	52%	52%	52%
2023	Baseline scenario	48%	48%	48%	52%	52%	52%
	Experiment 7	44%	44%	44%	56%	56%	56%
	Experiment 8	44%	44%	45%	55%	56%	56%
2024	Baseline scenario	46%	46%	47%	53%	54%	54%
	Experiment 7	43%	43%	43%	57%	57%	57%
	Experiment 8	42%	43%	43%	57%	57%	58%

Source: model results

Table A10D. 4 The changes in the average percentage of people who will and who will not need care between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in rural China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 7 and baseline	2%	0%	0%	0%	0%	-2%
	Experiment 8 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 7 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 8 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 7 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 8 and baseline	-1%	-1%	-1%	1%	1%	1%
2018	Experiment 7 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 8 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 7 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 8 and baseline	-2%	-2%	-2%	2%	2%	2%
2020	Experiment 7 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 8 and baseline	-2%	-2%	-2%	2%	2%	2%
2021	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%
2022	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%
2023	Experiment 7 and baseline	-4%	-4%	-4%	4%	4%	4%
	Experiment 8 and baseline	-4%	-4%	-4%	4%	4%	4%
2024	Experiment 7 and baseline	-4%	-4%	-4%	4%	4%	4%
	Experiment 8 and baseline	-4%	-4%	-4%	4%	4%	4%

Source: model results

Table A10D. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services from 2015 to 2024 at the baseline, the experiments 7 and 8 for rural China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,773	2,791	2,808	86	90	95	348	356	365
	Experiment 7	2,759	2,777	2,795	86	90	94	349	357	366
	Experiment 8	2,759	2,777	2,795	86	90	94	375	385	394
2016	Baseline	2,732	2,751	2,770	87	91	95	326	336	346
	Experiment 7	2,704	2,723	2,743	87	91	95	328	338	348
	Experiment 8	2,704	2,723	2,743	87	91	95	393	405	417
2017	Baseline	1,674	1,702	1,729	212	222	233	355	367	379
	Experiment 7	1,644	1,661	1,678	213	224	235	355	370	385
	Experiment 8	1,643	1,669	1,695	213	223	233	465	484	503
2018	Baseline	1,881	1,895	1,908	221	229	238	355	367	378
	Experiment 7	1,847	1,861	1,875	226	235	244	358	370	381
	Experiment 8	1,841	1,855	1,869	225	234	243	512	525	539
2019	Baseline	2,329	2,375	2,422	281	290	300	463	474	484
	Experiment 7	2,285	2,327	2,369	295	303	311	458	471	485
	Experiment 8	2,273	2,318	2,362	291	300	309	655	673	690
2020	Baseline	2,471	2,496	2,520	301	312	323	444	457	470
	Experiment 7	2,406	2,434	2,462	322	334	345	455	467	479
	Experiment 8	2,388	2,423	2,457	313	326	339	696	714	732

2021	Baseline	2,317	2,350	2,383	361	379	397	481	495	509
	Experiment 7	2,222	2,258	2,293	392	408	423	483	503	522
	Experiment 8	2,217	2,255	2,294	379	398	417	754	788	822
2022	Baseline	2,465	2,485	2,504	394	401	408	460	472	485
	Experiment 7	2,360	2,385	2,410	439	451	463	480	488	497
	Experiment 8	2,322	2,353	2,383	427	435	443	808	820	831
2023	Baseline	2,575	2,636	2,696	436	457	478	478	483	488
	Experiment 7	2,524	2,550	2,577	506	514	523	479	491	503
	Experiment 8	2,468	2,516	2,564	490	512	534	809	833	857
2024	Baseline	2,717	2,743	2,769	456	472	489	484	499	514
	Experiment 7	2,536	2,582	2,627	534	551	569	503	512	521
	Experiment 8	2,559	2,591	2,623	531	551	570	854	873	891
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	201	207	213	108	113	119	1,168	1,182	1,195
	Experiment 7	201	207	213	108	113	119	1,196	1,209	1,222
	Experiment 8	201	207	213	108	113	119	1,168	1,182	1,195
2016	Baseline	218	226	233	98	103	108	1,093	1,109	1,125
	Experiment 7	218	226	233	98	103	108	1,161	1,176	1,191
	Experiment 8	218	226	233	98	103	108	1,093	1,109	1,125
2017	Baseline	253	264	275	137	143	148	745	765	786
	Experiment 7	255	266	277	136	142	149	865	884	904
	Experiment 8	256	266	277	137	143	148	742	762	782
2018	Baseline	290	297	304	128	135	141	844	854	865
	Experiment 7	289	296	303	127	134	140	1,002	1,015	1,028

	Experiment 8	297	305	313	127	134	140	837	847	857
2019	Baseline	356	367	378	191	201	210	1,024	1,054	1,083
	Experiment 7	352	365	378	189	199	209	1,240	1,280	1,320
	Experiment 8	373	387	401	191	201	211	1,013	1,047	1,081
2020	Baseline	412	420	427	171	180	189	1,105	1,121	1,136
	Experiment 7	401	410	420	168	176	184	1,381	1,403	1,424
	Experiment 8	436	448	459	176	185	195	1,078	1,096	1,113
2021	Baseline	467	482	497	178	186	194	1,145	1,181	1,217
	Experiment 7	460	472	484	177	186	194	1,504	1,527	1,551
	Experiment 8	524	540	556	193	202	211	1,127	1,149	1,172
2022	Baseline	543	558	572	156	164	172	1,239	1,256	1,273
	Experiment 7	525	534	543	152	160	168	1,654	1,676	1,698
	Experiment 8	612	627	642	185	194	203	1,202	1,221	1,241
2023	Baseline	592	620	648	161	166	172	1,329	1,360	1,391
	Experiment 7	592	610	628	149	157	165	1,820	1,840	1,859
	Experiment 8	690	719	748	202	209	217	1,285	1,321	1,358
2024	Baseline	673	688	702	138	145	152	1,374	1,392	1,410
	Experiment 7	654	665	677	137	144	150	1,859	1,883	1,906
	Experiment 8	751	765	778	208	218	229	1,327	1,344	1,362

Source: model results

Table A10D. 6 The changes in the average number of people who will require different type of LTC services between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in rural China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 7 and baseline	-14	0	1	0	0	27
	Experiment 8 and baseline	-14	0	28	0	0	0
2016	Experiment 7 and baseline	-28	0	2	0	0	67
	Experiment 8 and baseline	-28	0	69	0	0	0
2017	Experiment 7 and baseline	-33	2	3	2	0	119
	Experiment 8 and baseline	-40	1	117	3	0	-4
2018	Experiment 7 and baseline	-34	6	3	-1	-1	161
	Experiment 8 and baseline	-40	5	159	8	-1	-8
2019	Experiment 7 and baseline	-48	13	2	-2	-2	226
	Experiment 8 and baseline	-58	10	199	20	1	-7
2020	Experiment 7 and baseline	-62	22	10	-9	-4	282
	Experiment 8 and baseline	-73	14	257	28	6	-25
2021	Experiment 7 and baseline	-92	29	8	-10	-1	346
	Experiment 8 and baseline	-94	19	294	58	15	-32

2022	Experiment 7 and baseline	-99	50	16	-24	-4	420
	Experiment 8 and baseline	-132	34	347	69	30	-35
2023	Experiment 7 and baseline	-85	57	8	-10	-9	480
	Experiment 8 and baseline	-120	55	350	99	43	-39
2024	Experiment 7 and baseline	-152	79	14	-22	-1	491
	Experiment 8 and baseline	-161	79	374	77	73	-48

Source: model results

Table A10D. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services at the baseline, the experiments 7 and 8 for each year from 2015 to 2024 in rural China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	59%	59%	60%	2%	2%	2%	7%	8%	8%
	Experiment 7	59%	58%	59%	2%	2%	2%	7%	8%	8%
	Experiment 8	59%	58%	60%	2%	2%	2%	8%	8%	8%
2016	Baseline	60%	60%	61%	2%	2%	2%	7%	7%	7%
	Experiment 7	59%	58%	60%	2%	2%	2%	7%	7%	7%
	Experiment 8	59%	58%	60%	2%	2%	2%	9%	9%	9%
2017	Baseline	50%	49%	51%	6%	6%	7%	11%	11%	11%
	Experiment 7	47%	47%	48%	6%	6%	6%	10%	10%	11%
	Experiment 8	48%	47%	49%	6%	6%	6%	13%	14%	14%
2018	Baseline	51%	50%	51%	6%	6%	6%	10%	10%	10%
	Experiment 7	48%	48%	49%	6%	6%	6%	9%	9%	10%
	Experiment 8	48%	48%	49%	6%	6%	6%	13%	13%	14%
2019	Baseline	50%	50%	52%	6%	6%	6%	10%	10%	10%
	Experiment 7	47%	47%	49%	6%	6%	6%	10%	10%	10%
	Experiment 8	47%	47%	49%	6%	6%	6%	14%	14%	14%
2020	Baseline	50%	50%	51%	6%	6%	6%	9%	9%	9%
	Experiment 7	47%	47%	48%	6%	6%	6%	9%	9%	9%
	Experiment 8	47%	47%	48%	6%	6%	6%	14%	14%	14%

2021	Baseline	47%	46%	48%	7%	7%	8%	10%	10%	10%
	Experiment 7	42%	42%	44%	7%	8%	8%	9%	9%	10%
	Experiment 8	43%	42%	44%	7%	7%	8%	15%	15%	15%
2022	Baseline	47%	47%	48%	8%	8%	8%	9%	9%	9%
	Experiment 7	42%	42%	43%	8%	8%	8%	9%	9%	9%
	Experiment 8	42%	42%	43%	8%	8%	8%	15%	15%	14%
2023	Baseline	46%	46%	48%	8%	8%	8%	9%	8%	8%
	Experiment 7	42%	41%	42%	8%	8%	8%	8%	8%	8%
	Experiment 8	42%	41%	43%	8%	8%	9%	14%	14%	14%
2024	Baseline	47%	46%	47%	8%	8%	8%	8%	8%	9%
	Experiment 7	41%	41%	42%	9%	9%	9%	8%	8%	8%
	Experiment 8	41%	41%	42%	9%	9%	9%	14%	14%	14%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 7	4%	4%	4%	2%	2%	2%	25%	25%	25%
	Experiment 8	4%	4%	4%	2%	2%	2%	25%	25%	25%
2016	Baseline	5%	5%	5%	2%	2%	2%	24%	24%	24%
	Experiment 7	5%	5%	5%	2%	2%	2%	25%	25%	25%
	Experiment 8	5%	5%	5%	2%	2%	2%	24%	24%	24%
2017	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 7	7%	8%	8%	4%	4%	4%	25%	25%	25%
	Experiment 8	7%	8%	8%	4%	4%	4%	21%	21%	21%
2018	Baseline	8%	8%	8%	3%	4%	4%	23%	23%	23%
	Experiment 7	8%	8%	8%	3%	3%	4%	26%	26%	26%

	Experiment 8	8%	8%	8%	3%	3%	4%	22%	22%	22%
2019	Baseline	8%	8%	8%	4%	4%	4%	22%	22%	22%
	Experiment 7	7%	7%	7%	4%	4%	4%	26%	26%	26%
	Experiment 8	8%	8%	8%	4%	4%	4%	21%	21%	21%
2020	Baseline	8%	8%	8%	3%	4%	4%	23%	22%	22%
	Experiment 7	8%	8%	8%	3%	3%	3%	27%	27%	27%
	Experiment 8	9%	9%	9%	3%	4%	4%	21%	21%	21%
2021	Baseline	9%	10%	10%	4%	4%	4%	23%	23%	23%
	Experiment 7	9%	9%	9%	3%	3%	4%	29%	29%	28%
	Experiment 8	10%	10%	10%	4%	4%	4%	22%	22%	21%
2022	Baseline	10%	10%	11%	3%	3%	3%	24%	24%	24%
	Experiment 7	9%	9%	9%	3%	3%	3%	29%	29%	29%
	Experiment 8	11%	11%	11%	3%	3%	4%	22%	22%	22%
2023	Baseline	11%	11%	11%	3%	3%	3%	24%	24%	24%
	Experiment 7	10%	10%	10%	2%	3%	3%	30%	30%	30%
	Experiment 8	12%	12%	12%	3%	3%	3%	22%	22%	22%
2024	Baseline	12%	12%	12%	2%	2%	3%	24%	23%	23%
	Experiment 7	11%	11%	11%	2%	2%	2%	30%	30%	30%
	Experiment 8	12%	12%	12%	3%	3%	4%	21%	21%	21%

Source: model results

Table A10D. 8 The changes in the average percentage of people who will require different type of LTC services between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in rural China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 7 and baseline	0%	0%	0%	0%	0%	1%
	Experiment 8 and baseline	0%	0%	1%	0%	0%	0%
2016	Experiment 7 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 8 and baseline	-1%	0%	1%	0%	0%	0%
2017	Experiment 7 and baseline	-2%	0%	0%	0%	0%	3%
	Experiment 8 and baseline	-2%	0%	3%	0%	0%	-1%
2018	Experiment 7 and baseline	-3%	0%	0%	0%	0%	3%
	Experiment 8 and baseline	-3%	0%	4%	0%	0%	-1%
2019	Experiment 7 and baseline	-3%	0%	0%	0%	0%	4%
	Experiment 8 and baseline	-3%	0%	4%	0%	0%	-1%
2020	Experiment 7 and baseline	-3%	0%	0%	-1%	0%	4%
	Experiment 8 and baseline	-3%	0%	5%	0%	0%	-1%
2021	Experiment 7 and baseline	-4%	0%	0%	-1%	0%	5%
	Experiment 8 and baseline	-4%	0%	5%	1%	0%	-2%

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2022	Experiment 7 and baseline	-5%	0%	0%	-1%	0%	6%
	Experiment 8 and baseline	-5%	0%	6%	1%	0%	-2%
2023	Experiment 7 and baseline	-5%	0%	0%	-1%	0%	6%
	Experiment 8 and baseline	-5%	0%	5%	1%	1%	-2%
2024	Experiment 7 and baseline	-5%	1%	0%	-1%	0%	6%
	Experiment 8 and baseline	-5%	1%	5%	0%	1%	-2%

Source: model results

10E An increase in the proportion of individual with disability by 1% per year is accompanied by a reduction in informal care provided by children that is proportional to the number of living children for urban China

Table A10E. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 1	2,780	2,797	2,814	4,108	4,166	4,224	6,888	6,963	7,038
	Experiment 2	2,780	2,797	2,814	4,108	4,166	4,224	6,888	6,963	7,038
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 1	3,204	3,219	3,235	4,061	4,114	4,168	7,264	7,334	7,403
	Experiment 2	3,204	3,219	3,235	4,060	4,114	4,169	7,264	7,334	7,404
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 1	2,749	2,769	2,789	4,951	5,019	5,088	7,700	7,788	7,877
	Experiment 2	2,749	2,769	2,789	4,950	5,019	5,088	7,699	7,788	7,877
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 1	3,003	3,029	3,054	5,134	5,236	5,339	8,137	8,265	8,393
	Experiment 2	3,003	3,029	3,054	5,133	5,236	5,339	8,136	8,265	8,394

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2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 1	2,782	2,802	2,822	5,844	5,940	6,036	8,626	8,742	8,859
	Experiment 2	2,782	2,802	2,822	5,840	5,940	6,041	8,622	8,742	8,863
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 1	2,974	2,991	3,008	6,213	6,293	6,373	9,187	9,284	9,381
	Experiment 2	2,975	2,991	3,008	6,213	6,293	6,372	9,187	9,284	9,381
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 1	3,011	3,030	3,049	6,652	6,764	6,877	9,663	9,795	9,926
	Experiment 2	3,012	3,031	3,050	6,652	6,764	6,876	9,663	9,795	9,926
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 1	3,151	3,173	3,195	7,061	7,168	7,276	10,212	10,342	10,471
	Experiment 2	3,152	3,174	3,196	7,058	7,167	7,276	10,210	10,342	10,473
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 1	3,184	3,207	3,230	7,404	7,540	7,675	10,588	10,747	10,905
	Experiment 2	3,186	3,208	3,231	7,406	7,538	7,671	10,592	10,747	10,901
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 1	3,051	3,073	3,095	7,850	7,966	8,082	10,901	11,040	11,178
	Experiment 2	3,050	3,071	3,093	7,856	7,968	8,080	10,906	11,040	11,173

Source: model results

Table A10E. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in urban China (Unit:10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	-9	-9	-9	3	8	12
	Experiment 2 and baseline	-9	-9	-9	3	8	12
2016	Experiment 1 and baseline	-18	-17	-16	16	17	18
	Experiment 2 and baseline	-18	-17	-16	16	17	18
2017	Experiment 1 and baseline	-34	-35	-36	37	35	33
	Experiment 2 and baseline	-34	-35	-36	37	35	33
2018	Experiment 1 and baseline	-60	-59	-58	58	59	60
	Experiment 2 and baseline	-60	-59	-58	57	59	61
2019	Experiment 1 and baseline	-81	-75	-69	48	67	86
	Experiment 2 and baseline	-81	-75	-69	44	67	90
2020	Experiment 1 and baseline	-88	-89	-90	87	91	96
	Experiment 2 and baseline	-88	-89	-90	87	91	95
2021	Experiment 1 and baseline	-103	-103	-102	53	90	128
	Experiment 2 and baseline	-103	-102	-102	52	90	127
2022	Experiment 1 and baseline	-131	-127	-123	96	105	115
	Experiment 2 and baseline	-130	-126	-122	93	104	116
2023	Experiment 1 and baseline	-131	-137	-143	78	102	126
	Experiment 2 and baseline	-130	-136	-142	81	101	121
2024	Experiment 1 and baseline	-127	-126	-125	72	80	88
	Experiment 2 and baseline	-128	-128	-127	77	82	86

Source: model results

Table A10E. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 1	40%	40%	40%	60%	60%	60%
	Experiment 2	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 1	44%	44%	44%	56%	56%	56%
	Experiment 2	44%	44%	44%	56%	56%	56%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 1	35%	36%	36%	64%	64%	65%
	Experiment 2	35%	36%	36%	64%	64%	65%
2018	Baseline scenario	37%	37%	38%	62%	63%	63%
	Experiment 1	36%	37%	37%	63%	63%	64%
	Experiment 2	36%	37%	37%	63%	63%	64%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 1	32%	32%	32%	68%	68%	68%
	Experiment 2	32%	32%	32%	68%	68%	68%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 1	32%	32%	32%	68%	68%	68%
	Experiment 2	32%	32%	32%	68%	68%	68%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 1	31%	31%	31%	69%	69%	69%
	Experiment 2	31%	31%	31%	69%	69%	69%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 1	31%	31%	31%	69%	69%	69%
	Experiment 2	31%	31%	31%	69%	69%	69%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 1	30%	30%	30%	70%	70%	70%
	Experiment 2	30%	30%	30%	70%	70%	70%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 1	28%	28%	28%	72%	72%	72%
	Experiment 2	28%	28%	28%	72%	72%	72%

Source: model results

Table A10E. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 1 and 2 for each year from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 1 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 2 and baseline	0%	0%	0%	0%	0%	0%
2018	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2020	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2021	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2022	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2023	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%
2024	Experiment 1 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 2 and baseline	-1%	-1%	-1%	1%	1%	1%

Source: model results

Table A10E. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 1	2,345	2,365	2,384	98	104	110	276	283	291
	Experiment 2	2,345	2,365	2,384	98	104	110	276	283	291
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 1	2,313	2,332	2,350	102	107	111	284	289	295
	Experiment 2	2,313	2,332	2,350	102	107	111	284	290	296
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 1	2,358	2,379	2,400	105	110	115	433	442	452
	Experiment 2	2,358	2,379	2,400	105	110	115	436	446	456
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 1	2,455	2,491	2,527	106	111	116	463	478	492
	Experiment 2	2,455	2,490	2,526	106	111	116	471	486	501
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 1	2,600	2,628	2,656	117	126	134	645	663	680
	Experiment 2	2,600	2,628	2,655	117	126	134	658	678	697
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 1	2,716	2,737	2,757	127	133	139	695	708	721
	Experiment 2	2,716	2,736	2,756	127	133	139	718	733	747

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2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 1	2,690	2,727	2,764	134	144	154	861	876	891
	Experiment 2	2,688	2,725	2,762	134	144	154	897	913	929
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 1	2,753	2,788	2,823	147	153	159	949	966	983
	Experiment 2	2,750	2,785	2,820	147	153	159	1,002	1,020	1,039
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 1	2,702	2,731	2,760	164	170	177	1,113	1,143	1,173
	Experiment 2	2,698	2,727	2,755	164	170	177	1,182	1,214	1,246
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 1	2,824	2,856	2,887	172	182	192	1,207	1,221	1,235
	Experiment 2	2,820	2,851	2,882	172	182	192	1,293	1,306	1,319
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 1	529	536	543	88	93	97	772	786	799
	Experiment 2	529	536	543	88	93	97	772	786	799
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 1	524	532	540	87	92	96	751	763	776
	Experiment 2	524	532	540	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 1	838	854	871	102	107	113	1,115	1,127	1,138
	Experiment 2	838	854	870	102	107	113	1,112	1,124	1,135
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 1	881	904	927	110	116	121	1,119	1,137	1,155

	Experiment 2	881	904	927	110	116	121	1,111	1,129	1,148
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 1	1,109	1,125	1,140	126	132	138	1,247	1,268	1,288
	Experiment 2	1,109	1,126	1,143	126	132	138	1,231	1,252	1,274
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 1	1,240	1,256	1,271	144	152	159	1,290	1,308	1,326
	Experiment 2	1,241	1,256	1,272	144	152	159	1,266	1,283	1,300
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 1	1,471	1,497	1,523	160	168	175	1,337	1,353	1,369
	Experiment 2	1,471	1,497	1,524	160	168	175	1,302	1,317	1,331
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 1	1,693	1,709	1,725	189	198	208	1,330	1,354	1,378
	Experiment 2	1,691	1,707	1,724	189	198	208	1,280	1,304	1,327
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 1	1,962	1,993	2,023	213	223	234	1,250	1,279	1,308
	Experiment 2	1,961	1,990	2,020	213	223	234	1,189	1,214	1,238
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 1	2,117	2,137	2,157	229	240	251	1,302	1,332	1,361
	Experiment 2	2,115	2,135	2,154	229	240	251	1,228	1,255	1,283

Source: model results

Table A10E. 6 The changes in the average number of people who will require different type of LTC service between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	10	0	-1	2	2	-4
	Experiment 2 and baseline	10	0	-1	2	2	-4
2016	Experiment 1 and baseline	15	0	0	1	0	1
	Experiment 2 and baseline	15	0	1	1	0	0
2017	Experiment 1 and baseline	30	0	0	4	0	2
	Experiment 2 and baseline	30	0	3	4	0	-1
2018	Experiment 1 and baseline	46	0	-1	8	0	6
	Experiment 2 and baseline	46	0	8	8	0	-2
2019	Experiment 1 and baseline	55	2	-2	8	-2	5
	Experiment 2 and baseline	55	2	13	9	-2	-10
2020	Experiment 1 and baseline	73	1	-6	8	0	17
	Experiment 2 and baseline	71	1	19	9	0	-9
2021	Experiment 1 and baseline	70	0	5	16	-5	6
	Experiment 2 and baseline	68	0	42	16	-5	-31

2022	Experiment 1 and baseline	97	-2	-11	7	-1	15
	Experiment 2 and baseline	93	-2	44	5	-1	-35
2023	Experiment 1 and baseline	80	1	-6	6	-2	23
	Experiment 2 and baseline	76	1	65	4	-2	-43
2024	Experiment 1 and baseline	83	-2	-28	-26	0	53
	Experiment 2 and baseline	78	-2	57	-28	0	-23

Source: model results

Table A10E. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services for each year from 2015 to 2024 at the baseline, the experiments 1 and 2 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	58%	2%	3%	3%	7%	7%	7%
	Experiment 1	57%	57%	58%	2%	2%	3%	7%	7%	7%
	Experiment 2	57%	57%	58%	2%	2%	3%	7%	7%	7%
2016	Baseline	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 1	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 2	57%	57%	58%	3%	3%	3%	7%	7%	7%
2017	Baseline	47%	47%	48%	2%	2%	2%	9%	9%	9%
	Experiment 1	48%	47%	48%	2%	2%	2%	9%	9%	9%
	Experiment 2	48%	47%	48%	2%	2%	2%	9%	9%	9%
2018	Baseline	47%	47%	49%	2%	2%	2%	9%	9%	9%
	Experiment 1	48%	48%	49%	2%	2%	2%	9%	9%	9%
	Experiment 2	48%	48%	49%	2%	2%	2%	9%	9%	9%
2019	Baseline	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 1	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 2	45%	44%	45%	2%	2%	2%	11%	11%	12%
2020	Baseline	43%	43%	44%	2%	2%	2%	11%	12%	12%
	Experiment 1	44%	43%	44%	2%	2%	2%	11%	11%	11%
	Experiment 2	44%	43%	44%	2%	2%	2%	12%	12%	12%

2021	Baseline	40%	40%	41%	2%	2%	2%	13%	13%	13%
	Experiment 1	40%	40%	42%	2%	2%	2%	13%	13%	13%
	Experiment 2	40%	40%	42%	2%	2%	2%	13%	14%	14%
2022	Baseline	38%	38%	39%	2%	2%	2%	14%	14%	14%
	Experiment 1	39%	39%	40%	2%	2%	2%	13%	13%	14%
	Experiment 2	39%	39%	40%	2%	2%	2%	14%	14%	14%
2023	Baseline	36%	36%	37%	2%	2%	2%	15%	15%	16%
	Experiment 1	37%	36%	37%	2%	2%	2%	15%	15%	15%
	Experiment 2	36%	36%	37%	2%	2%	2%	16%	16%	16%
2024	Baseline	35%	35%	36%	2%	2%	2%	16%	16%	16%
	Experiment 1	36%	36%	37%	2%	2%	2%	15%	15%	15%
	Experiment 2	36%	36%	37%	2%	2%	2%	16%	16%	16%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 1	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 2	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 1	13%	13%	13%	2%	2%	2%	18%	19%	19%
	Experiment 2	13%	13%	13%	2%	2%	2%	18%	19%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 1	17%	17%	17%	2%	2%	2%	23%	22%	22%
	Experiment 2	17%	17%	17%	2%	2%	2%	22%	22%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 1	17%	17%	17%	2%	2%	2%	22%	22%	22%

	Experiment 2	17%	17%	17%	2%	2%	2%	22%	22%	21%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 1	19%	19%	19%	2%	2%	2%	21%	21%	21%
	Experiment 2	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 1	20%	20%	20%	2%	2%	2%	21%	21%	21%
	Experiment 2	20%	20%	20%	2%	2%	2%	20%	20%	20%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 1	22%	22%	22%	2%	2%	3%	20%	20%	20%
	Experiment 2	22%	22%	22%	2%	2%	3%	20%	19%	19%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 1	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 2	24%	24%	24%	3%	3%	3%	18%	18%	18%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 1	27%	26%	26%	3%	3%	3%	17%	17%	17%
	Experiment 2	26%	26%	26%	3%	3%	3%	16%	16%	16%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 1	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 2	27%	27%	27%	3%	3%	3%	16%	16%	16%

Source: model results

Table A10E. 8 The changes in the average percentage of people who will require different type of LTC between the baseline, and the experiments 1 and 2 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 1 and baseline	10	0	-1	2	2	-4
	Experiment 2 and baseline	10	0	-1	2	2	-4
2016	Experiment 1 and baseline	15	0	0	1	0	1
	Experiment 2 and baseline	15	0	1	1	0	0
2017	Experiment 1 and baseline	30	0	0	4	0	2
	Experiment 2 and baseline	30	0	3	4	0	-1
2018	Experiment 1 and baseline	46	0	-1	8	0	6
	Experiment 2 and baseline	46	0	8	8	0	-2
2019	Experiment 1 and baseline	55	2	-2	8	-2	5
	Experiment 2 and baseline	55	2	13	9	-2	-10
2020	Experiment 1 and baseline	73	1	-6	8	0	17
	Experiment 2 and baseline	71	1	19	9	0	-9
2021	Experiment 1 and baseline	70	0	5	16	-5	6
	Experiment 2 and baseline	68	0	42	16	-5	-31

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2022	Experiment 1 and baseline	97	-2	-11	7	-1	15
	Experiment 2 and baseline	93	-2	44	5	-1	-35
2023	Experiment 1 and baseline	80	1	-6	6	-2	23
	Experiment 2 and baseline	76	1	65	4	-2	-43
2024	Experiment 1 and baseline	83	-2	-28	-26	0	53
	Experiment 2 and baseline	78	-2	57	-28	0	-23

Source: model results

10F An increase in the proportion of individual with disability by 1% per year is accompanied by a reduction in informal care provided by children to none for urban China

Table A10F. 1 Population projection: the average number (with95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 3	2,783	2,800	2,817	4,109	4,165	4,220	6,892	6,965	7,037
	Experiment 4	2,783	2,800	2,817	4,111	4,165	4,218	6,893	6,965	7,036
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 3	3,204	3,219	3,235	4,062	4,114	4,167	7,266	7,334	7,402
	Experiment 4	3,204	3,219	3,235	4,059	4,114	4,169	7,263	7,334	7,405
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 3	2,745	2,766	2,786	4,952	5,023	5,094	7,698	7,788	7,879
	Experiment 4	2,747	2,767	2,787	4,955	5,022	5,089	7,702	7,788	7,875
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 3	2,995	3,021	3,047	5,144	5,244	5,343	8,140	8,265	8,390
	Experiment 4	2,998	3,024	3,049	5,139	5,241	5,343	8,137	8,265	8,393

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2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 3	2,776	2,792	2,808	5,876	5,959	6,042	8,652	8,751	8,851
	Experiment 4	2,779	2,795	2,812	5,877	5,956	6,035	8,656	8,751	8,847
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 3	2,952	2,970	2,988	6,242	6,320	6,398	9,194	9,290	9,386
	Experiment 4	2,956	2,975	2,993	6,235	6,315	6,395	9,191	9,290	9,388
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 3	2,983	2,999	3,016	6,727	6,805	6,883	9,710	9,805	9,899
	Experiment 4	2,989	3,006	3,023	6,720	6,798	6,876	9,709	9,804	9,899
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 3	3,095	3,125	3,154	7,108	7,236	7,364	10,203	10,361	10,519
	Experiment 4	3,105	3,134	3,163	7,097	7,227	7,356	10,202	10,361	10,520
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 3	3,133	3,168	3,203	7,495	7,616	7,736	10,628	10,783	10,939
	Experiment 4	3,142	3,178	3,214	7,483	7,604	7,726	10,625	10,782	10,940
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 3	3,010	3,029	3,049	7,948	8,065	8,181	10,958	11,094	11,230
	Experiment 4	3,009	3,027	3,044	7,958	8,068	8,178	10,967	11,095	11,222

Source: model results

Table A10F. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in urban China (Unit:10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	-6	-6	-6	5	6	8
	Experiment 4 and baseline	-6	-6	-6	6	6	6
2016	Experiment 3 and baseline	-18	-17	-16	18	17	16
	Experiment 4 and baseline	-18	-17	-16	15	17	19
2017	Experiment 3 and baseline	-38	-39	-40	39	39	39
	Experiment 4 and baseline	-37	-38	-39	42	38	34
2018	Experiment 3 and baseline	-67	-66	-66	68	67	65
	Experiment 4 and baseline	-64	-64	-63	63	64	65
2019	Experiment 3 and baseline	-87	-85	-83	80	86	92
	Experiment 4 and baseline	-84	-82	-79	82	83	84
2020	Experiment 3 and baseline	-110	-110	-110	116	118	120
	Experiment 4 and baseline	-106	-106	-105	109	114	118
2021	Experiment 3 and baseline	-132	-134	-136	128	131	134
	Experiment 4 and baseline	-125	-127	-129	120	124	127
2022	Experiment 3 and baseline	-186	-175	-164	143	173	204
	Experiment 4 and baseline	-177	-166	-155	132	164	196
2023	Experiment 3 and baseline	-183	-177	-170	169	178	186
	Experiment 4 and baseline	-174	-166	-159	157	167	176
2024	Experiment 3 and baseline	-168	-170	-172	169	178	187
	Experiment 4 and baseline	-169	-173	-177	179	182	184

Source: model results

Table A10F. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 3	40%	40%	40%	60%	60%	60%
	Experiment 4	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 3	44%	44%	44%	56%	56%	56%
	Experiment 4	44%	44%	44%	56%	56%	56%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 3	35%	36%	36%	64%	64%	65%
	Experiment 4	35%	36%	36%	64%	64%	65%
2018	Baseline scenario	37%	37%	38%	62%	63%	63%
	Experiment 3	36%	37%	37%	63%	63%	64%
	Experiment 4	36%	37%	37%	63%	63%	64%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 3	32%	32%	32%	68%	68%	68%
	Experiment 4	32%	32%	32%	68%	68%	68%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 3	32%	32%	32%	68%	68%	68%
	Experiment 4	32%	32%	32%	68%	68%	68%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 3	30%	31%	31%	69%	69%	70%
	Experiment 4	31%	31%	31%	69%	69%	69%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 3	30%	30%	30%	70%	70%	70%
	Experiment 4	30%	30%	30%	70%	70%	70%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 3	29%	29%	29%	71%	71%	71%
	Experiment 4	29%	29%	30%	70%	71%	71%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 3	27%	27%	27%	73%	73%	73%
	Experiment 4	27%	27%	27%	73%	73%	73%

Source: model results

Table A10F. 4 The changes in the average percentage of people who will and who will not need between the baseline and the experiments 3 and 4 for each year from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 3 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 4 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	0%	0%	-1%	1%	0%	0%
2018	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2020	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2021	Experiment 3 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 4 and baseline	-1%	-1%	-1%	1%	1%	1%
2022	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%
2023	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%
2024	Experiment 3 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 4 and baseline	-2%	-2%	-2%	2%	2%	2%

Source: model results

Table A10F. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 3	2,318	2,337	2,356	99	104	109	278	284	291
	Experiment 4	2,318	2,337	2,356	99	104	109	302	308	314
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 3	2,264	2,282	2,300	102	107	111	283	289	295
	Experiment 4	2,264	2,282	2,300	102	107	111	333	340	347
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 3	2,283	2,304	2,326	105	110	115	433	442	451
	Experiment 4	2,279	2,301	2,323	105	110	115	527	533	540
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 3	2,357	2,391	2,424	106	111	116	462	476	490
	Experiment 4	2,349	2,383	2,416	106	111	116	594	613	631
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 3	2,483	2,508	2,533	118	124	130	647	660	674
	Experiment 4	2,473	2,497	2,521	118	124	130	826	840	855
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 3	2,575	2,595	2,615	127	133	139	692	705	718
	Experiment 4	2,559	2,578	2,597	127	133	139	925	942	958

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2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 3	2,559	2,582	2,606	140	147	154	853	863	873
	Experiment 4	2,535	2,558	2,582	140	147	154	1,147	1,159	1,171
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 3	2,556	2,599	2,642	151	157	163	937	957	978
	Experiment 4	2,524	2,568	2,611	151	157	163	1,295	1,319	1,344
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 3	2,533	2,562	2,591	164	172	180	1,106	1,125	1,143
	Experiment 4	2,490	2,520	2,550	164	172	180	1,515	1,540	1,565
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 3	2,658	2,683	2,708	175	184	193	1,184	1,205	1,225
	Experiment 4	2,623	2,647	2,670	176	185	194	1,638	1,659	1,679
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 3	529	535	541	87	91	95	799	814	829
	Experiment 4	529	535	541	87	91	95	777	790	803
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 3	523	531	539	87	92	96	802	814	826
	Experiment 4	524	532	540	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 3	833	849	866	102	107	113	1,197	1,210	1,223
	Experiment 4	833	849	865	102	107	113	1,109	1,121	1,133
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 3	872	894	915	110	116	121	1,237	1,256	1,276

	Experiment 4	873	895	917	110	116	121	1,106	1,124	1,142
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 3	1,099	1,113	1,126	128	133	138	1,401	1,422	1,442
	Experiment 4	1,100	1,113	1,126	128	133	138	1,233	1,249	1,266
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 3	1,225	1,238	1,252	144	151	159	1,478	1,496	1,514
	Experiment 4	1,223	1,238	1,252	144	151	159	1,257	1,273	1,290
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 3	1,448	1,467	1,487	164	169	174	1,565	1,578	1,591
	Experiment 4	1,447	1,465	1,484	164	169	174	1,288	1,300	1,312
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 3	1,657	1,682	1,707	190	200	210	1,619	1,642	1,665
	Experiment 4	1,650	1,676	1,701	190	200	210	1,288	1,308	1,328
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 3	1,931	1,957	1,983	213	219	226	1,549	1,581	1,613
	Experiment 4	1,925	1,951	1,976	213	219	226	1,176	1,203	1,229
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 3	2,089	2,117	2,145	230	238	246	1,612	1,638	1,665
	Experiment 4	2,082	2,109	2,135	231	239	246	1,208	1,231	1,254

Source: model results

Table A10F. 6 The changes in the average number of people who will require different type of LTC between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	-18	0	0	0	0	24
	Experiment 4 and baseline	-18	0	24	1	0	0
2016	Experiment 3 and baseline	-35	0	0	0	0	52
	Experiment 4 and baseline	-35	0	51	1	0	0
2017	Experiment 3 and baseline	-45	0	-1	-2	0	86
	Experiment 4 and baseline	-48	0	91	-2	0	-3
2018	Experiment 3 and baseline	-54	0	-2	-2	0	125
	Experiment 4 and baseline	-62	0	134	-1	0	-8
2019	Experiment 3 and baseline	-65	1	-4	-4	-1	159
	Experiment 4 and baseline	-76	1	176	-4	-1	-13
2020	Experiment 3 and baseline	-69	1	-9	-9	0	205
	Experiment 4 and baseline	-86	1	227	-10	0	-18
2021	Experiment 3 and baseline	-75	3	-9	-14	-4	230

	Experiment 4 and baseline	-99	3	288	-16	-4	-48
2022	Experiment 3 and baseline	-93	2	-19	-20	0	303
	Experiment 4 and baseline	-124	2	342	-26	0	-31
2023	Experiment 3 and baseline	-89	2	-24	-30	-7	325
	Experiment 4 and baseline	-131	3	391	-36	-7	-54
2024	Experiment 3 and baseline	-90	0	-44	-46	-2	360
	Experiment 4 and baseline	-126	1	410	-54	-1	-48

Source: model results

Table A10F. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services for each year from 2015 to 2024 at the baseline, the experiments 3 and 4 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	58%	2%	3%	3%	7%	7%	7%
	Experiment 3	56%	56%	57%	2%	2%	3%	7%	7%	7%
	Experiment 4	56%	56%	57%	2%	2%	3%	7%	7%	7%
2016	Baseline	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 3	56%	55%	57%	3%	3%	3%	7%	7%	7%
	Experiment 4	56%	55%	57%	3%	3%	3%	8%	8%	8%
2017	Baseline	47%	47%	48%	2%	2%	2%	9%	9%	9%
	Experiment 3	46%	46%	47%	2%	2%	2%	9%	9%	9%
	Experiment 4	46%	46%	47%	2%	2%	2%	11%	11%	11%
2018	Baseline	47%	47%	49%	2%	2%	2%	9%	9%	9%
	Experiment 3	46%	46%	47%	2%	2%	2%	9%	9%	9%
	Experiment 4	46%	45%	47%	2%	2%	2%	12%	12%	12%
2019	Baseline	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 3	42%	42%	43%	2%	2%	2%	11%	11%	11%
	Experiment 4	42%	42%	43%	2%	2%	2%	14%	14%	14%
2020	Baseline	43%	43%	44%	2%	2%	2%	11%	12%	12%
	Experiment 3	41%	41%	42%	2%	2%	2%	11%	11%	11%
	Experiment 4	41%	41%	42%	2%	2%	2%	15%	15%	15%

2021	Baseline	40%	40%	41%	2%	2%	2%	13%	13%	13%
	Experiment 3	38%	38%	39%	2%	2%	2%	13%	13%	13%
	Experiment 4	38%	38%	38%	2%	2%	2%	17%	17%	17%
2022	Baseline	38%	38%	39%	2%	2%	2%	14%	14%	14%
	Experiment 3	36%	36%	37%	2%	2%	2%	13%	13%	13%
	Experiment 4	36%	36%	37%	2%	2%	2%	18%	18%	18%
2023	Baseline	36%	36%	37%	2%	2%	2%	15%	15%	16%
	Experiment 3	34%	34%	35%	2%	2%	2%	15%	15%	15%
	Experiment 4	33%	33%	34%	2%	2%	2%	20%	20%	20%
2024	Baseline	35%	35%	36%	2%	2%	2%	16%	16%	16%
	Experiment 3	33%	33%	34%	2%	2%	2%	15%	15%	15%
	Experiment 4	33%	33%	34%	2%	2%	2%	21%	21%	21%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 3	13%	13%	13%	2%	2%	2%	19%	20%	20%
	Experiment 4	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 3	13%	13%	13%	2%	2%	2%	20%	20%	20%
	Experiment 4	13%	13%	13%	2%	2%	2%	18%	19%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 3	17%	17%	17%	2%	2%	2%	24%	24%	24%
	Experiment 4	17%	17%	17%	2%	2%	2%	22%	22%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 3	17%	17%	17%	2%	2%	2%	24%	24%	24%

	Experiment 4	17%	17%	17%	2%	2%	2%	22%	21%	21%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 3	19%	19%	19%	2%	2%	2%	24%	24%	24%
	Experiment 4	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 3	20%	20%	20%	2%	2%	2%	24%	24%	24%
	Experiment 4	20%	20%	20%	2%	2%	2%	20%	20%	20%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 3	22%	22%	22%	2%	2%	3%	23%	23%	23%
	Experiment 4	22%	22%	22%	2%	2%	3%	19%	19%	19%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 3	23%	23%	23%	3%	3%	3%	23%	23%	23%
	Experiment 4	23%	23%	23%	3%	3%	3%	18%	18%	18%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 3	26%	26%	26%	3%	3%	3%	21%	21%	21%
	Experiment 4	26%	26%	26%	3%	3%	3%	16%	16%	16%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 3	26%	26%	26%	3%	3%	3%	20%	20%	20%
	Experiment 4	26%	26%	26%	3%	3%	3%	15%	15%	15%

Source: model results

Table A10F. 8 The changes in the average percentage of people who will require different type of LTC between the baseline, and the experiments 3 and 4 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2016	Experiment 3 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 4 and baseline	-1%	0%	1%	0%	0%	0%
2017	Experiment 3 and baseline	-1%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-1%	0%	2%	0%	0%	0%
2018	Experiment 3 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-2%	0%	2%	0%	0%	0%
2019	Experiment 3 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 4 and baseline	-2%	0%	3%	0%	0%	-1%
2020	Experiment 3 and baseline	-2%	0%	0%	-1%	0%	3%
	Experiment 4 and baseline	-2%	0%	3%	-1%	0%	-1%
2021	Experiment 3 and baseline	-2%	0%	0%	-1%	0%	3%

	Experiment 4 and baseline	-2%	0%	4%	-1%	0%	-1%
2022	Experiment 3 and baseline	-2%	0%	-1%	-1%	0%	4%
	Experiment 4 and baseline	-3%	0%	4%	-1%	0%	-1%
2023	Experiment 3 and baseline	-2%	0%	-1%	-1%	0%	4%
	Experiment 4 and baseline	-3%	0%	5%	-1%	0%	-1%
2024	Experiment 3 and baseline	-2%	0%	-1%	-1%	0%	4%
	Experiment 4and baseline	-2%	0%	5%	-1%	0%	-1%

Source: model results

10G An increase in the proportion of individual with disabilities by 2% per year is accompanied by a reduction in informal care provided by children that is proportional to the number of living children for urban China

Table A10G. 1 Population projection: the average number (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 5	2,776	2,793	2,811	4,117	4,171	4,225	6,893	6,965	7,036
	Experiment 6	2,776	2,793	2,811	4,117	4,171	4,225	6,893	6,965	7,036
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 5	3,186	3,202	3,218	4,078	4,132	4,186	7,264	7,334	7,404
	Experiment 6	3,186	3,202	3,218	4,078	4,132	4,187	7,263	7,334	7,404
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 5	2,716	2,736	2,757	4,981	5,052	5,123	7,697	7,788	7,879
	Experiment 6	2,716	2,736	2,757	4,981	5,052	5,123	7,697	7,788	7,880
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 5	2,955	2,981	3,007	5,180	5,283	5,387	8,135	8,265	8,394
	Experiment 6	2,955	2,981	3,007	5,179	5,283	5,388	8,134	8,265	8,396

2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 5	2,721	2,737	2,753	5,932	6,010	6,088	8,653	8,747	8,841
	Experiment 6	2,721	2,737	2,753	5,930	6,010	6,090	8,650	8,747	8,843
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 5	2,885	2,903	2,921	6,286	6,373	6,459	9,171	9,276	9,380
	Experiment 6	2,886	2,903	2,921	6,287	6,372	6,458	9,172	9,276	9,379
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 5	2,895	2,911	2,927	6,797	6,875	6,952	9,692	9,786	9,879
	Experiment 6	2,896	2,912	2,928	6,793	6,874	6,955	9,689	9,786	9,883
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 5	3,014	3,041	3,068	7,159	7,278	7,396	10,173	10,319	10,464
	Experiment 6	3,015	3,042	3,069	7,157	7,277	7,396	10,172	10,319	10,465
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 5	3,029	3,070	3,112	7,443	7,633	7,823	10,472	10,703	10,934
	Experiment 6	3,029	3,071	3,113	7,437	7,632	7,827	10,467	10,703	10,940
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 5	2,927	2,950	2,973	7,908	8,038	8,168	10,835	10,988	11,141
	Experiment 6	2,925	2,948	2,971	7,913	8,040	8,168	10,837	10,988	11,139

Source: model results

Table A10G. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 5 and 6 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 5 and baseline	-13	-13	-12	13	13	13
	Experiment 6 and baseline	-13	-13	-12	13	13	13
2016	Experiment 5 and baseline	-36	-35	-34	34	35	36
	Experiment 6 and baseline	-36	-35	-34	33	35	36
2017	Experiment 5 and baseline	-67	-68	-69	68	68	68
	Experiment 6 and baseline	-67	-68	-69	68	68	68
2018	Experiment 5 and baseline	-107	-106	-105	104	106	109
	Experiment 6 and baseline	-107	-106	-105	103	106	110
2019	Experiment 5 and baseline	-142	-141	-139	136	137	137
	Experiment 6 and baseline	-142	-140	-139	134	137	140
2020	Experiment 5 and baseline	-177	-177	-178	160	171	182
	Experiment 6 and baseline	-176	-177	-178	161	171	181
2021	Experiment 5 and baseline	-219	-222	-224	160	171	182
	Experiment 6 and baseline	-219	-221	-224	314	302	290
2022	Experiment 5 and baseline	-268	-259	-250	194	215	236
	Experiment 6 and baseline	-267	-221	-224	194	200	206
2023	Experiment 5 and baseline	-287	-274	-261	118	195	273
	Experiment 6 and baseline	-286	-273	-260	112	194	277
2024	Experiment 5 and baseline	-251	-249	-248	130	152	174
	Experiment 6 and baseline	-253	-251	-250	134	154	174

Source: model results

Table A10G. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 5	40%	40%	40%	60%	60%	60%
	Experiment 6	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 5	43%	44%	44%	56%	56%	57%
	Experiment 6	43%	44%	44%	56%	56%	57%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 5	35%	35%	35%	65%	65%	65%
	Experiment 6	35%	35%	35%	65%	65%	65%
2018	Baseline scenario	37%	37%	38%	62%	63%	63%
	Experiment 5	36%	36%	36%	64%	64%	64%
	Experiment 6	36%	36%	36%	64%	64%	64%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 5	31%	31%	31%	69%	69%	69%
	Experiment 6	31%	31%	31%	69%	69%	69%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 5	31%	31%	31%	69%	69%	69%
	Experiment 6	31%	31%	31%	69%	69%	69%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 5	30%	30%	30%	70%	70%	70%
	Experiment 6	30%	30%	30%	70%	70%	70%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 5	29%	29%	30%	70%	71%	71%
	Experiment 6	29%	29%	30%	70%	71%	71%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 5	28%	29%	29%	71%	71%	72%
	Experiment 6	28%	29%	29%	71%	71%	72%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 5	27%	27%	27%	73%	73%	73%
	Experiment 6	27%	27%	27%	73%	73%	73%

Source: model results

Table A10G. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 5 and 6 for each year from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 5 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2018	Experiment 5 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 6 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2020	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2021	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2022	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2023	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%
2024	Experiment 5 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 6 and baseline	-2%	-2%	-2%	2%	2%	2%

Source: model results

Table A10G. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 5	2,348	2,367	2,385	99	104	109	278	285	291
	Experiment 6	2,348	2,367	2,385	99	104	109	278	285	291
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 5	2,329	2,348	2,367	102	107	111	283	289	295
	Experiment 6	2,329	2,348	2,367	102	107	111	284	290	296
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 5	2,385	2,408	2,430	105	110	115	433	442	451
	Experiment 6	2,385	2,408	2,430	105	110	115	437	447	457
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 5	2,494	2,532	2,570	106	111	116	463	477	491
	Experiment 6	2,494	2,532	2,570	106	111	116	474	489	504
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 5	2,661	2,687	2,713	117	123	129	646	659	671
	Experiment 6	2,661	2,687	2,713	117	123	129	667	681	695
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 5	2,786	2,810	2,834	126	132	138	693	705	717
	Experiment 6	2,785	2,809	2,832	126	132	138	730	744	757

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2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 5	2,803	2,827	2,851	140	147	154	855	870	884
	Experiment 6	2,801	2,825	2,848	140	147	154	914	929	944
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 5	2,839	2,878	2,917	145	151	157	932	951	969
	Experiment 6	2,835	2,874	2,914	145	151	157	1,019	1,039	1,058
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 5	2,807	2,869	2,930	165	174	182	1,057	1,101	1,145
	Experiment 6	2,803	2,864	2,926	165	174	182	1,173	1,221	1,270
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 5	2,936	2,967	2,998	171	180	188	1,171	1,190	1,210
	Experiment 6	2,930	2,961	2,992	171	180	188	1,311	1,333	1,355
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 5	529	535	542	87	91	95	777	790	803
	Experiment 6	529	535	542	87	91	95	777	790	803
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 5	525	533	541	87	92	96	751	763	776
	Experiment 6	525	533	541	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 5	841	858	874	102	107	113	1,116	1,128	1,139
	Experiment 6	840	857	874	102	107	113	1,112	1,123	1,135
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 5	887	910	933	110	115	121	1,120	1,138	1,156

	Experiment 6	887	910	932	110	115	121	1,108	1,127	1,145
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 5	1,124	1,137	1,149	128	133	137	1,255	1,271	1,287
	Experiment 6	1,123	1,136	1,150	128	133	137	1,234	1,250	1,266
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 5	1,242	1,261	1,280	142	150	157	1,297	1,316	1,334
	Experiment 6	1,243	1,260	1,278	142	150	157	1,260	1,278	1,296
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 5	1,485	1,502	1,519	165	169	173	1,348	1,360	1,372
	Experiment 6	1,484	1,501	1,519	165	169	173	1,289	1,303	1,317
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 5	1,699	1,723	1,748	181	190	200	1,364	1,385	1,406
	Experiment 6	1,696	1,721	1,747	181	190	200	1,281	1,301	1,321
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 5	1,950	1,988	2,025	204	212	221	1,260	1,289	1,319
	Experiment 6	1,941	1,984	2,027	204	212	221	1,152	1,176	1,200
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 5	2,093	2,128	2,163	219	230	240	1,318	1,343	1,369
	Experiment 6	2,092	2,127	2,161	219	230	240	1,189	1,211	1,232

Source: model results

Table A10. 6 The changes in the average number of people who will require different type of LTC between the baseline and the experiments 5 and 6 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 5 and baseline	12	0	0	1	0	0
	Experiment 6 and baseline	12	0	0	1	0	0
2016	Experiment 5 and baseline	32	0	0	2	0	1
	Experiment 6 and baseline	32	0	1	2	0	0
2017	Experiment 5 and baseline	58	0	-1	7	0	3
	Experiment 6 and baseline	58	0	5	6	0	-1
2018	Experiment 5 and baseline	88	0	-2	14	-1	7
	Experiment 6 and baseline	88	0	10	14	-1	-5
2019	Experiment 5 and baseline	115	0	-6	20	-1	9
	Experiment 6 and baseline	114	0	16	20	-1	-12
2020	Experiment 5 and baseline	145	0	-9	13	-2	24
	Experiment 6 and baseline	144	0	30	13	-2	-13
2021	Experiment 5 and baseline	170	3	-2	21	-4	13

	Experiment 6 and baseline	168	3	58	20	-4	-45
2022	Experiment 5 and baseline	186	-4	-26	21	-9	46
	Experiment 6 and baseline	183	-4	62	19	-9	-38
2023	Experiment 5 and baseline	218	-4	-48	1	-13	33
	Experiment 6 and baseline	214	-4	73	-3	-13	-80
2024	Experiment 5 and baseline	195	-5	-58	-35	-11	65
	Experiment 6 and baseline	189	-5	84	-36	-10	-68

Source: model results

Table A10G. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services for each year from 2015 to 2024 at the baseline, the experiments 5 and 6 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	58%	2%	3%	3%	7%	7%	7%
	Experiment 5	57%	57%	58%	2%	2%	3%	7%	7%	7%
	Experiment 6	57%	57%	58%	2%	2%	3%	7%	7%	7%
2016	Baseline	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 5	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 6	57%	57%	58%	3%	3%	3%	7%	7%	7%
2017	Baseline	47%	47%	48%	2%	2%	2%	9%	9%	9%
	Experiment 5	48%	48%	49%	2%	2%	2%	9%	9%	9%
	Experiment 6	48%	48%	49%	2%	2%	2%	9%	9%	9%
2018	Baseline	47%	47%	49%	2%	2%	2%	9%	9%	9%
	Experiment 5	48%	48%	50%	2%	2%	2%	9%	9%	9%
	Experiment 6	48%	48%	50%	2%	2%	2%	9%	9%	9%
2019	Baseline	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 5	45%	45%	46%	2%	2%	2%	11%	11%	11%
	Experiment 6	45%	45%	46%	2%	2%	2%	11%	11%	11%
2020	Baseline	43%	43%	44%	2%	2%	2%	11%	12%	12%
	Experiment 5	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 6	44%	44%	45%	2%	2%	2%	12%	12%	12%

2021	Baseline	40%	40%	41%	2%	2%	2%	13%	13%	13%
	Experiment 5	41%	41%	42%	2%	2%	2%	13%	13%	13%
	Experiment 6	41%	41%	42%	2%	2%	2%	13%	14%	14%
2022	Baseline	38%	38%	39%	2%	2%	2%	14%	14%	14%
	Experiment 5	40%	40%	41%	2%	2%	2%	13%	13%	13%
	Experiment 6	40%	40%	41%	2%	2%	2%	14%	14%	14%
2023	Baseline	36%	36%	37%	2%	2%	2%	15%	15%	16%
	Experiment 5	38%	38%	39%	2%	2%	2%	14%	14%	15%
	Experiment 6	38%	38%	39%	2%	2%	2%	16%	16%	16%
2024	Baseline	35%	35%	36%	2%	2%	2%	16%	16%	16%
	Experiment 5	37%	37%	38%	2%	2%	2%	15%	15%	15%
	Experiment 6	37%	37%	38%	2%	2%	2%	17%	17%	17%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 5	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 6	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 5	13%	13%	13%	2%	2%	2%	18%	18%	19%
	Experiment 6	13%	13%	13%	2%	2%	2%	18%	18%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 5	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 6	17%	17%	17%	2%	2%	2%	22%	22%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 5	17%	17%	17%	2%	2%	2%	22%	22%	21%

	Experiment 6	17%	17%	17%	2%	2%	2%	21%	21%	21%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 5	19%	19%	19%	2%	2%	2%	21%	21%	21%
	Experiment 6	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 5	20%	20%	20%	2%	2%	2%	21%	21%	21%
	Experiment 6	20%	20%	20%	2%	2%	2%	20%	20%	20%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 5	22%	22%	22%	2%	2%	2%	20%	20%	20%
	Experiment 6	22%	22%	22%	2%	2%	2%	19%	19%	19%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 5	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 6	24%	24%	24%	3%	3%	3%	18%	18%	18%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 5	26%	26%	26%	3%	3%	3%	17%	17%	17%
	Experiment 6	26%	26%	26%	3%	3%	3%	16%	15%	15%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 5	26%	26%	26%	3%	3%	3%	17%	17%	17%
	Experiment 6	26%	26%	26%	3%	3%	3%	15%	15%	15%

Source: model results

Table A10G. 8 The changes in the average percentage of people who will require different type of LTC between the baseline, and the experiments 5 and 6 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 5 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	0%
2018	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2019	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2020	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2021	Experiment 5 and baseline	1%	0%	0%	0%	0%	0%
	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2022	Experiment 5 and baseline	1%	0%	-1%	0%	0%	0%

	Experiment 6 and baseline	1%	0%	0%	0%	0%	-1%
2023	Experiment 5 and baseline	2%	0%	-1%	-1%	0%	0%
	Experiment 6 and baseline	2%	0%	1%	-1%	0%	-1%
2024	Experiment 5 and baseline	2%	0%	-1%	-1%	0%	1%
	Experiment 6 and baseline	2%	0%	1%	-1%	0%	-1%

Source: model results

10H An increase in the proportion of individual with disabilities by 2% per is accompanied by a reduction in informal care provided by children to none for urban China

Table A10H. 1 Population projection: the average number (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 7 and 8 in urban China (Unit: 10,000)

Year	Experiment	Will not need care			Will need care			Total population		
		-0.95	average	0.95	-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	2,789	2,806	2,823	4,105	4,159	4,212	6,894	6,965	7,036
	Experiment 7 No intervention	2,776	2,793	2,811	4,115	4,171	4,227	6,891	6,965	7,038
	Experiment 8	2,776	2,793	2,811	4,117	4,171	4,225	6,893	6,965	7,036
2016	Baseline scenario	3,222	3,236	3,251	4,045	4,097	4,150	7,266	7,334	7,402
	Experiment 7	3,186	3,202	3,218	4,079	4,132	4,185	7,265	7,334	7,403
	Experiment 8	3,186	3,202	3,218	4,077	4,132	4,187	7,263	7,334	7,405
2017	Baseline scenario	2,783	2,804	2,826	4,913	4,984	5,055	7,696	7,788	7,881
	Experiment 7	2,711	2,731	2,751	4,985	5,057	5,129	7,696	7,788	7,880
	Experiment 8	2,712	2,732	2,752	4,988	5,056	5,124	7,700	7,788	7,877
2018	Baseline scenario	3,062	3,087	3,112	5,076	5,177	5,278	8,138	8,265	8,391
	Experiment 7	2,944	2,971	2,997	5,195	5,294	5,393	8,139	8,265	8,390

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	Experiment 8	2,947	2,973	2,999	5,189	5,292	5,394	8,136	8,265	8,393
2019	Baseline scenario	2,863	2,877	2,891	5,796	5,873	5,951	8,659	8,750	8,842
	Experiment 7	2,703	2,718	2,734	5,950	6,032	6,114	8,653	8,750	8,848
	Experiment 8	2,705	2,721	2,738	5,953	6,029	6,105	8,658	8,750	8,843
2020	Baseline scenario	3,062	3,080	3,098	6,126	6,202	6,278	9,188	9,282	9,376
	Experiment 7	2,852	2,871	2,890	6,333	6,415	6,496	9,185	9,285	9,386
	Experiment 8	2,857	2,876	2,895	6,323	6,409	6,496	9,180	9,285	9,391
2021	Baseline scenario	3,115	3,133	3,152	6,600	6,674	6,749	9,714	9,807	9,901
	Experiment 7	2,852	2,868	2,883	6,857	6,938	7,019	9,709	9,806	9,902
	Experiment 8	2,858	2,874	2,891	6,851	6,931	7,012	9,709	9,806	9,902
2022	Baseline scenario	3,282	3,300	3,318	6,965	7,063	7,161	10,247	10,363	10,479
	Experiment 7	2,943	2,972	3,002	7,275	7,381	7,486	10,218	10,353	10,487
	Experiment 8	2,951	2,981	3,010	7,266	7,372	7,478	10,217	10,353	10,488
2023	Baseline scenario	3,316	3,344	3,373	7,326	7,438	7,550	10,641	10,782	10,923
	Experiment 7	2,952	2,983	3,013	7,671	7,788	7,905	10,623	10,770	10,917
	Experiment 8	2,960	2,992	3,024	7,664	7,779	7,893	10,624	10,770	10,917
2024	Baseline scenario	3,178	3,199	3,221	7,779	7,886	7,994	10,957	11,086	11,215
	Experiment 7	2,866	2,885	2,904	8,072	8,194	8,316	10,937	11,079	11,220
	Experiment 8	2,847	2,866	2,886	8,099	8,217	8,335	10,946	11,083	11,221

Source: model results

Table A10H. 2 The changes in the average number of people who will and who will not need care between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 7 and baseline	-13	-13	-12	11	13	14
	Experiment 8 and baseline	-13	-13	-12	13	13	13
2016	Experiment 7 and baseline	-36	-35	-34	35	35	35
	Experiment 8 and baseline	-36	-35	-34	32	35	37
2017	Experiment 7 and baseline	-72	-73	-74	72	73	74
	Experiment 8 and baseline	-71	-72	-73	75	72	69
2018	Experiment 7 and baseline	-118	-117	-116	119	117	115
	Experiment 8 and baseline	-115	-114	-113	113	114	116
2019	Experiment 7 and baseline	-160	-159	-157	154	159	163
	Experiment 8 and baseline	-158	-156	-154	157	156	155
2020	Experiment 7 and baseline	-210	-209	-209	208	213	219
	Experiment 8 and baseline	-205	-204	-204	197	208	219
2021	Experiment 7 and baseline	-263	-266	-268	258	264	270
	Experiment 8 and baseline	-257	-259	-261	251	257	263
2022	Experiment 7 and baseline	-339	-328	-317	310	318	325
	Experiment 8 and baseline	-331	-320	-308	301	309	317
2023	Experiment 7 and baseline	-363	-362	-360	345	350	355
	Experiment 8 and baseline	-356	-352	-349	339	341	343
2024	Experiment 7 and baseline	-312	-314	-316	293	307	321
	Experiment 8 and baseline	-331	-333	-335	320	331	341

Source: model results

Table A10H. 3 Population projection: the average percentage (with 95% confidence interval) of people who will and who will not need care for each year from 2015 to 2024 at the baseline, the experiments 7 and 8 in urban China

Year	Experiments	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Baseline scenario	40%	40%	40%	60%	60%	60%
	Experiment 7	40%	40%	40%	60%	60%	60%
	Experiment 8	40%	40%	40%	60%	60%	60%
2016	Baseline scenario	44%	44%	44%	56%	56%	56%
	Experiment 7	43%	44%	44%	56%	56%	57%
	Experiment 8	43%	44%	44%	56%	56%	57%
2017	Baseline scenario	36%	36%	36%	64%	64%	64%
	Experiment 7	35%	35%	35%	65%	65%	65%
	Experiment 8	35%	35%	35%	65%	65%	65%
2018	Baseline scenario	37%	37%	38%	62%	63%	63%
	Experiment 7	36%	36%	36%	64%	64%	64%
	Experiment 8	36%	36%	36%	64%	64%	64%
2019	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 7	31%	31%	31%	69%	69%	69%
	Experiment 8	31%	31%	31%	69%	69%	69%
2020	Baseline scenario	33%	33%	33%	67%	67%	67%
	Experiment 7	31%	31%	31%	69%	69%	69%
	Experiment 8	31%	31%	31%	69%	69%	69%
2021	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 7	29%	29%	29%	71%	71%	71%
	Experiment 8	29%	29%	29%	71%	71%	71%
2022	Baseline scenario	32%	32%	32%	68%	68%	68%
	Experiment 7	29%	29%	29%	71%	71%	71%
	Experiment 8	29%	29%	29%	71%	71%	71%
2023	Baseline scenario	31%	31%	31%	69%	69%	69%
	Experiment 7	28%	28%	28%	72%	72%	72%
	Experiment 8	28%	28%	28%	72%	72%	72%
2024	Baseline scenario	29%	29%	29%	71%	71%	71%
	Experiment 7	26%	26%	26%	74%	74%	74%
	Experiment 8	26%	26%	26%	74%	74%	74%

Source: model results

Table A10H. 4 The changes in the average percentage of people who will and who will not need care between the baseline and the experiments 7 and 8 for each year from 2015 to 2024 in urban China

Year	Comparisons	Will not need care			Will need care		
		-0.95	average	0.95	-0.95	average	0.95
2015	Experiment 7 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 8 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 7 and baseline	0%	0%	0%	0%	0%	0%
	Experiment 8 and baseline	0%	0%	0%	0%	0%	0%
2017	Experiment 7 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 8 and baseline	-1%	-1%	-1%	1%	1%	1%
2018	Experiment 7 and baseline	-1%	-1%	-1%	1%	1%	1%
	Experiment 8 and baseline	-1%	-1%	-1%	1%	1%	1%
2019	Experiment 7 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 8 and baseline	-2%	-2%	-2%	2%	2%	2%
2020	Experiment 7 and baseline	-2%	-2%	-2%	2%	2%	2%
	Experiment 8 and baseline	-2%	-2%	-2%	2%	2%	2%
2021	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%
2022	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%
2023	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%
2024	Experiment 7 and baseline	-3%	-3%	-3%	3%	3%	3%
	Experiment 8 and baseline	-3%	-3%	-3%	3%	3%	3%

Source: model results

Table A10H. 5 Population projection: the average number (with 95% confidence interval) of people who will require different LTC services from 2015 to 2024 at the baseline, the experiments 7 and 8 for urban China (Unit: 10, 000)

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	2,336	2,355	2,373	99	104	109	278	285	291
	Experiment 7	2,319	2,338	2,357	99	104	109	278	284	291
	Experiment 8	2,348	2,338	2,385	99	104	109	278	313	291
2016	Baseline	2,299	2,316	2,334	102	107	111	284	289	295
	Experiment 7	2,265	2,284	2,302	102	107	111	283	289	295
	Experiment 8	2,265	2,284	2,302	102	107	111	348	355	362
2017	Baseline	2,325	2,349	2,373	105	110	115	434	443	452
	Experiment 7	2,284	2,306	2,329	105	110	115	433	442	451
	Experiment 8	2,280	2,303	2,326	105	110	115	557	564	571
2018	Baseline	2,409	2,444	2,480	106	111	116	464	478	493
	Experiment 7	2,356	2,390	2,424	106	111	116	462	476	489
	Experiment 8	2,348	2,382	2,416	106	111	116	645	664	682
2019	Baseline	2,548	2,573	2,598	117	123	129	650	665	679
	Experiment 7	2,483	2,507	2,531	117	123	130	645	657	670
	Experiment 8	2,472	2,496	2,519	117	123	130	907	920	933
2020	Baseline	2,644	2,664	2,685	127	132	137	702	714	727
	Experiment 7	2,557	2,581	2,604	126	132	138	691	703	715
	Experiment 8	2,541	2,564	2,587	126	132	138	1,045	1,061	1,077

2021	Baseline	2,630	2,657	2,684	137	144	151	860	871	882
	Experiment 7	2,544	2,567	2,590	140	147	155	849	861	873
	Experiment 8	2,522	2,544	2,567	140	147	155	1,308	1,322	1,337
2022	Baseline	2,666	2,692	2,717	150	155	160	957	977	996
	Experiment 7	2,543	2,569	2,595	150	154	159	943	960	977
	Experiment 8	2,515	2,540	2,564	150	154	159	1,511	1,535	1,559
2023	Baseline	2,623	2,651	2,679	161	170	178	1,124	1,149	1,173
	Experiment 7	2,477	2,503	2,529	165	172	178	1,099	1,114	1,130
	Experiment 8	2,442	2,467	2,493	164	171	178	1,773	1,795	1,816
2024	Baseline	2,749	2,773	2,797	175	184	193	1,230	1,249	1,267
	Experiment 7	2,595	2,622	2,649	175	184	193	1,176	1,195	1,213
	Experiment 8	2,557	2,582	2,607	175	183	191	1,920	1,947	1,974
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	528	535	541	87	91	95	777	790	803
	Experiment 7	529	535	541	87	91	95	805	819	834
	Experiment 8	529	535	542	87	91	95	777	790	803
2016	Baseline	523	531	539	87	92	96	749	762	775
	Experiment 7	524	532	540	87	92	96	817	829	841
	Experiment 8	525	533	541	87	92	96	749	762	775
2017	Baseline	834	851	867	102	107	113	1,113	1,124	1,136
	Experiment 7	834	851	868	102	107	113	1,228	1,241	1,254
	Experiment 8	835	851	867	102	107	113	1,109	1,121	1,133
2018	Baseline	875	896	918	110	116	122	1,113	1,132	1,150
	Experiment 7	875	896	918	110	115	121	1,287	1,306	1,325

	Experiment 8	877	899	920	110	115	121	1,104	1,121	1,139
2019	Baseline	1,105	1,117	1,129	128	133	138	1,247	1,262	1,278
	Experiment 7	1,103	1,117	1,131	128	133	137	1,474	1,495	1,516
	Experiment 8	1,103	1,116	1,129	128	133	137	1,225	1,241	1,257
2020	Baseline	1,233	1,248	1,263	144	152	159	1,275	1,292	1,308
	Experiment 7	1,221	1,236	1,252	142	150	157	1,596	1,613	1,630
	Experiment 8	1,219	1,235	1,252	142	150	157	1,250	1,268	1,286
2021	Baseline	1,467	1,481	1,496	168	173	178	1,338	1,348	1,358
	Experiment 7	1,447	1,466	1,485	164	169	173	1,714	1,728	1,742
	Experiment 8	1,445	1,463	1,481	164	169	173	1,273	1,286	1,298
2022	Baseline	1,679	1,702	1,724	190	200	209	1,322	1,339	1,355
	Experiment 7	1,637	1,661	1,685	187	197	206	1,816	1,840	1,864
	Experiment 8	1,635	1,658	1,682	187	197	206	1,269	1,288	1,308
2023	Baseline	1,959	1,987	2,014	216	226	235	1,241	1,256	1,271
	Experiment 7	1,932	1,959	1,985	203	213	223	1,796	1,828	1,860
	Experiment 8	1,926	1,953	1,980	202	212	222	1,157	1,181	1,206
2024	Baseline	2,137	2,163	2,189	229	240	252	1,260	1,278	1,297
	Experiment 7	2,050	2,078	2,107	219	228	237	1,856	1,887	1,918
	Experiment 8	2,050	2,079	2,108	218	228	237	1,179	1,199	1,219

Source: model results

Table A10H. 6 The changes in the average number of people who will require different type of LTC services between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in urban China (Unit: 10,000)

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 7 and baseline	-17	0	0	1	0	30
	Experiment 8 and baseline	-17	0	29	1	0	0
2016	Experiment 7 and baseline	-33	0	0	2	0	66
	Experiment 8 and baseline	-33	0	65	2	0	0
2017	Experiment 7 and baseline	-43	0	-1	0	0	117
	Experiment 8 and baseline	-46	0	122	1	0	-4
2018	Experiment 7 and baseline	-54	0	-3	0	-1	174
	Experiment 8 and baseline	-62	0	185	2	-1	-10
2019	Experiment 7 and baseline	-66	0	-7	0	-1	233
	Experiment 8 and baseline	-77	0	255	-1	-1	-21
2020	Experiment 7 and baseline	-84	0	-11	-12	-2	322
	Experiment 8 and baseline	-101	0	347	-13	-2	-24
2021	Experiment 7 and baseline	-90	3	-10	-15	-5	380

	Experiment 8 and baseline	-113	3	451	-18	-5	-62
2022	Experiment 7 and baseline	-123	-1	-17	-41	-3	502
	Experiment 8 and baseline	-152	-1	559	-44	-3	-50
2023	Experiment 7 and baseline	-148	2	-34	-28	-13	571
	Experiment 8 and baseline	-184	2	646	-34	-14	-75
2024	Experiment 7 and baseline	-151	-1	-54	-84	-12	608
	Experiment 8 and baseline	-191	-1	698	-84	-12	-79

Source: model results

Table A10H. 7 Population projection: the average percentage (with 95% confidence interval) of people who will require different types of LTC services for each year from 2015 to 2024 at the baseline, the experiments 7 and 8 in urban China

Year	Percentage change	Type of care								
		Informal care			Institutional care			Community-based care		
		-95%	average	95%	-95%	average	95%	-95%	average	95%
2015	Baseline	57%	57%	58%	2%	3%	3%	7%	7%	7%
	Experiment 7	56%	56%	57%	2%	2%	3%	7%	7%	7%
	Experiment 8	57%	57%	58%	2%	2%	3%	7%	7%	7%
2016	Baseline	57%	57%	58%	3%	3%	3%	7%	7%	7%
	Experiment 7	56%	55%	56%	3%	3%	3%	7%	7%	7%
	Experiment 8	56%	55%	56%	3%	3%	3%	9%	9%	7%
2017	Baseline	47%	47%	48%	2%	2%	2%	9%	9%	9%
	Experiment 7	46%	46%	47%	2%	2%	2%	9%	9%	9%
	Experiment 8	46%	46%	47%	2%	2%	2%	11%	11%	9%
2018	Baseline	47%	47%	49%	2%	2%	2%	9%	9%	9%
	Experiment 7	45%	45%	47%	2%	2%	2%	9%	9%	9%
	Experiment 8	45%	45%	47%	2%	2%	2%	12%	13%	9%
2019	Baseline	44%	44%	45%	2%	2%	2%	11%	11%	11%
	Experiment 7	42%	42%	43%	2%	2%	2%	11%	11%	11%
	Experiment 8	42%	41%	42%	2%	2%	2%	15%	15%	11%
2020	Baseline	43%	43%	44%	2%	2%	2%	11%	12%	12%
	Experiment 7	40%	40%	41%	2%	2%	2%	11%	11%	11%
	Experiment 8	40%	40%	41%	2%	2%	2%	17%	17%	12%

2021	Baseline	40%	40%	41%	2%	2%	2%	13%	13%	13%
	Experiment 7	37%	37%	38%	2%	2%	2%	12%	12%	12%
	Experiment 8	37%	37%	37%	2%	2%	2%	19%	19%	14%
2022	Baseline	38%	38%	39%	2%	2%	2%	14%	14%	14%
	Experiment 7	35%	35%	36%	2%	2%	2%	13%	13%	13%
	Experiment 8	35%	34%	35%	2%	2%	2%	21%	21%	14%
2023	Baseline	36%	36%	37%	2%	2%	2%	15%	15%	16%
	Experiment 7	32%	32%	33%	2%	2%	2%	14%	14%	14%
	Experiment 8	32%	32%	33%	2%	2%	2%	23%	23%	16%
2024	Baseline	35%	35%	36%	2%	2%	2%	16%	16%	16%
	Experiment 7	32%	32%	33%	2%	2%	2%	15%	15%	15%
	Experiment 8	32%	31%	32%	2%	2%	2%	24%	24%	17%
Year	**Percentage change**	**Type of care**								
		Private care			**Voluntary care**			**Unmet need**		
		-95%	**average**	**95%**	**-95%**	**average**	**95%**	**-95%**	**average**	**95%**
2015	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 7	13%	13%	13%	2%	2%	2%	20%	20%	20%
	Experiment 8	13%	13%	13%	2%	2%	2%	19%	19%	19%
2016	Baseline	13%	13%	13%	2%	2%	2%	19%	19%	19%
	Experiment 7	13%	13%	13%	2%	2%	2%	20%	20%	20%
	Experiment 8	13%	13%	13%	2%	2%	2%	18%	18%	19%
2017	Baseline	17%	17%	17%	2%	2%	2%	23%	23%	22%
	Experiment 7	17%	17%	17%	2%	2%	2%	25%	25%	24%
	Experiment 8	17%	17%	17%	2%	2%	2%	22%	22%	22%
2018	Baseline	17%	17%	17%	2%	2%	2%	22%	22%	22%
	Experiment 7	17%	17%	17%	2%	2%	2%	25%	25%	25%

	Experiment 8	17%	17%	17%	2%	2%	2%	21%	21%	21%
2019	Baseline	19%	19%	19%	2%	2%	2%	22%	21%	21%
	Experiment 7	19%	19%	19%	2%	2%	2%	25%	25%	25%
	Experiment 8	19%	19%	19%	2%	2%	2%	21%	21%	21%
2020	Baseline	20%	20%	20%	2%	2%	3%	21%	21%	21%
	Experiment 7	19%	19%	19%	2%	2%	2%	25%	25%	25%
	Experiment 8	19%	19%	19%	2%	2%	2%	20%	20%	20%
2021	Baseline	22%	22%	22%	3%	3%	3%	20%	20%	20%
	Experiment 7	21%	21%	21%	2%	2%	2%	25%	25%	25%
	Experiment 8	21%	21%	21%	2%	2%	2%	19%	19%	19%
2022	Baseline	24%	24%	24%	3%	3%	3%	19%	19%	19%
	Experiment 7	23%	23%	23%	3%	3%	3%	25%	25%	25%
	Experiment 8	23%	22%	22%	3%	3%	3%	17%	17%	17%
2023	Baseline	27%	27%	27%	3%	3%	3%	17%	17%	17%
	Experiment 7	25%	25%	25%	3%	3%	3%	23%	23%	24%
	Experiment 8	25%	25%	25%	3%	3%	3%	15%	15%	15%
2024	Baseline	27%	27%	27%	3%	3%	3%	16%	16%	16%
	Experiment 7	25%	25%	25%	3%	3%	3%	23%	23%	23%
	Experiment 8	25%	25%	25%	3%	3%	3%	15%	15%	15%

Source: model results

Table A10H. 8 The changes in the average percentage of people who will require different type of LTC services between the baseline, and the experiments 7 and 8 for each year from 2015 to 2024 in urban China

Year	Comparisons	Type of care					
		Informal care	Institutional care	Community -based care	Private care	Voluntary care	Unmet need
2015	Experiment 7 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 8 and baseline	0%	0%	0%	0%	0%	0%
2016	Experiment 7 and baseline	-1%	0%	0%	0%	0%	1%
	Experiment 8 and baseline	-1%	0%	2%	0%	0%	0%
2017	Experiment 7 and baseline	-2%	0%	0%	0%	0%	2%
	Experiment 8 and baseline	-2%	0%	2%	0%	0%	0%
2018	Experiment 7 and baseline	-2%	0%	0%	0%	0%	3%
	Experiment 8 and baseline	-2%	0%	3%	0%	0%	-1%
2019	Experiment 7 and baseline	-2%	0%	0%	-1%	0%	3%
	Experiment 8 and baseline	-2%	0%	4%	-1%	0%	-1%
2020	Experiment 7 and baseline	-3%	0%	-1%	-1%	0%	4%
	Experiment 8 and baseline	-3%	0%	5%	-1%	0%	-1%
2021	Experiment 7 and baseline	-3%	0%	-1%	-1%	0%	5%
	Experiment 8 and baseline	-3%	0%	6%	-1%	0%	-2%

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2022	Experiment 7 and baseline	-3%	0%	-1%	-2%	0%	6%
	Experiment 8 and baseline	-4%	0%	7%	-2%	0%	-1%
2023	Experiment 7 and baseline	-4%	0%	-1%	-2%	0%	7%
	Experiment 8 and baseline	-4%	0%	8%	-2%	0%	-2%
2024	Experiment 7 and baseline	-3%	0%	-1%	-2%	0%	7%
	Experiment 8 and baseline	-4%	0%	8%	-2%	0%	-2%

Source: model results

Appendix 11 The influence of the scenarios on the number of people who will need care and who will require different types of care

Table A11.1 The number of people who will need care under the baseline, a 1% increase (E1) and a 2% increase (E2) and the influence of E1 and E2 on this number (unit: 10,000)

Region	Year	Experiment	No. of people who will need care	The influence on the No. of people who will need care
Rural China	2015	Baseline	4,739	*
		E1	4,746	+7
		E2	4,754	+15
	2016	Baseline	4,615	*
		E1	4,635	+20
		E2	4,656	+41
	2017	Baseline	3,463	*
		E1	3,499	+36
		E2	3,532	+69
	2018	Baseline	3,776	*
		E1	3,821	+45
		E2	3,864	+88
	2019	Baseline	4,760	*
		E1	4,812	+52
		E2	4,868	+108
	2020	Baseline	4,985	*
		E1	5,049	+64
		E2	5,120	+135
	2021	Baseline	5,073	*
		E1	5,145	+72
		E2	5,206	+133
	2022	Baseline	5,335	*
		E1	5,413	+77

		E2	55.19	+184
	2023	Baseline	5,722	*
		E1	5,774	+52
		E2	5,956	+234
	2024	Baseline	5,938	*
		E1	5,982	+44
		E2	6,065	+127
urban China	2015	Baseline	4,159	*
		E1	4,165	+6
		E2	4,171	+12
	2016	Baseline	4,097	*
		E1	4,114	+17
		E2	4,132	+35
	2017	Baseline	4,984	*
		E1	5,019	+35
		E2	5,052	+68
	2018	Baseline	5,177	*
		E1	5,236	+59
		E2	5,283	+106
	2019	Baseline	5,873	*
		E1	5,943	+70
		E2	6,009	+136
	2020	Baseline	6,202	*
		E1	6,291	+89
		E2	6,370	+168
	2021	Baseline	6,674	*
		E1	6,758	+84
		E2	6,869	+195
	2022	Baseline	7,063	*
		E1	7,161	+108
		E2	7,267	+225
	2023	Baseline	7,438	*
		E1	7,530	+109
		E2	7,624	+186
	2024	Baseline	7,886	*
		E1	7,946	+109

		E2	8,003	+117

Source: model results

Table A11.2 The number of people who will require informal care, community-based care and who will have unmet need under a 1% increase (E1) and a 2% increase (E2), and the influence these numbers (unit: 10,000)

Region	Year	Experiment	No. of people who require informal care	The influence on the No. of people who require informal care	No. of people who require community-based care	The influence on the No. of people who require community-based care	No. of people who will have unmet care need	The influence on the No. of people who will have unmet care need
Rural China	2015	Baseline	2,791	*	356	*	1,182	*
		E1	2,798	+7	357	+1	1,182	0
		E2	2,804	+13	357	+1	1,182	0
	2016	Baseline	2,751	*	336	*	1,109	*
		E1	2,770	+19	337	+1	1,109	0
		E2	2,790	+38	339	+3	1,109	0
	2017	Baseline	1,702	*	367	*	765	*
		E1	1,737	+35	371	+4	763	-2
		E2	1,769	+67	374	+7	762	-4
	2018	Baseline	1,895	*	367	*	854	*
		E1	1,939	+44	373	+6	851	-4
		E2	1,980	+85	380	+14	847	-8

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	2019	Baseline	2,375	*	474	*	1,054	*
		E1	2,422	+47	488	+15	1,043	-11
		E2	2,472	+97	493	+19	1,048	-6
	2020	Baseline	2,496	*	457	*	1,121	*
		E1	2,553	+58	480	+23	1,109	-11
		E2	2,615	+119	500	+42	1,100	-21
	2021	Baseline	2,350	*	495	*	1,181	*
		E1	2,402	+52	526	+31	1,162	-19
		E2	2,448	+98	546	+51	1,158	-23
	2022	Baseline	2,485	*	472	*	1,256	*
		E1	2,541	+56	515	+43	1,229	-27
		E2	2,614	+129	565	+93	1,213	-43
	2023	Baseline	2,636	*	483	*	1,360	*
		E1	2,719	+83	536	+52	1,333	-27
		E2	2,777	+141	597	+114	1,303	-57
	2024	Baseline	2,743	*	499	*	1,392	*
		E1	2,765	+22	545	+46	1,346	-46
		E2	2,802	+59	605	+107	1,318	-74
Urban China	2015	Baseline	2,355	*	285	*	790	*
		E1	2,361	+6	285	0	790	0
		E2	2,367	+12	285	0	790	0

	2016	Baseline	2,316	*	289	*	762	*
		E1	2,332	+16	289	0	762	0
		E2	2,349	+33	289	0	762	0
	2017	Baseline	2,349	*	443	*	1,124	*
		E1	2,382	+33	443	0	1,124	-1
		E2	2,412	+63	443	0	1,123	-1
	2018	Baseline	2,444	*	478	*	1,132	*
		E1	2,498	+54	478	-1	1,129	-2
		E2	2,543	+99	477	-1	1,127	-5
	2019	Baseline	2,573	*	665	*	1,262	*
		E1	2,638	+65	663	-2	1,258	-4
		E2	2,707	+134	660	-5	1,250	-12
	2020	Baseline	2,664	*	714	*	1,292	*
		E1	2,757	+93	709	-6	1,284	-8
		E2	2,842	+178	706	-8	1,279	-13
	2021	Baseline	2,657	*	871	*	1,348	*
		E1	2,767	+110	867	-4	1,312	-36
		E2	2,876	+218	870	-1	1,304	-44
	2022	Baseline	2,692	*	977	*	1,339	*
		E1	2,829	+138	967	-10	1,305	-34
		E2	2,948	+257	951	-26	1,302	-37

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	2023	Baseline	2,651	*	1,149	*	1,256	*
		E1	2,783	+132	1,144	-5	1,216	-41
		E2	2,949	+298	1,110	-39	1,182	-74
	2024	Baseline	2,773	*	1,249	*	1,278	*
		E1	2,910	+137	1,221	-28	1,256	-23
		E2	3,056	+283	1,204	-45	1,203	-76

Source: model results

Table A11.3 The number of people who will require informal care, community-based care and who will have unmet need in the baseline, E3 and E4, and how E3 and E4 influence these numbers when the provision of informal care, which is provided by children decreases to none (unit: 10,000)

Region	Year	Experiment	No. of people who require informal care	The influence on the No. of people who require informal care	No. of people who require community-based care	The influence on the No. of people who require community-based care	No. of people who will have unmet need	The influence on the No. of people who will have unmet need
Rural China	2015	Baseline	2,791	*	356	*	1,182	*
		E3	2,776	-15	356	0	1,196	+15
		E4	2,776	-15	371	+15	1,182	0
	2016	Baseline	2,751	*	336	*	1,109	*
		E3	2,720	-31	335	0	1,140	+31
		E4	2,720	-31	367	+31	1,109	0
	2017	Baseline	1,702	*	367	*	765	*
		E3	1,669	-33	367	0	806	+41
		E4	1,667	-34	409	+42	765	0
	2018	Baseline	1,895	*	367	*	854	*

		E3	1,866	-28	363	-3	903	+49
		E4	1,861	-34	413	+46	854	0
	2019	Baseline	2,375	*	474	*	1,054	*
		E3	2,347	-29	470	-3	1,108	+55
		E4	2,338	-37	525	+51	1,053	-1
	2020	Baseline	2,496	*	457	*	1,121	*
		E3	2,462	-34	453	-4	1,186	+65
		E4	2,454	-42	514	+57	1,119	-2
	2021	Baseline	2,350	*	495	*	1,181	*
		E3	2,309	-40	493	-1	1,248	+67
		E4	2,301	-48	551	+56	1,174	-7
	2022	Baseline	2,485	*	472	*	1,256	*
		E3	2,462	-22	469	-3	1,333	+77
		E4	2,446	-39	528	+56	1,252	-4
	2023	Baseline	2,636	*	483	*	1,360	*
		E3	2,614	-22	470	-14	1,444	+84
		E4	2,610	-26	531	+48	1,375	15
	2024	Baseline	2,743	*	499	*	1,392	*
		E3	2,709	-34	497	-2	1,449	+57
		E4	2,704	-38	545	+46	1,377	-15
Urban	2015	Baseline	2,355	*	285	*	790	*

China		E3	2,336	-19	284	0	809	+19
		E4	2,336	-19	303	+19	790	0
	2016	Baseline	2,316	*	289	*	762	*
		E3	2,280	-37	289	0	800	+37
		E4	2,280	-37	326	+37	762	0
	2017	Baseline	2,349	*	443	*	1,124	*
		E3	2,303	-47	442	-1	1,178	+54
		E4	2,299	-50	500	+58	1,122	-2
	2018	Baseline	2,444	*	478	*	1,132	*
		E3	2,390	-55	477	-2	1,199	+67
		E4	2,382	-63	555	+77	1,126	-6
	2019	Baseline	2,573	*	665	*	1,262	*
		E3	2,515	-57	662	-3	1,339	+77
		E4	2,504	-69	757	+92	1,254	-9
	2020	Baseline	2,664	*	714	*	1,292	*
		E3	2,602	-62	710	-4	1,379	+87
		E4	2,585	-79	823	+108	1,281	-11
	2021	Baseline	2,657	*	871	*	1,348	*
		E3	2,597	-60	866	-5	1,439	+91
		E4	2,573	-84	995	+124	1,330	-18
	2022	Baseline	2,692	*	977	*	1,339	*

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		E3	2,627	-64	973	-4	1,447	+108
		E4	2,597	-95	1,116	+140	1,330	-8
	2023	Baseline	2,651	*	1,149	*	1,256	*
		E3	2,596	-55	1,142	-7	1,360	+104
		E4	2,552	-99	1,293	+144	1,246	-11
	2024	Baseline	2,773	*	1,249	*	1,278	*
		E3	2,715	-58	1,235	-14	1,400	+122
		E4	2,683	-90	1,393	+145	1,284	+5

Source: model results

Table A11.4 The number of people who will require informal care, community-based care and who will have unmet need in the baseline, E7 and E8, and how E7 and E8 influence these numbers when increasing the disability prevalence rate by 2% per year is accompanied by a reduction in informal care provided by children to none (unit: 10,000)

Region	Year	Experiment	No. of people who require informal care	The influence on the No. of people who require informal care	No. of people who require community-based care	The influence on the No. of people who require community-based care	No. of people who will have unmet need	The influence on the No. of people who will have unmet need
Rural China	2015	Baseline	2,791	*	356	*	1,182	*
		E7	2,777	-14	357	+1	1,209	+27
		E8	2,777	-14	385	+28	1,182	0
	2016	Baseline	2,751	*	336	*	1,109	*
		E7	2,723	-28	338	+2	1,176	+67
		E8	2,723	-28	405	+69	1,109	0
	2017	Baseline	1,702	*	367	*	765	*
		E7	1,661	-33	370	+3	884	+119
		E8	1,669	-40	484	+117	762	-4
	2018	Baseline	1,895	*	367	*	854	*
		E7	1,861	-34	370	+3	1,015	+161

		E8	1,855	-40	525	+159	847	-8
	2019	Baseline	2,375	*	474	*	1,054	*
		E7	2,327	-48	471	+2	1,280	+226
		E8	2,318	-58	673	+199	1,047	-7
	2020	Baseline	2,496	*	457	*	1,121	*
		E7	2,434	-62	467	+10	1,403	+282
		E8	2,423	-73	714	+257	1,096	-25
	2021	Baseline	2,350	*	495	*	1,181	*
		E7	2,258	-92	503	+8	1,527	+346
		E8	2,255	-94	788	+294	1,149	-32
	2022	Baseline	2,485	*	472	*	1,256	*
		E7	2,385	-99	488	+16	1,676	+420
		E8	2,353	-132	820	+347	1,221	-35
	2023	Baseline	2,636	*	483	*	1,360	*
		E7	2,550	-85	491	+8	1,840	+480
		E8	2,516	-120	833	+350	1,321	-39
	2024	Baseline	2,743	*	499	*	1,392	*
		E7	2,582	-152	512	+14	1,883	+491
		E8	2,591	-161	873	+374	1,344	-48
Urban China	2015	Baseline	2,355	*	285	*	790	*
		E7	2,338	-17	284	0	819	+30

		E8	2,338	-17	313	+29	790	0
	2016	Baseline	2,316	*	289	*	762	*
		E7	2,284	-33	289	0	829	+66
		E8	2,284	-33	355	+65	762	0
	2017	Baseline	2,349	*	443	*	1,124	*
		E7	2,306	-43	442	-1	1,241	+117
		E8	2,303	-46	564	+122	1,121	-4
	2018	Baseline	2,444	*	478	*	1,132	*
		E7	2,390	-54	476	-3	1,306	+174
		E8	2,382	-62	664	+185	1,121	-10
	2019	Baseline	2,573	*	665	*	1,262	*
		E7	2,507	-66	657	-7	1,495	+233
		E8	2,496	-77	920	+255	1,241	-21
	2020	Baseline	2,664	*	714	*	1,292	*
		E7	2,581	-84	703	-11	1,613	+322
		E8	2,564	-101	1,061	+347	1,268	-24
	2021	Baseline	2,657	*	871	*	1,348	*
		E7	2,567	-90	861	-10	1,728	+380
		E8	2,544	-113	1,322	+451	1,286	-62
	2022	Baseline	2,692	*	977	*	1,339	*
		E7	2,569	-123	960	-17	1,840	+502

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		E8	2,540	-152	1,535	+559	1,288	-50
	2023	Baseline	2,651	*	1,149	*	1,256	*
		E7	2,503	-148	1,114	-34	1,828	+571
		E8	2,467	-184	1,795	+646	1,181	-75
	2024	Baseline	2,773	*	1,249	*	1,278	*
		E7	2,622	-151	1,195	-54	1,887	+608
		E8	2,582	-191	1,947	+698	1,199	-79

Source: model results

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