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A Natural Experiment about the Effects of Urbanization on Elders' Mental Well-Being and Chronic Disease Management: Lessons from China's Passive Urbanization

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Di Liang

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ABSTRACT OF THE DISSERTATION

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Professor Susan Louise Ettner, Chair

This dissertation examined how China's passive urbanization (i.e., state-led urbanization) affected elders' mental health and chronic disease management. China's passive urbanization usually involved land requisition and village reconstruction, and it has transformed many rural villages into urban-style communities. But its social and health impacts have rarely been evaluated. This dissertation explored how passive urbanization affected depressive symptoms and hypertension management and whether intergenerational support from children mediated these effects, among elders who were originally rural. This dissertation used the 2011 national baseline data from the China Health and Retirement Longitudinal Study (CHARLS). Passive urbanization was found to be associated with an increase in elders' receipt of financial support from children by 1449 yuan/year. Passive urbanization was associated with a 5% risk difference in having severe depressive symptoms.

However, passive urbanization did not improve hypertension management among elders. G-estimation revealed that the mediation effects of intergenerational support were very small. These findings suggest that passive urbanization might have improved rural elders' mental well-being through improved community-level physical and social environments as well as increased income. But healthcare services in rural China still need to be strengthened to combat the epidemic of non-communicable diseases.

This dissertation of Di Liang is approved.

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Table of contents

Figure

Tables

Appendix Tables

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2. **Liang D.**, Zhang D. Children's Geographic Proximity and Older Parents' Depressive Symptoms. 1st Conference of China Health Policy and Management Society & China Health Review, Atlanta, 5/14/2016
3. **Liang D**. The Effects of Passive Urbanization on Children's Family Support for Rural Elders in China. Population Association of America Annual Meeting 2016, Washington, D. C., 4/1/2016

CHAPTER ONE: INTRODUCTION

Urbanization and population aging in the world

Urbanization and population aging are both unprecedented global trends that are shaping the 21st century in many aspects of society. Urbanization is the increase in the proportion of people living in urban areas, as well as the change in size, density, and heterogeneity of cities (Vlahov & Galea, 2002). Population aging is a shift in the distribution of a country's population towards older ages, due to both longer life expectancy and declining fertility rate (United Nations (UN), 2002). On the one hand, urbanization has the potential to bring about economic growth, resource efficiency and well-being for society, and population aging is the result of success in public health and socioeconomic development (World Health Organization (WHO), 2002). On the other hand, urbanization and population aging, especially when they come hand in hand, challenge society to adapt to the demographic change to maximize the well-being and happiness of older people.

Urbanization and population aging are both global trends which are inevitable. The world is becoming more urbanized and aged than any time before. In 2007, for the first time in human history, more people were living in urban areas than in rural areas (UN, 2014). In 2014, 54% of the world's population was residing in urban areas (UN, 2014). However, only 30% of the world's population was urban in 1950, and 66% of the world's population is projected to be urban by 2050 (UN, 2014). At the same time, the world population is rapidly aging. Between 2000 and 2050, the proportion of the world's population over 60 years old is expected to double from about 11% to 22% (World Health Organization (WHO), 2011).

Although urbanization and population aging are worldwide phenomena, they pose a greater challenge to some countries than others. At present, Africa and Asia remain mostly rural, although other parts of the world are mostly urban. But Africa and Asia are urbanizing faster than the other regions in the coming years. Between 2014 and 2050, just three countries, Nigeria, India, and China together are expected to account for 37% of the projected growth of the world's urban population (UN, 2014). In the meantime, low- and middle-income countries will experience the most rapid demographic change in the coming years. The time required for the percentage of the population aged 65 and over to rise from 7% to 14% was over 100 years for France and over 40 years for the UK. In contrast, it will take probably less than 25 years for China and Brazil to reach the same proportion of the older population (WHO, 2011).

Globally, urbanization can be achieved in different ways, including natural population increase in urban areas, rural-urban migration, the geographic expansion of urban areas, and the transformation of villages into urban settlements (WHO, 2010a). The relative importance of each pathway varies within and between countries. However, relocation during later stages of life as well as community transformation may also fundamentally change the life of older people. It is notable that rural areas remain disproportionately older than urban areas, due to the rural-urban migration of young people, in the urbanization process of low- and middle- income countries (Mirkin & Weinberger, 2001). It is worth investigating whether the well-being of those rural elders living in a transitioning community and a changing family would be affected by urbanization.

Urbanization and population aging in China

Although each country has its unique strengths and challenges, some may have more experiences or lessons to offer than others. Considering its large but rapidly aging population as well as its rapid urbanization, China can be an appropriate case to study the social phenomenon around urbanization and population aging.

As a result of its dramatic increase in average life expectancy and the decline of fertility rate, China is now undergoing rapid population aging (see Table 1). The average life expectancy in China has increased to 74.8 in 2010 (National Bureau of Statistics of the People's Republic of China, 2012a). Also, the fertility rate has dropped from about six children per woman in 1962 to less than 1.7 in 2012, according to the most conservative estimate (The World Bank, 2015). According to the sixth population census in China, however, the fertility rate in China has dropped even further, to 1.18 in 2010 (National Bureau of Statistics of the People's Republic of China, 2012b). Despite controversies with the exact numbers, the reality is that China's fertility rate has dropped sharply in the past 50 years (Guo, 2013). As a result, people are concerned that the old-age dependency ratio, defined as the number of people ages 65 and older per 100 working-age people ages 20-64, is projected to rise from 0.13 in 2010 to 0.45 in 2050 (UN, 2011). Such demographic transition is unlikely to be reversed by major changes to current family planning policy, although many have suggested that repeal of family planning policy may be a fix to population aging (Zeng & Hesketh, 2016).

At the same time, China is also undergoing rapid urbanization. In 2014, 54.8% of China's population was living in urban areas, while in 1978 only 17.9% of China's population

was living in urban areas (National Bureau of Statistics of the People's Republic of China, 2015). Urbanization is not merely a natural phenomenon happening along with economic growth in contemporary China. Keqiang Li, the current premier of China, has openly named urbanization as: "an essential element of and basic strategy for modernization" and "the key to unlocking China's domestic demand," and the government is now promoting "coordinated urbanization" to stimulate economic growth and social development (Li, 2012). According to the "National New-type Urbanization Plan," about 60% of China's population is expected to live in urban areas by 2020 (Xinhua News Agency, 2014).

Similar to other countries, the growth of urban population in China is mostly caused by natural population increase in urban areas, rural-urban migration, the geographic expansion of urban areas, and the transformation of villages into urban settlements. Among these causes, population increase in urban areas is perhaps the least important. From 2000 to 2010, 100 million people newly became urban residents in China: only 15% of the urban population growth came from natural population increase in urban areas, while 42% came from rural-urban migration and another 42% came from urban land expansion (The World Bank, 2014).

However, different from other countries, China's urbanization pathways are moderated by China's unique household registration system (*hukou* system) as well as its state-led and top-down strategy (Chen, Liu, & Tao, 2013). I will discuss these two issues briefly here, and more details can be found in Chapter Two.

On the one hand, rural migrants usually cannot settle down in urban areas as they want, especially big cities, because of the household registration system (Wing &

Buckingham, 2008). Thus, despite the fact that over 50% of the total Chinese population are living in urban areas, less than 30% of the total population are registered urban residents (China Data Center Tsinghua University, 2013). These unregistered urban residents, in general, have limited access to healthcare, education, job opportunities, pension, and public housing compared to registered urban residents (Chan & Zhang, 1999).

On the other hand, the state-led urbanization and countryside transformation deprived the land of millions of rural residents. It was estimated based on official documents that: from 1990 to 2013 more than 83 million mu (5.53 million ha) arable land has been expropriated; at least 1.4 million natural villages have disappeared; and 127 million peasants have lost their lands (Zhang, 2015). A recent national representative survey provided more evidence about the past wave of accelerated urbanization. It was estimated that among those families that had ever owned lands, 14% have ever experienced land requisition, and 64.3 out of 402 million rural and urban families in China had ever experienced land requisition or housing demolition (China Data Center Tsinghua University, 2013).

Why is China's urbanization considered as a top-down and state-led process? First of all, all urban lands in China were owned by the state, and all rural lands in China were owned collectively by registered rural residents. Only land use rights, instead of land ownership, can be traded in China. *The Land Management Law of the People's Republic of China* amended in 1998 set up the government monopoly in China's land market. Before January 1st, 1999, when the amendment went into effects, land requisition were usually achieved after the direct negotiation between those who wanted to use the land and local villagers, under the supervision of local governments (Liu, 2012; Liu, Cao, Yan, & Wang, 2016). However, since

then, local governments in China have become the only entity to acquire and to sell land use rights. Local governments also profited from the so-called land revenue which has become the single most important financial resource for almost all local governments in China until now (Liu, 2012). As a result, with both the power and incentives, local governments in China became the most important player to seize rural land and push urbanization forwards. More details about the motivation, process, and consequences of urbanization in China will be discussed in Chapter Two.

Urbanization, population aging and health

"Where people live affects their health and opportunities for leading lives to their full potential" (WHO, 2011). Urban settings can influence population health through many pathways, such as housing, water, sanitation, food, urban transport, noise exposure, climate change, social environment, and health and social services (WHO, 2011). Moving into an urban setting and living in a community which is turned into an urban setting may have both positive and negative health consequences. On the one hand, in many low- and middle-income countries, urban life usually means better sanitation and nutrition as well as more access to social services and healthcare for peasants. On the other hand, in urban areas, people may also be exposed to air pollution, noise, violence in the community and sedentary lifestyles which are detrimental to their health. In addition, urbanization is perhaps a threat to health for migrants who have to live in slums (Patel & Burke, 2009; Songsore, 2004). Thus, since elders are usually sensitive to changes in living settings, the rural-to-urban transition may bring about the both positive and negative consequences, not to mention the process of house demolition and relocation which can be especially stressful for elders whose rural

community is undergoing rapid urbanization.

Urbanization not only affects older people directly but also shapes the structure and function of the family in which older people live. It is a worldwide concern that traditional family patterns, in which older people are usually empowered, are eroded by modernization, industrialization, and urbanization along with other complex factors such as education, easy traveling, and the establishment of modern social and economic values. This is a common and burning concern, especially in low- and middle-income countries in Asia and Africa. Such concern is warranted because it is very difficult for many of these countries to follow the lead of Western industrialized countries by building up the welfare state, well-functioning public pension schemes and high-quality public-financed medical provision in the near future (Apt, 2001). Thus, the crucial question is whether the cultural norms of these countries will remain strong enough for families to maintain their support to older members in the process of urbanization and population aging.

In order to prepare for the demographic and social changes caused by urbanization and population aging, we need to answer the following questions. How will urbanization influence the community and the family in which the elderly live? How will urbanization influence the health of the elderly? How will the interaction of urbanization and population aging have an impact on the healthcare system all over the world, especially in the middle and low income countries?

In the case of China, these questions are crucial, both in the near future and in the long-term. Just as many other low- and middle-income countries, China is still ill-equipped to prepare for the demographic transition discussed above, especially in rural areas in which the

majority of elderly people live. According to the baseline (2011-2012) report of the China Health and Retirement Longitudinal Study (CHARLS), 16.4% of registered urban elders and 56.9% of registered rural residents did not have any pensions. Although over 90% of rural and urban elders were covered by basic public health insurance, those localized health plans usually did not cover any professional long-term care (National School of Development at Peking University, 2013). As a result, due to lack of public support and scarce private resources, family members are probably the most reliable source of economic support and informal care for most elders, especially in rural areas. However, the safety-net knitted by family support for older people was confronted by urbanization and many other socioeconomic factors. Elders living in different urban or rural communities may have different challenges.

A limitation of most research on the effects of urbanization is self-selection: People who choose to move to urban areas are different from those who choose to remain in rural areas, most likely in ways that affect their outcomes (Harpham, 1994). Identifying causal effects of urbanization on subsequent outcomes, therefore, requires a study design or methodology addressing selection bias. In this study, I address this issue by studying the impacts of urbanization on those rural elders whose communities were urbanized. These people did not self-select to live in urban areas, for the government's decision to urbanize a community was exogenous. Local residents were seldom involved in the decision-making process, and the best they could do was usually just to negotiate an appropriate price for their loss of housing and lands. Thus, such "passive" urbanization in China can be viewed as a natural experiment to explore the effects of urbanization on elders' well-being. I will call

these elders “passively urbanized elders” and focus on their family support, well-being and healthcare utilization in comparison with long-term rural elders who did not migrate to urban areas and have not experienced “passive” urbanization.

Research questions

In this study, I will explore the following research questions about the effects of passive urbanization on family support for elders, elders’ mental well-being, and elders’ healthcare utilization, by comparing elders who were originally rural but passively urbanized to elders who were always rural.

1. What are the total effects of passive urbanization on elders’ mental well-being?
2. To what extent is the effect of urbanization on elders’ mental well-being mediated by influencing children’s family support?
3. What are the total effects of urbanization on elders’ chronic disease management?
4. To what extent is the effect of urbanization on elders’ chronic disease management mediated by influencing children’s family support?

CHAPTER TWO: LITERATURE REVIEW

In this part of the dissertation, I will review relevant literature and previous studies around the topic of China’s urbanization and intergenerational family support, along with their impacts on the mental well-being and chronic disease management among older adults.

In the first section of this Chapter, I will briefly introduce the general background of this study. I will briefly introduce China’s urbanization process and relevant policies to explain the context of all my research questions. China’s urbanization is a vast topic which

has generated heated debates in recent years, due to its enormous political, economic and social consequences. However, a detailed review of all the debates and policy alternatives will be out of the scope of this section, since in this study I will focus on some social and health consequences of urbanization, especially among China's rural elders. Also, I will briefly introduce both how China's elders are supported outside of their families, including pension, health insurance, and formal long-term care. This section will explain why I focus on rural elders' family support: they receive very limited support from outside of their families.

In the second section of this Chapter, I will highlight the progress and knowledge gap in previous studies about the impacts of urbanization and family support on elders' mental well-being and chronic disease management in China. I will also discuss the contribution of this study to the literature.

2.1 General background

2.1.1 China's urbanization

Although over 20% of the total population was estimated to live in cities in some periods of ancient China, such as in the Tang Dynasty (AD 618–690 & 705–907) and the Song Dynasty (AD 960-1279), the rate of urbanization was only 10.6% in 1949 when the People's Republic of China was founded (Zhao, 2006; National Bureau of Statistics of the People's Republic of China, 2013). The urbanization process was still very slow until the late 1970s for many political, economic and social reasons. After 1978, as the economy and political system in China has been transformed gradually, the urbanization process has been accelerated (Chen, Liu, & Tao, 2013). From 1978 to 2013, the number of permanent residents

in urban China has increased from 170 million to 730 million. In the past 35 years, on average another 1.02 percent of the total population became permanent residents in urban areas every year (National Bureau of Statistics of the People's Republic of China, 2013).

Moreover, the unprecedented rate of urbanization is highly likely to be continued in the near future. Currently, urbanization has been considered to be a major strategy to boost the domestic economy and to enhance social development by the central government and some scholars. According to the *National New-type Urbanization Plan*, the percentage of permanent residents in urban areas will increase from 53.7% in 2014 to about 60% in 2020, and the percentage of registered urban residents will increase from about 36% in 2014 to about 45% in 2010 (State Council of the People's Republic of China, 2014a). The government plans to urbanize 300 million people between 2014 and 2020 through different pathways: the government plans to turn 100 million registered rural residents who are living and working in urban areas into registered urban residents; the government plans to gentrify or reconstruct the urban communities in which about 100 million people are currently living; and the government plans to urbanize 100 million people in central and western China by attracting them to live and work close to their hometown.

It is still unknown whether China will successfully urbanize 300 million people in five years and what the exact social consequences will be. However, understanding how ordinary rural Chinese transitioned to urban residents and what urbanization meant to them in the past have implications for the future. To answer the first question, I will first introduce China's household registration system (*hukou system*), and then explain how rural people are urbanized in China. To answer the second question, I will briefly mention the rural-urban

disparity in China, and I will try to answer one part of the question in this study: how does urbanization influence the well-being of rural elders?

How do people become urban residents from rural residents in China?

In order to answer the question of how people become urban residents from rural residents in China, we first need to know the definition of urban residents. According to the *National New-type Urbanization Plan*, there are two kinds of urban residents: permanent urban residents who live in urban areas for six months or more each year and registered urban residents whose *hukou* status is non-agricultural. According to the *National New-type Urbanization Plan*, although about 60% of the total population will be permanent urban residents in 2020, only about 45% of the total population will be registered as urban residents. Those people who are permanent urban residents but not registered urban residents have been the focus of academic research and social policies in the past decade. So why is *hukou* status so important?

1) Hukou system

The household registration system, known as the "*hukou system*," is one unique social institution which has great implications for China's urbanization. Rooted in ancient China, China's current *"hukou system"* started in 1958, modeled after the *propiska* (internal passport) system in the Soviet Union (Cheng & Selden, 1994). The *hukou* system is basically designed to collect and manage the information about citizens' personal identification, kinship, and legal residence. It also functions as a system for social control (Chan & Buckingham, 2008). A thorough discussion of its history and complicated functions will be outside the scope of this dissertation.

The "*hukou system*" matters in the process of urbanization because it classified citizens according to two indicators: "agricultural *hukou*" versus "non-agricultural *hukou,*" and "local *hukou*" versus "non-local *hukou*." People's entitlement to social welfare is largely determined by their category of *hukou* status. A large proportion of social services can only be accessed by registered local residents, as these services are usually supported by the local government. These services can include public education, public healthcare resources and health insurance, public housing, and pension. *Hukou* status can also influence people's job opportunities significantly (Chan, & Zhang, 1999). Currently, the *hukou* system has become a controversial social policy which has greatly impeded social mobility and equitable access to public services in China. The essence of problems around *hukou* system is the institutional barriers to social resources and mobility opportunities. In the future, the government is unlikely to repeal the *hukou* system itself, as its identification function can still be useful. However, it is important to break the link between *hukou* status and access to social resources and mobility opportunities (Chan & Buckingham, 2008).

2) Active urbanization and passive urbanization

China is urbanizing under the context of rural-urban "dualism." Contemporary China consists of at least two parts: rural China and urban China. Disparities in social resources (e.g., education, healthcare, public housing) and mobility opportunities further split each part of China. For instance, within urban China, obvious disparities mentioned above exist between metropolitan areas and middle- and small-sized cities (Li, 2015). As a result, both rural residents and urban residents can be highly motivated to migrate to other parts of the country.

The group of rural residents who choose to work and live in urban areas consists of three subgroups: (1) migrant workers who work in urban areas; (2) college graduates who come from rural areas; and (3) owners of businesses who come from rural areas (Li, 2012). Different from the other two subgroups, a large proportion of migrant workers may still want to live in their rural hometown later. In 2014, 274 million registered rural residents were working as "peasant workers." Within the 274 million "peasant workers," 168 million were working outside the town where they were registered residents as migrant workers (National Bureau of Statistics of the People's Republic of China, 2015). However, whether and where migrant workers will settle down eventually is still unknown (Ye, 2007). Moreover, studies have revealed inconsistent results about their willingness to settle down in urban areas (Ye, 2007; Li, 2009). It is notable that migrant workers' *hukou* status is one of the main barriers for them to settle down in cities, especially in metropolitan areas.

As discussed above, people who choose to work and live in urban areas can be considered as undergoing active urbanization. In addition to active urbanization, there are also people who are undergoing passive urbanization. In this dissertation, passive urbanization is defined as a process in which a rural community was transformed into an urban-style community by the government. Different from migrants who self-selected to migrate from rural villages to urban communities, passively urbanized villagers usually did not self-select to transform their villages to urban-style communities.

China's urbanization is first and foremost a top-down process led by the government (Li, 2012). Since the mid-1990s, to increase the rate of urbanization has even become an openly-spoken development goal of the state. Requisition of land and demolition of housing

can be done by the government at a large scale rapidly. Local residents are seldom involved in the decision making procedure. Local residents, in general, cannot choose whether or not to urbanize their communities, even though conflicts did happen when local residents did not agree with the decision of the government. Relevant policies issues are summarized as below, though a comprehensive review of the political and economic roots of China's state-led urbanization is out of the scope of this dissertation.

Motivations to achieve economic growth, concerns about food safety and tax distribution between the central government and local governments have largely shaped China's land policies and urbanization movements. As mentioned in Chapter One, the *Land Management Law of the People's Republic of China* amended in 1998 set up the government monopoly in China's land market, to protect arable land during the process of economic development. But rapid urbanization continued, and China's total grain production dropped 16% from 1998 to 2003 (Zhang, Yang, & Wang, 2007). Highly concerned about the food security, the central government announced that China must retain at least 1.8 billion mu (15 mu=1 hectare) of arable land in 2006 when China only had some 1.82 billion mu of farmland (Chen, 2008).

Despite restrictions from the central government, local governments still had the power and incentives to seize rural land and push urbanization forwards. According to the current land policies, local governments have the monopoly on the supply and trade of lands in China. All urban lands in China were owned by the state, and all rural lands in China were owned collectively by farmers. However, only state-owned urban lands can be used for building factories, apartments and other constructions, and only local governments can

supply and trade state-owned urban lands. Local governments also have enormous financial incentives to expropriate rural lands and change them to urban state-owned lands. China's tax distribution reform in 1994 has largely undermined local governments' capacity to collect the tax. This partly explains why local governments become addicted to land revenue financially. By selling the land-use rights of state-owned lands to property developers, the local government can make big profits which could be even higher than its tax revenue. In 2014, the land revenue of local governments in China was more than 4000 billion yuan (644 billion USD). Moreover, the land revenue accounted for over 50% of the total government revenue in 12 out of 20 provinces for which the government revenue information is available to the public (Chinanews, 2015). Even after subtracting the compensations for land expropriation, the profit from selling the land-use rights was once as high as 4.2% of China's GDP in 2010 (World Bank, 2014).

The central government quickly found that it was almost impossible to curb local governments in land grabbing. In 2008, China announced a new land policy called "increasing vs. decreasing balance." This policy is meant to relieve the tension between strict farmland protection policy and rapid urban growth (Long, Li, Liu, Woods, & Zou, 2012). According to this policy, when increasing construction land in urban areas, local governments need to decrease construction land in rural areas by the same amount (Ruan, 2012). Thus, reconstructing rural villages into urban style communities has become one of the most convenient methods to decrease the floor area of rural housing (Zhang, 2015). Land expropriation caused by urban expansion usually only affected rural communities on the fringe of cities, while village reconstruction due to the "increasing vs. decreasing balance"

involved many more remote rural areas. By 2013, 29 out of 31 provinces and municipalities in mainland China have implemented the "increasing vs. decreasing balance" policy (Ministry of Land and Resources of the People's Republic of China, 2013). This type of passive urbanization was often carried out under the name of building a "new socialist countryside" or building "new rural communities." As a result, the second kind of passive urbanization was often called as the movements of "making peasants move into apartments," and the movements of "making rural villages become urban communities" (Tan, 2014; Zhang, 2015).

Village reconstruction usually happened along with farmland consolidation (Jiao & Zhou, 2016). The practice of "increasing vs. decreasing balance" varied across regions, but the following localized case in Hubei Province could be valuable to illustrate the process of village reconstruction (Jiao & Zhou, 2016). In this case, a private real estate developer invested on a village reconstruction project in his own hometown. The county government first established a working group to facilitate this project. The township government and the village committee (leaders in the village) held 27 information sessions for different groups of villagers. Villagers were also organized into small groups with only 3-5 persons for further mobilization. The head of the village and representatives of the developer would talk to those who did not want to participate in village construction. Notably, the whole mobilization process lasted for only one month, and all villagers signed to give their land and houses to the developer in exchange for land rent and a new apartment in the new concentrated community. Unfortunately, some other cases of village reconstruction can be much more coercive. In 2015, a villager in Shandong Province burned himself in his home to resist the housing

demolition related to village reconstruction (He, 2015).

In summary, there are mainly two kinds of passive urbanization: direct land requisition which usually happened near cities, and village reconstruction which usually took place further away (Zhang, 2015). Both industrialized regions and less developed regions have ambitious plans, though the implementation and social consequences of these plans need further observations (Chang, 2006). For example, in 2006, Jiangsu province, one of the richest provinces in China, planned to consolidate all of its 250 thousand natural villages into 40 thousand concentrated communities in the next 20 to 25 years. In other words, more than 80% of natural villages in Jiangsu will disappear according to the plan, and the majority of about 40 million rural residents in Jiangsu will have to move to new communities.

People who were passively urbanized shared many experiences as below. First, housing demolition and relocation to urban style communities were common. In most cases of land requisition, rural residents lost their farmland and houses at the same time. In the process of village reconstruction, housing demolition and relocation were also common to almost everyone, because the goal of village reconstruction was to consolidate the construction land of rural houses (Tan, 2014). Second, many rural residents would lose their farmland during passive urbanization. During the process of village construction, some residents might still own their farmland. However, it is very inconvenient for residents living in urban style communities to continue working on farmland, because: 1) new communities are often far away from residents' farmland; 2) apartments in new communities are not designed for storing farming tools and food grain; 3) it is impossible to raise pigs, chickens, ducks, and other animals in new communities (Chen, 2012a; Chen, 2012b). As a result,

passively urbanized residents often stop working on farmland and start to work in the secondary and tertiary sectors, although not all of them can find jobs in the secondary and tertiary sectors near their communities. Third, the social networks in original villages will often change after relocation. In most cases, people from several villages are consolidated into one new community. Also, migrants may also buy or rent apartments in these new communities. On the one hand, the connections between neighbors will be weakened after village reconstruction. On the other hand, residents may set up new connections through new jobs and other social organizations (Ye, 2012). Other transitions include the changes in social services, as well as increased living expenses. Compared to rural residents, people in new communities, in general, have access to more social services, such as healthcare, libraries, schools, etc. (Zhou & Wang, 2015). In the meantime, it is also more expensive for rural residents to live in the new community than in original villages.

2.1.2 China's supporting systems for elders

It was said that: "for thousands of years, filial piety was China's Medicare, Social Security, and long-term care, all woven into a single family value (Levin, 2008)." This statement has pointed out the centrality of family support for elders' life in China, although it is not perfectly true at present.

First of all, over 90% of elders in both rural and urban China are covered by public health insurance, but for rural elders, these public health insurance plans are not comprehensive enough. Healthcare access is still perceived as a major concern among rural elders. Adult children are usually still the main bearer of rural elders' medical expenses in rural China (Cai, Giles, O'Keefe, & Wang, 2012).

Second, although financial and instrumental support is available outside of elders' families, it is either insufficient or distributed with striking disparity, or both (Li, Zhang, Zhang, Zhang, Zhou, & Chen, 2013). Regarding means for living, 83.6% of registered urban elders have pension plans, while only 43.1% of registered rural elders have any pension plan (National School of Development at Peking University, 2013). As a result, most rural elders have to depend on their adult children when they cannot work on the farmland any longer. Regarding instrumental support, elders in China, especially in rural areas, can only access very limited, if any, long-term care outside of their family. The rationale behind underinvestment is obvious: if to provide financial, instrumental and emotional support for elders can be taken for granted as a family affair, the government will have no responsibility for caring for elders other than those who are so-called "Three No's"—people with no working ability, no income, and no children or relatives. However, such a rationale is not convincing. If all families should take full responsibility to care for their elders, why do urban elders receive additional financial and instrumental support outside of their families?

In this section, I will briefly review the healthcare system, the pension system and long-term care system in China, in order to explain why children's family support still plays a crucial role in almost every aspect of elders' life.

1) Healthcare system and health insurance in China

Currently, people in China generally seek healthcare from two sectors: primary care facilities and hospitals.

Primary care facilities mainly include urban community health centers, township health centers, village clinics, and private clinics. Although the government is trying to

strengthen the public primary care sector, non-government facilities still provide a considerable share of care. In 2012, only 52.1% primary care facilities were public (National Health and Family Planning Commission of the People's Republic of China (NHFPC), 2014). For rural elders, village clinics, private clinics and township health centers are the most accessible healthcare facilities.

Hospitals in mainland China are classified into three categories according to the hospital's service capacity. For instance, tertiary hospitals tend to have the most advanced technology and are designed to provide specialty care, and among tertiary hospitals, 96.0% are public (NHFPC, 2014). China's tertiary hospitals are predominantly concentrated in large cities, such as Beijing, Shanghai, and the capital city of each province. However, for most rural elders, the most accessible hospitals are county hospitals which are counted as secondary hospitals.

At present, over 95% of the total population in China is covered by three public health insurance programs: the New Cooperative Medical Scheme (NCMS) covering rural residents, the Urban Residents Basic Medical Insurance (UR-BMI) covering non-working urban residents (children, students, the elderly and disabled) and the Urban Employee-Basic Medical Insurance (UE-BMI) covering urban employed residents. Thus, elders in China are either mostly covered by UR-BMI in urban areas or NCMS in rural areas (Yip, Hsiao, Chen, Hu, Ma, & Maynard, 2012).

The healthcare system in China has been undergoing a major transition since the start of the national health reform in 2009. The national health reform has made impressive progress in achieving universal health insurance coverage and investing in public primary

care facilities. However, China's healthcare system is still faced with many challenges. First, one of the most important problems is the lack of well-trained healthcare providers, both primary care providers and specialty providers. To make it worse, well-trained doctors are mostly working in tertiary hospitals in large cities. Most rural residents, especially in remote areas, do not have easy access to high-quality healthcare. Second, the public hospital system, which is profit-driven, has become the biggest challenge for China's healthcare reform. Nowadays, the government is expecting the private sector to challenge the monopoly of public hospitals. According to the newest Plan of Healthcare Delivery System for 2015-2020, private hospitals are expected to provide 30% of the healthcare provided by all hospitals. Some scholars are worried that this will make the delivery system even more profit-oriented than it presently is (Yip & Hsiao, 2014). If so, the general population may have less access to high-quality care, and the cost of healthcare will escalate still further. Also, the social health insurance system needs to find a balance between financial sustainability and its capacity for risk-sharing. On the one hand, the current fragmented health insurance programs are still not sufficient and comprehensive enough to protect people from financial difficulties when seeking healthcare. Some studies have shown that health insurance coverage does not necessarily decrease catastrophic health expenses of patients, partly due to the escalating healthcare costs over the same period (Meng et al., 2012). On the other hand, the sustainability of local health insurance programs is also challenged by rapidly escalating healthcare expenditure.

2) Pension system in China

China's pension system, just as the healthcare system, is also undergoing major

transition at present. The pension system has four main subsystems: the civil service pension system which covers most employees of government agencies and public institutions such as public hospitals, universities and research institutes; the Urban Enterprise Pension System (UEPS) which covers urban workers in both state-owned and private enterprises; the New Rural Pension Scheme (NRPS) which was launched in 2009 to cover rural residents; and the Urban Resident Pension Scheme (URPS) which was launched in 2011 to cover urban nonwage residents (Dorfman, Holzmann, O'Keefe, Wang, Sin, & Hinz, 2013). According to the *Opinions of the State Council on Establishing a Unified Basic Pension Insurance System for Urban and Rural Residents* which was announced in 2014, NRPS and URPS will be consolidated into one unified basic pension insurance system before 2020 to cover all nonwage rural and urban citizens (State Council of the People's Republic of China, 2014b). It is also notable that the civil service pension system and the UEPS will also be unified gradually, according to *Decision of the State Council on the Reform of the Pension Insurance System for Employees of State Organs and Public Institutions* which was announced in 2015 (State Council of the People's Republic of China, 2015).

Despite the unprecedented political commitment to provide basic financial support for all elders in China, obvious disparities exist between pension plans. The gap between the generous civil service pension plan and the UEPS has become a controversial social issue. The disparity between UEPS and NRPS is even more striking: on average, an urban elder with UEPS could receive 20,900 yuan (3371 USD) in 2012, while a rural elder with NRPS could only receive 859 yuan (138 USD) in the same year (Chinese social development research, 2014).

In addition, the sustainability of the pension system is uncertain (Peng, 2011). In the case of UEPS, the pension system is managed by local governments, just like health insurance plans. The current pension system is designed to have three pillars according to the suggestions from the World Bank: the PAYG system, the individual account system and the voluntary complementary insurance. But it is a *de facto* "pay-as-you-go" (PAYG) system: most individual accounts are empty since a large proportion of the money in the individual account is often used to pay for the pensions of current retirees. In other words, retirees' pension is paid by people who are currently working. As China's population is aging rapidly, the PAYG system is highly likely to run deficits as the dependency ratio rises (Dong & Wang, 2014).

Moreover, the fragmented pension system has become especially problematic for migrant workers from rural areas. The majority of migrant workers are registered residents in their hometown, rather than the registered residents in cities where they work and live in. As a result, even though they contribute to the local pension plan, they may have difficulties receiving the pension in the future (Peng, 2011). For instance, if there is a person from Sichuan province working in Guangdong province, he or she will have to contribute to the pension system in Guangdong for 10 consecutive years in order to receive a pension in Guangdong. However, the actual administrative procedure can be extremely complicated. Thus, many migrant workers are not motivated to contribute to the local pension plan.

In summary, China is now struggling in providing basic financial support for all rural elders and migrant workers. However, at least in the near future, rural elders may still have to rely on private transfers from their family members as means for living.

3) Long-term care in China

The Chinese government is now scaling up long-term care facilities and services nationwide. According to *the Construction of Old-age Social Service System (2011-2015)*, China plans to build a long-term care system consisting of three components nationwide: homecare, community services and institution services (State Council of the People's Republic of China, 2011). This national plan is a milestone for China's long-term care system, as neither a well-functioning system nor a mature industry for formal long-term care has ever existed in China before. According to the national plan, by the end of 2015, China will have 30 beds per 1000 elders over 60 years, and community service centers for elders will cover all urban communities and half of all rural communities nationwide. Guided by this national plan, local governments have set up specific goals to build the local long-term care system. Most provinces planned their long-term care system based on the "9073" model: 90% of elders will stay at home and receive homecare if in need; 7% of elders can access community services, such as daycare in the community; and 3% of elders will live in nursing homes. By the end of March 2015, China had 27.5 beds per 1000 elders over 60 years nationwide, and 5.84 million beds in total (Ministry of Civil Affairs of People's Republic of China, 2015). However, to build the facilities can be easy, while to provide accessible and high-quality long-term care services can be much more difficult.

Under the charge of the Ministry of Civil Affairs, the service system designed in the national plan is mainly targeting at elders who are "three no's," "five guarantees," 80 years and older, empty-nesters, disabled or having low-income. "Three no's" elders are urban elders who have no working capacity, no income for living, and no children or relatives. The

“five guarantees” are the services that should be provided to these “three no’s” elders: (1) food, oil and fuel; (2) clothes, bedding, and allowance; (3) appropriate housing; (4) in-time healthcare and long-term care; and (5) burial service.

Notably, many programs targeting at “three no’s” and “five guarantees” are only to provide basic means for living. For instance, at present, the primary goal for public nursing homes in rural areas is mainly to just accommodate those elders who are “five guarantees.” These nursing homes are usually not well-equipped and well-staffed to provide professional long-term care for disabled elders. Moreover, since these nursing homes are often targeted at elders without children and relatives, elders who have children and relatives but do need long-term care often feel stigmatized to live in those nursing homes (Cai, Giles, O'Keefe, & Wang, 2012).

For elders who are not “three no’s” and “five guarantees,” their professional long-term care alternatives are also very limited. In metropolitan areas, such as in Beijing and Shanghai, both public and private nursing homes are much better equipped and staffed than those in rural areas or small cities. However, public nursing homes were reported to have a long waiting-list; and private nursing homes can be expensive for ordinary retirees, as nursing homes are not covered by health insurance, and there is no long-term care insurance plan available. In relatively remote rural areas, elders will have even fewer choices for professional long-term care. Township nursing homes will also function as community service centers to provide daycare and other services. In addition, rural elders are encouraged to experiment to form mutual help groups: elders in a village can live together and take care of each other.

In summary, China is now trying to build a long-term care system for all elders. However, the current public long-term system is designed to care for the most vulnerable group of elders – low-income, disabled elders without children or relatives. The government is encouraging the private sector, the private institutions, and informal caregivers, to take care of the majority of elders. Thus, adult children are expected to be the main caregivers for their elderly parents.

2.2 Literature review

In this section, I will review previous theoretical and empirical studies related to the effects of urbanization on elders' family support, mental well-being, and chronic disease management in China.

2.2.1 Theories about urbanization, mental health, and health services use

There was no conceptual framework which explicitly links urbanization, mental health, and health services use altogether. Here I reviewed previous frameworks which viewed urbanization as a social determinant of health and stressed contextual determinants of mental health and health services use.

Urbanization as a social determinant of health

The study of the relationships between health and urbanization, or the characteristics of urban living, naturally fits in the field of social epidemiology or social medicine (Krieger, 1994; Kaplan, 1999; Kaufman, Kaufman, & Poole, 2003). In the 19th century, public health shared the common historical origins and interests with urban planning in the era of miasma and contagion (Corburn, 2004). The germ theory later shifted the focus of public health from

investigating ways to improve urban infrastructure to identify microbes and respondent interventions. In the mid-to-latter half of the 20th century, public health emphasized individual-level risk factors (e.g., diet, exercise, and smoking) but largely ignored the social and economic determinants of population health. Since the 1970s, public health researchers started to conceptualize the relations between the social environment and population health (McKeown, 1972; Blum, 1974; Lalonde, 1974; Morris, 1975; Travis, 1977). Three main theoretical non-mutually exclusive approaches were developed: (1) psychosocial approaches; (2) sociopolitical approaches; and (3) eco-social frameworks (Krieger, 2011). According to these frameworks, social stratification which assigns individuals to different social positions engenders differential exposures and differential vulnerability, resulting in differential health consequences (WHO, 2010b). Material circumstances, such as housing and neighborhood environments which are central to urban life, are important intermediate social determinants of health.

Many studies which explored the impacts of urban living on health drew on theories or conceptual frameworks mentioned above that discuss the social and economic determinants of population health (Hancock & Duhl, 1988; Hancock, 2004). Seminal work by Evans and Stoddart (1990) presented a conceptual framework listing the social environment and physical environmental as determinants of individuals' behavioral and biological response, health and function, and disease. Most relevant frameworks since then have recognized the importance and the complexity of the interactions between the social, economic, cultural, and physical environment and health as well as healthcare (Hamilton & Bhatti, 1996; Starfield & Shi, 1999; Evans & Stoddart, 2003). However, there has been few

published frameworks that have explicitly been formulated to integrate the range of social and economic determinants that shape the health of urban populations (Galea, Freudenberg, & Vlahov, 2005).

One proposed conceptual framework has linked health outcomes to urban living conditions shaped by municipal level determinants which are in turn influenced by major global and national trends (Galea, Freudenberg, & Vlahov, 2005). In this framework, health outcomes of all strata of residents are directly or indirectly affected by all aspects of urban living conditions: the physical environment (housing, density, built environment, pollution), the social environment (social networks, social support, social capital), health and social services (formal and informal services), as well as population characteristics (demographics, socioeconomic status, ethnicity, attitudes, behaviors). These elements of urban living conditions are shaped by municipal level determinants including the government (policies and practices at all levels as implemented in cities), the market (food, housing, labor, etc.), and the civil society (community organization, community capacity, social movements). Finally, the municipal level determinants are influenced by major global and national trends, such as immigration, suburbanization, changes in the role of government, and globalization.

This framework is useful to inform researchers of important elements when conceptualizing the relationships between urbanization and health. However, this conceptual framework is rooted in the US urban experience (Galea, Freudenberg, & Vlahov, 2005; Freudenberg, Galea, & Vlahov, 2005; Galea & Vlahov, 2005). When applying to urban health research in other countries, its utility needs further examination. In addition, this framework does not specify relationships that can be used for explanation and prediction. For instance,

what are the direct and indirect pathways between urban living conditions and population health outcomes? Therefore, this framework requires more specific definition and operationalization to be applied in a given study.

Contextual factors of mental health

Theoretical models were developed to link neighborhood-level factors and mental health (Hill & Maimon, 2013). At the neighborhood level, neighborhood structure (e.g., socioeconomic disadvantage, race and ethnic composition, residential instability) is related to neighborhood social organization (e.g., collective efficacy, social ties) and neighborhood disorder (e.g., structural dilapidation, toxic conditions). These neighborhood-level processes affect individuals' mental health mainly through two pathways: the experience of neighborhood conditions is the primary mediator between neighborhood-level processes and mental health status; several classes of secondary mediators include socioeconomic status, biological factors, psychological dispositions, social resources, and health behaviors; those secondary mediators can mediate the effects of neighborhood-level processes and the experience of neighborhood conditions on individuals' mental health. Also, individual-level characteristics, such as socioeconomic status and social resources, can moderate the link between neighborhood-level processes and mental health status. It is notable that these models were developed primarily based on empirical and theoretical studies in the US (Aneshensel, 2010; Aneshensel & Sucoff, 1996; Cutrona, Wallace, & Wesner, 2006; Fitzpatrick & LaGory, 2010; Massey, 2004; Mirowsky & Ross, 2003; Ross, 2000; Ross & Mirowsky, 2009; Wandersman & Nation, 1998). The complex mediation and moderation processes underlying the associations between neighborhood-level processes and mental

health status need further exploration and extension in other settings.

Two additional frameworks to explain how socioeconomic factors affect elders' mental health are particularly relevant to this study: stress process theory and crisis theory (Ferraro & Wilkinson, 2013). According to the stress process theory, stressors refer to "the broad array of problematic conditions and experiences that can challenge the adaptive capacities of people" (Pearlin, 2010). Differences in exposure to stressors cause different levels of depression and other forms of distress in the population. It is also often hypothesized that the deleterious effects of stressors on well-being can be lessened or eliminated by strong social support systems (Cohen & Wills, 1985). According to the crisis theory, major life events trigger an emotional upheaval which is a coin with two sides. Such major events may challenge one's role identity. However, coping with such events successfully can be beneficial to one's psychological well-being (Turner & Avison, 1992; Reynolds & Turner, 2008).

Contextual determinants of health services use

The Behavioral Model of Health Services Use is a multilevel model that incorporates both individual and contextual determinants of health services use (Andersen & Davidson, 2007). This model categorized contextual and individual characteristics into three categories: (1) predisposing conditions that lead people to use or not use services, (2) enabling conditions that facilitate or impede use of services, and (3) need or conditions that laypeople or healthcare providers recognize as requiring healthcare (Andersen, 1995; Andersen 2008).

At the contextual level, predisposing characteristics include the demographic and social composition of communities, collective and organizational values, cultural norms and

political perspectives. Enabling characteristics include health policies, financing resources available for health services (e.g., per capita community income, affluence, the rate of health insurance coverage), and the amount, distribution, and structure of health services facilities and personnel. Need characteristics include environmental need characteristics (e.g., occupational and traffic and crime-related injury and death rates) and population health indices (e.g., epidemiological indicators of mortality, morbidity, and disability).

At the individual level, predisposing characteristics include the demographic characteristics (e.g., age and sex), social factors (e.g., education, occupation, ethnicity and social relationships), and health beliefs (e.g., attitudes, values, and knowledge related to health and health services). Enabling characteristics include financing and organizational factors: individual financing factors involve the individual's income, wealth, and health insurance status; organizational factors involves the individual's regular source of care, means of transportation, travel time to and waiting time for healthcare. Need characteristics include perceived need for health services (i.e., how people view and experience their general health, functional state and illness symptoms) and evaluated need (i.e., professional assessments and objective measurements of patients' health status and need for medical care).

2.2.2 Urbanization and family support among rural elders

It is often assumed that during the process of urbanization, rural elders' family support will be weakened. As elders' living arrangements were often considered as a proxy for family support, pattern changes in living arrangements in both rural and urban areas have raised concerns about loosening family ties. In 2013, there were 202 million people who were

60 years and older in China, and about 100 million people 60 years and older, who were considered to be "empty-nesters" as they were not living with their adult children (Wu, 2013). It is estimated that there are about 50 million rural "empty-nesters." These "left-behind" elders are considered to have enormous difficulties receiving family support from their children who may migrate to urban areas.

However, such cross-sectional aggregate data about elders' living arrangements may not be informative enough to picture the actual intergenerational support from adult children. First of all, the living arrangements of parents and their children are not static but change over the life span. Childcare needs, death of one parent, and health status of parents can all lead to transitions in living arrangements (Chen, 2005). Also, the relationship between living arrangements, intergenerational transfers, and elders' well-being can be more nuanced than commonly expected. A study in rural Anhui province, a major labor exporting region, revealed that: elder parents living in the three-generation households or with grandchildren in skipped-generation households, but not those living with adult children only, experienced favorable mental outcomes. A possible explanation was that elders who were taking care of their grandchildren received increased remittances which were associated with improved mental well-being (Silverstein, Cong, & Li, 2006).

Fewer studies have measured intergenerational support from children, and many of these studies about intergenerational support were focused on the relationship between transfers and recipients' income with the purpose of exploring underlying motives. Lee and Xiao (1998) analyzed the data from the China Survey on Support Systems for the Elderly in 1992 and found that in both urban and rural China, children's financial transfers to their

elderly parents were based on the parents' need. A more recent study in Anhui province also supported the notion that financial transfers from adult children were mainly needs-based (Guo, Chi, & Silverstein, 2009).

In addition, there are some studies exploring possible determinants of intergenerational transfers based on a newly available dataset. Lei et al. (2012) used the CHARLS 2008 pilot data to analyze the patterns and correlates of intergenerational transfers between elderly parents and adult children in Zhejiang and Gansu Provinces. They found that transfers flow predominantly from children to elderly parents. The financial transfers are significantly affected by the financial capabilities of individual children. Educated and married children have a higher tendency to provide transfers to their parents. Zimmer and Kwong (2003) explored the relationship between family size and support of older adults in both urban and rural China. They found that having more children increased the chances of receiving financial and instrumental support from children but decreased the chances of receiving support from other sources of support (e.g., the community). When the number of children increases, there were linear increases in the probability of receiving financial support, while there were only diminishing increases in the probability of receiving instrumental support.

In terms of the effects of urbanization on family support among rural elders, most previous studies were focused on the consequences of migration on elders who are "left-behind." Based on an annual household survey conducted from 1986 to 2004 in four provinces in China, researchers found that elderly with migrant children received similar levels of financial transfers as those without migrant children (Giles, Wang, & Zhao, 2010).

However, very limited empirical evidence has pictured how rural elders' intergenerational support from children will be influenced by different mechanisms of urbanization. In other words, how will intergenerational support change if elders' original communities are urbanized? Answers to such questions remain unknown.

2.2.2 Urbanization and mental well-being among rural elders

The mental well-being among rural elders has received much attention in the past decade. One concern is that the suicide rate is high among the elderly, particularly in rural areas, despite decreases in general population suicide rates (Jing, Zhang, & Wu, 2011; Li, Xiao, & Xiao, 2009; Liu, 2013). However, currently, there is no national epidemiologic study that specifically focuses on or estimates the prevalence of various psychiatric disorders among the elderly (Simon, Chang, Zeng, & Dong, 2013). In a general nationwide study, those 55 years and older evidenced a 1-month prevalence for any psychiatric disorder rate of 24.04% (i.e., 10.56% mood disorder, 7.97% anxiety disorder, 5.90% substance abuse disorders, 0.77% psychotic disorders, 0.68% organic mental disorders, and 0.43% other mental disorders) (Phillips et al., 2009). In contrast, the 1-month prevalence of any psychiatric disorder was 12.51% for those between the ages of 18 to 39, and 23.23% for those between 40 and 54. In other words, the older population in China had poorer mental well-being compared to those who were younger.

Urbanization has long been viewed as a detrimental factor for mental health around that world (Harpham, 1994; Blue & Harpham, 1996; Chan et al., 2015). In China, the county-level population density was found to be a predictor of individual CES-D scores, suggesting that people in urban areas were more likely to have depressive symptoms (Chen,

Chen, & Landry, 2015). However, a limitation of most research on the effects of urbanization is self-selection: people who choose to move to urban areas are different from those who choose to remain in rural areas, most likely in ways that affect their outcomes (Harpham, 1994). Identifying causal effects of urbanization on subsequent outcomes, therefore, requires a study design or methodology addressing selection bias.

Some recent studies have looked at the impacts of community-level factors on elders' mental well-being.

Yang and Lou (2015) used the baseline data of CHARLS to explore the associations between childhood adversities, urbanization and depressive symptoms among middle-aged and older adults. In their study, they included a sub-sample of those who are: (1) aged 45 or above; (2) with the first *hukou* status being rural; and (3) having mainly lived in a rural region before the age of 16. Then, by combining information on respondents' *hukou* status and neighborhood type, they categorized their sample into three groups: (1) the non-urbanized who stayed in rural areas and held the rural *hukou* status; (2) the semi-urbanized who moved into urban areas while still holding the rural *hukou* status; and (3) the fully urbanized who moved to urban areas and obtained the urban *hukou* status. The authors used factorial analysis of covariance to study the correlation between childhood adversity and depressive symptoms and the moderation of urbanization on the correlation. They found that higher level of urbanization status was significantly associated with fewer depressive symptoms. However, this study did not take a further step to estimate the effect magnitude of urbanization. It also did not differentiate the effects of active urbanization and passive urbanization or exploring potential pathways of the effects of urbanization. It did not address the self-selection issue

related to migration: it was possible that people who were less likely to become depressed survived the struggling to stay in urban areas, while the urban life did not necessarily make them happy. In addition, when exploring the effect of urbanization, the authors did not sufficiently control for the effects of family support which may confound their targeted effects.

Shen (2014) used the 2008 pilot data of CHARLS to explore what community-level factors could explain the variances in mental health among middle-aged and older-aged Chinese. Shen found that the number of amenities and organizations (e.g. basketball playground, swimming pool, outside exercise facilities, room for card games and chess games, room for Ping Pong) within the community was significantly associated with the mental health in midlife and later life, even after controlling for the individual-level socioeconomic and social support predictors. This study has suggested pathways through which community-level factors can influence the mental well-being of local residents. It was designed to evaluate the "community building" strategy of the Chinese government which was aimed at expanding community-based services. However, this study only used the pilot survey data of CHARLS covering two provinces in China. It also did not estimate the effects of urbanization on mental well-being directly.

Another study also tried to differentiate the effects of family, community, and public policy on depressive symptoms among elderly Chinese (Zurlo, Hu, & Huang, 2014). This study used the 2011 national baseline data of CHARLS. They evaluated the associations between three types of social support (family, community, and public) and depressive symptoms in people 60 years and older. They operationalized family support by measuring:

(1) whether the respondent lived with spouse; (2) the number of extended family members and relatives; and (3) frequency of contact with children. They measured community support by whether the community had a senior center. They operationalized policy support by measuring: (1) whether the respondent received a pension; (2) whether the respondent had medical insurance; and (3) whether the respondent received subsidy to elderly aged over 60. They found that having fewer depressive symptoms is associated with living with a spouse, having frequent contact with children, having a senior center in the community, and receiving a subsidy from the local agency. However, they stratify their sample by respondents' *hukou* status, and they did not estimate the effects of *hukou* status. In addition, contact frequency with children may not be a good proxy for intergenerational support from children.

In addition, few researchers have studied the impacts of land requisition and village reconstruction (e.g. building a "new socialist countryside," or building "new rural communities") on elders' depressive symptoms. In Chongqing, an experimental site for urbanization in China, it was found that the "new socialist countryside" was associated with better mental health among rural residents, probably due to improved infrastructure, housing and transportation condition (Pan, Zhou, Zhang, & Du, 2015). However, this study was a cross-sectional study with a small sample size (N=224) in only one village of Chongqing. Yang and Lou (2016) found similar results using the 2011 China Health and Retirement Longitudinal Study (CHARLS). They found that land expropriation in the rural community was associated with having lower scores on the 10-item Center for Epidemiological Studies Depression (CES-D) (higher CES-D scores indicate more severe depression symptoms), probably because of the increased availability of infrastructure and grassroots organization

(Yang & Lou, 2016). However, they did not look at the effects of village reconstruction at the same time, and they did not explore the role of family dynamics which might also change during the process of community transformation.

In summary, evidence has accumulated for the essential role of intergenerational support from children to elders' mental well-being, and rural elders were reported to have poorer mental well-being in China. It is still unknown how different mechanisms of urbanization will influence rural elders' mental well-being, and what the potential pathways of such effects may be.

2.2.3 Chronic disease management in China

Along with rapid urbanization and population aging, China is also undergoing an epidemiological transition from the infectious to the chronic diseases in much shorter time than many other countries (Yang et al., 2008). In the process of rapid urbanization, people's behavioral changes can be triggered by changes in occupational activities, SES, built environment and so on (Gong et al., 2012). In 2013, the prevalence of hypertension among people 15 years and older was 24%. In other words, 266 million people in China had hypertension. Moreover, only 40% of patients with hypertension were aware of the disease (Chinese Center for Disease Control and Prevention, 2013). Many studies have shown that despite the high prevalence of hypertension, awareness, treatment and control rates of hypertension remain low, especially in rural China (Gu et al., 2002; Wu et al., 2008; Liu, Wu, Wang, Lee, Zhang, & Kong, 2007).

Considering the high disease burden related to hypertension, improving the diagnosis and management of hypertension at the population level has become a major public

health issue in China. In other parts of the world, social support, including family support, has been found to be beneficial for the diagnosis and control of hypertension as well as the management of other chronic conditions (Cornwell & Waite, 2012; Gallant, 2003). However, most studies in China which explored relevant factors for hypertension management focused on individual-level factors, including gender, education, high-risk behaviors, health insurance coverage, and income (Muntner et al., 2004; Lei & Lin, 2009).

Few studies have explored the system-level, community-level and family-level factors. A meta-analysis about the effectiveness of interventions for hypertension care in the community revealed that strengthening family support can be effective for hypertension management (Lu et al., 2012). However, whether this community intervention can be generalized to a larger population remains unknown. In addition, system-level factors were also found to be influential for hypertension management. By using the baseline data of CHARLS, Feng, Pang, and Beard (2014) estimated the hypertension prevalence, awareness, treatment and control to evaluate the impacts of healthcare reform since 2009 on chronic disease management. They found that nearly 40% of people aged 45 years and older had hypertension. Among individuals with hypertension, more than 40% were unaware of their condition, about 50% were not receiving any medication, and 80% of patients were not controlling their condition well. They also found that having health insurance which covered outpatient care was associated with higher awareness and better outcome of hypertension management.

In summary, for rural elders in China, it is still not well-known whether and how their hypertension management will be influenced by family-level and community-level

factors.

2.2.4 Contribution of this thesis

The contribution of research questions:

First, this study contributes to understanding the intersection of population aging and urbanization, about which empirical literature scarcely existed. Many previous studies focused on the impacts of children's migration on elders' well-being (Giles & Mu, 2007; Guo, Aranda, & Silverstein, 2009). Also, most previous studies exploring community-level factors related to elders' well-being only focused on rural or urban elders. However, to my knowledge, very few studies have examined how a transitioning community and family dynamics might influence elders' health and healthcare (Pan, Zhou, Zhang, & Du, 2015).

This study also fills knowledge gaps in understanding how passive urbanization affected elders' mental well-being and chronic disease management in China. Most previous studies on passive urbanization were localized studies in the fields of urban planning, sociology, and political science. Few have examined the health consequences of passive urbanization.

The contribution of methods:

First, China's passive urbanization movement has provided a unique opportunity to identify and estimate the effects of urbanization. In most countries, urbanization happens in a more "natural" way, since people usually self-select to move to urban areas. It is then very challenging to estimate the causal effects of urbanization on people's health and healthcare utilization. However, in this study, China's passive urbanization movement can be viewed as a natural experiment which is relatively exogenous. The problem of self-selection can be

largely alleviated.

Second, this study takes advantage of CHARLS which is a national representative dataset and was not available for many previous researchers. By using this dataset, the study may be able to estimate some effects which previous localized studies may not be able to detect. The results may also be more generalizable than previous localized studies. In addition, CHARLS is designed as a longitudinal dataset modeled after Health and Retirement Study in the US and other longitudinal studies in the world. Thus, further comparisons across waves and countries may be possible.

The contribution of the conceptual framework:

Extant frameworks in urban health, mental health, and health services utilizations were largely rooted in the U.S. urban experience (Galea, Freudenberg, & Vlahov, 2005; Freudenberg, Galea, & Vlahov, 2005; Galea & Vlahov, 2005). Also, many of these frameworks could not be directly applied in research for explanation or prediction. This empirical study develops a conceptual model which explicitly links the community-level, family-level, and individual-level factors based on previous frameworks. This empirical study tests elements of previous frameworks in a dramatically different context. This study also contributes to future framework development by making specific definitions and operationalization. Specifically, this study has gone beyond extending our knowledge of correlates and focuses much more on identifying specific mediators and moderators in the conceptual model.

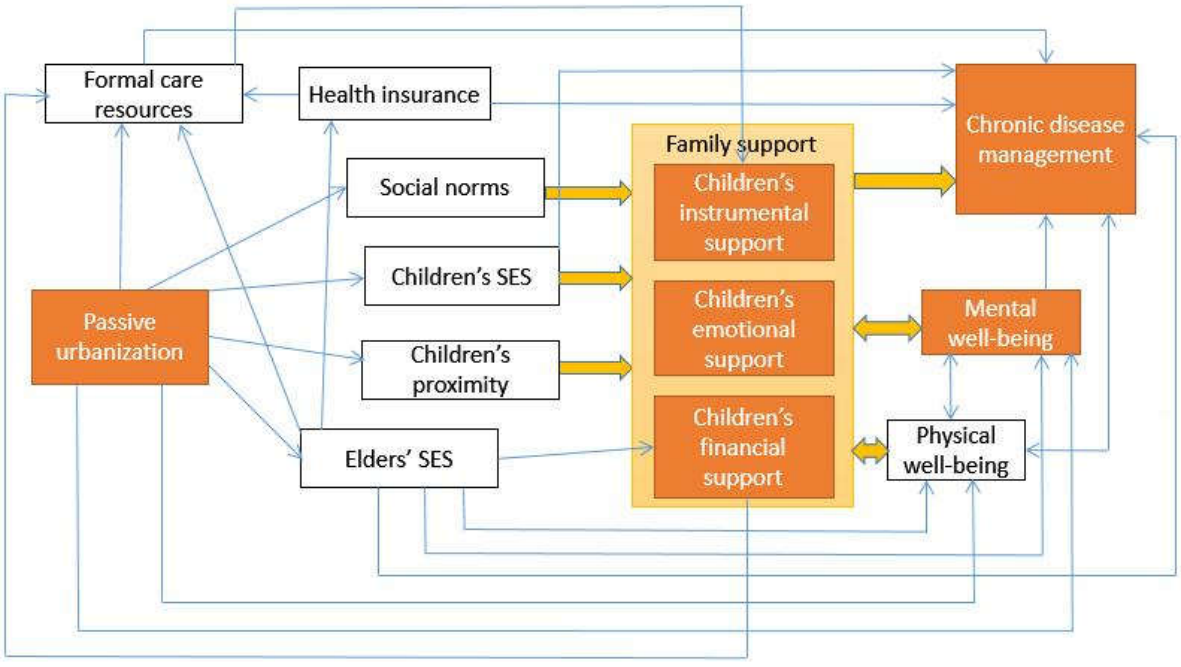
CHAPTER THREE: CONCEPTUAL MODEL

This Chapter has two sections. In the first section, I will explain the conceptual model of this dissertation which describes the impacts of passive urbanization on family support, mental well-being, and chronic disease management among elders. In the second section, I will discuss my research hypotheses and rationales.

3.1 Conceptual model

On the left side of Figure 1, the concept of "passive urbanization" captured the experience of passively urbanized elders living in rural communities which are urbanized compared with always rural elders. In this Chapter, how passive urbanization can influence elders' family support from children, elders' physical and mental well-being, and elders' chronic disease management is discussed.

Figure 1 Conceptual model for the impact of passive urbanization on the mental well-being and chronic disease management of elderly Chinese



Note: The thin arrows represent the relationship between two concepts, and the thick arrows represent the relationship between one concept and all three kinds of family support. Factors

which do not mediate the effects of passive urbanization on family support, mental well-being, and chronic disease management are not included in the figure for simplicity. They are the number of female children, the number of male children, genetic endowment, early environment, other kinds of social support, and the location of communities.

3.1.1 Passive urbanization: consequences and predictors

Passive urbanization can have enormous impacts on several aspects of elders' life through altering elders' physical environment, social environment (e.g., family support), health and social services, socioeconomic status, and so on. As shown in Figure 1, passive urbanization can influence formal care resources, social norms, children's socioeconomic status (SES), children's proximity, and elders' SES. The direct relationships between passive urbanization and elders' mental and physical well-being will be discussed later.

Formal care resources

The arrow from "passive urbanization" to "formal care resources" represents the changes in formal long-term care and healthcare access after community transformation. For formal long-term care, there is an obvious gap in access between rural communities and urban communities at present. For instance, until the end of 2015, most provinces will set up community service centers in all urban communities for elders to provide some homecare and daycare, as planned by the government. In contrast, similar services will only cover at most 50% of all rural villages in most provinces, even according to the current plan (State Council of People's Republic of China, 2013). Not to mention the quality gap of formal care between rural and urban areas, formal long-term care of all kinds is simply much less available in rural areas. Thus, compared to long-term rural elders, "passive urbanization" may lead to better access to formal long-term care for passively urbanized elders, for it may be easier to deliver community services in places where the population is more concentrated. For healthcare, the

rural-urban disparities also exist.

Social norms

The arrow from "passive urbanization" to "social norms" represents the impacts of urbanization on social norms which regulate how parents and their children treat each other. Despite regional variations, rural areas are generally considered to be traditional and conservative, regarding its patriarchal family value. There is evidence, such as increasing suicide rates among rural elders, suggesting that the elderly have been losing the power within their family gradually in the past two decades (Liu, 2010; Liu, 2011; Liu, 2013).

Children's SES

The arrow from "passive urbanization" to "children's SES" represents the impacts of community transformation on children's SES. Currently, in China, the reconstruction of rural villages often goes hand in hand with land consolidation and an influx of capital investments. It is possible that new job opportunities are created during the process of community transformation. Thus, for passively urbanized elders, these new job opportunities may improve the income of their children, although these jobs are not likely to offer high salaries.

Children's proximity

The arrow from "passive urbanization" to "children's proximity" represents how community transformation influences children's proximity. In this conceptual model, I will assume that passive urbanized elders will enjoy greater children's proximity when compared to long-term rural elders. Rural parents in China are likely to become "empty nesters" if their children work in urban areas. Under such circumstances, family union may be achieved in two ways: 1) children move back to rural areas, and 2) parents move to urban areas. The

communities of passively urbanized elders may have job opportunities to attract the younger generation after community reconstruction.

Elders' SES

At the individual level, "passive urbanization" is associated with "elders' SES," as represented by the arrow from "passive urbanization" to "elders' SES." Community transformation may have a positive impact on elders' SES, just as how community transformation may influence children's SES as discussed above.

Though omitted in Figure 1, the location of communities could be important to predict passive urbanization as well as its consequences. It is notable that passive urbanization was not a truly randomized process. Thus, there might be confounders between passive urbanization and the outcomes and mediators in this study. One major potential confounder is the location of communities. For instance, rural communities in East China might be more likely to experience land requisition due to rapid economic development than rural communities in West China. The effects of passive urbanization may also differ across communities located in different regions. Suburban communities in Beijing or Shanghai may benefit a lot from monetary compensations for land requisition. However, remote rural communities in West China may benefit little from compulsory village construction which makes it inconvenient to work on farming.

3.1.2 Passive urbanization and family support

Intergenerational family support is perhaps the most important kind of social support for Chinese elders. In the center of Figure 1, intergenerational family support includes emotional support, financial support, and instrumental support. Here, emotional support

refers to non-tangible help which makes people feel loved and cared for; financial support refers to financial transfers; and instrumental support refers to the various types of tangible help, also known as informal care. Within each family, intergenerational family support can go from parents to children or from children to parents. In this conceptual model, I will focus on financial support and instrumental support from children to their parents. In the case of China, parents in both rural and urban areas usually make a large monetary transfer for the marriage of their children. However, in later stage of life, the direction of intergenerational financial transfer is mainly from adult children to their parents (Lei et al., 2012). In addition, the majority of elders in China do not have considerable assets, especially in rural areas. I will then assume that most adult children support their parents due to altruism as well as filial piety according to the traditional social norms. Thus, family support for elders is mainly influenced by elders' needs and available resources. As shown in Figure 1, passive urbanization may influence children's family support through formal care resources, social norms, children's socioeconomic status (SES), children's proximity, and elders' SES. Other factors which do not mediate the effects of passive urbanization on family support will also be discussed at the end of the Chapter.

Formal care resources

As represented by the arrow from "formal care resources" to "children's instrumental support," formal long-term care resources in the community can influence children's instrumental support. Home care and nursing home in the community may complement as well as substitute for children's informal care for their parents. Notably, children's financial support may also influence parents' access to formal care, as represented

by the arrow from “children’s financial support” to “formal care resources.” For instance, elders’ children may pay for elders’ long-term care when they cannot provide informal care to their parents.

Social norms

The arrow from “social norms” to “children’s emotional support,” “children’s financial support,” and “children’s instrumental support” represents how social norms can regulate children’s family support of all kinds for their parents. Social norms in newly urbanized communities may differ from the original community, as the ways people live and work have become more urban than rural. For instance, passively urbanized elders may be more accepting of formal long-term care than long-term rural elders.

Children’s SES

The arrow from “children’s SES” to “children’s emotional support,” “children’s financial support,” and “children’s instrumental support” represents the impacts of children’s SES on all three kinds of family support. Children with lower SES may provide less emotional support for their parents than those with higher SES, as they may be too stressed to care for their parents. Those children who are well-off can have more available resources for their parents than those who can hardly make a living (Lei et al., 2012). However, children with high SES may have limited time to take care of their parents in person, as their time is valuable. In the meantime, it is also possible that children with low SES have less time for their parents than children with high SES, since they may be fully occupied to support the family financially.

Children’s proximity

The arrow from “children’s proximity” to “children’s emotional support,” “children’s financial support” and “children’s instrumental support” shows that children’s proximity influences all three kinds of family support. Chinese parents tend to live in the family of one of their children (such as their eldest son) traditionally (Zeng, Land, Gu, & Wang, 2013). Although more and more elders are living independently at present, staying close to their adult children is still crucial for their happiness. For financial support, children living away from their parents may provide more financial support to compensate for instrumental support that they cannot provide. The association between children’s proximity and children’s instrumental support can be complicated due to potential reverse causality. On the one hand, children living with their parents can potentially provide more instrumental help than children living in another city. On the other hand, children may move to live with or close to their parents because they expect to provide more instrumental support for their parents.

Elders’ SES

On the one hand, elders’ SES may influence children’s financial support, represented by the arrow from “elders’ SES” to “financial support.” Affluent elders may need little financial support from their children. For instance, pension may also substitute children’s financial support for their parents. If their parents do not have pension as the case of most rural elders, adult children will have to support the living of their parents.

On the other hand, elders’ SES may also influence children’s instrumental care indirectly by affecting elders’ formal care resources, as represented by the arrow from “elders’ SES” to “formal care resources” and the arrow from “formal care resources” to “children’s instrumental support.” Elders with high SES may be more accepting of formal care and have

more financial resources to utilize formal care than elders with low SES, which in turn might discourage the provision of instrumental support by the children.

Other factors associated with children's family support

Health insurance can influence children's instrumental support through formal care resources. As represented by the arrow from "health insurance" to "formal care resources," as health insurance pays for healthcare. In several cities (e.g., Shanghai, Qingdao), health insurance or stand-alone long-term care insurance also pays for long-term care provided by professional providers.

The number of female children and the number of male children influence all three kinds of family support as well, although they are omitted in Figure 1. The total number of children matters since elders with more adult children will have more potential providers of all kinds of family support, especially financial support (Zimmer & Kwong, 2003). For instrumental support, it is possible that elders will have only one or two primary caregivers regardless of their number of children instead. The gender of children also matters considering the traditional preference for male children in China, especially in rural areas. In urban areas, the daughter and the son may be expected to contribute equally to their parents. However, in rural areas, the son and his spouse, rather than the daughter, are expected to provide care for his parents. In addition, the number of children may also influence children's SES. Since rural families usually have limited resources to invest in children's education, children's SES may be negatively associated with the number of children in the family.

In addition, other kinds of social support may also affect children's family support. Besides children, the spouse is also a major caregiver. Siblings, neighbors, and friends can

also be important caregivers. The social support from other caregivers may complement or substitute the family support from children. For instance, a widowed or a divorced elder may receive more family support from his or her children, compared to a married elder.

3.1.3 Passive urbanization and physical well-being

Passive urbanization can influence elders' physical well-being directly, or indirectly through family support ("children's emotional support," "children's financial support," and "children's instrumental support"), elders' SES, mental well-being, and chronic disease management.

Passive urbanization

In Figure 1, elders' physical well-being can be influenced by urbanization directly, as represented by the arrow from "passive urbanization" to "physical well-being," and elders' physical health can also be influenced by urbanization indirectly through changes in formal care resources and chronic disease management.

First, passive urbanization can influence people's physical well-being by changing their lifestyle and living environment. For passively urbanized elders, their lifestyle will change dramatically after they start to live in a more urban community: they may have less occupational physical activities, as they may no longer work on their farmland; they can also access more kinds of food in an urban market than from their farmland; and they may no longer use coal and wood to cook. Changes in lifestyle will influence elders' physical well-being both in both positive and negative ways. Compared to long-term rural elders, passively urbanized elders will be less likely to suffer from malnutrition and indoor air pollution caused by burning coal or charcoal for cooking, but will become more likely to

have obesity, hypertension, and diabetes. In a localized study, researchers found that passively urbanized residents have higher two-week morbidity rates and higher hospitalization rates than both rural residents and urban residents, and passively urbanized residents are more likely to have chronic diseases than rural residents (Gao, Zhao, Ren, & Li, 2013).

In addition, passive urbanization may also influence people's physical well-being indirectly through changes in healthcare resources and chronic disease management, as represented by the arrow from "passive urbanization" to "formal care resources," the arrow from "formal care resources" to "chronic disease management," and the arrow between "chronic disease management" and "physical well-being". The rural-urban gap in healthcare resources has existed for a long time in China. High-quality healthcare resources are largely concentrated in urban areas, especially in large cities. Thus, healthcare resources are more available in urban communities than in rural communities (Liu, Zhang, Lu, Kwon, & Quan, 2007; Meng, Zhang, Yan, Hoekstra, & Zhuo, 2012). Thus, compared to long-term rural elders, passively urbanized elders may have better access to healthcare resources in the community.

Other factors associated with physical well-being

The bidirectional arrow between family support and "physical well-being" represents the associations between all three kinds of family support and elders' physical well-being. On the one hand, family support may improve elders' physical well-being: financial support from children may improve elders' nutrition and healthcare access; instrumental help from children may help elders remain active in daily life; and emotional support from children may also help elders stay healthy. On the other hand, elders' illnesses

and difficulties in ADLs can trigger caregiving, financial support and emotional support from adult children. However, caregivers may institutionalize elders if they are too ill to be taken care of at home, though institutionalization is uncommon in China, especially in rural areas.

The arrow from "elders' SES" to "physical well-being" represents the influence of elders' SES on their physical well-being. For rural elders in China, poor physical well-being can be a result of life-long exposures of malnutrition, limited healthcare access as well as occupational hazards, which are all closely related to their SES (Zhu & Xie, 2007; Zimmer & Kwong, 2004).

Though not represented in Figure 1, other kinds of social support are likely to be protective towards elders' physical well-being, just as the family support from children.

The impacts of mental well-being on physical well-being will be discussed in the following section.

3.1.4 Passive urbanization and mental well-being

As shown in Figure 1, elders' mental well-being can be affected by community-level factors, family-level factors as well as individual-level factors.

Passive urbanization

At the community level, elders' mental well-being can be directly influenced by the process of urbanization, as represented by the arrow from "passive urbanization" to "mental well-being." Passive urbanization can be considered as a stressor as well as a major life event for rural elders, according to the stress process theory and crisis theory reviewed in Chapter Two. Thus, passive urbanization, as a major life event for rural elders, can have direct negative effects on elders' mental well-being, at least in the short term. Passively urbanized

elders may feel under stress, as they usually have to cope with community transformation, housing demolition, and dramatic lifestyle changes. In addition, passive urbanization also challenges rural elders' identity as farmers, as they may have to change their way of working and living after passive urbanization. However, in the long term, when elders have coped with their life transition successfully, passive urbanization may have positive effects on their mental well-being. In addition, as mentioned before, passive urbanization may also affect elders' SES, physical well-being, and the family support from children. Family support, as well as other factors, may help elders cope with the stressor. Thus, the net effects of passive urbanization can be neutral or even positive.

Other factors associated with mental well-being

At the family level, elders' mental well-being is associated with all kinds of family support from children directly, as represented by the bidirectional arrow from family support to "mental well-being" in Figure 1. Similar to physical well-being, elders' mental health status can benefit from emotional, financial, and instrumental support from children, as they may perceive the support from children as a symbol of respect and love (Cong and Silverstein, 2008a; Cong and Silverstein, 2008b). However, an elder with poor mental well-being may have poor intergenerational relationships with his or her children, and he or she may receive less family support as a result. In addition, other kinds of social support are likely to be protective towards elders' mental well-being, just as the family support from children, though not represented in Figure 1.

At the individual level, elders' mental well-being can be influenced by their physical well-being, genetic endowment, early environment and their SES (Yang & Lou, 2015; Lei,

Sun, Strauss, Zhang, & Zhao, 2014).

Elders' mental well-being can be associated with their physical well-being, represented by the bi-directional arrow between "physical well-being" and "mental well-being." Elders who are in pain and disabled may also be sad. At the same time, elders' mental well-being can also influence their physical well-being.

Elders' mental well-being can also be influenced by their genetic endowment and early environments. Elders with a family history of mental disorders can be more likely to have mental disorders. Elders who had experienced negative life events in their earlier life can also be vulnerable to poor mental well-being. These two relationships are not included in Figure 1.

Elders' mental well-being can also be influenced by their SES, as represented by the arrow from "elders' SES" to "mental well-being." For many elders, living an affluent life may be associated with good mental well-being. Conversely, poverty may result in poor mental well-being.

3.1.5 Passive urbanization and chronic disease management

In Figure 1, "chronic disease management" can be influenced by community-level, family-level, and individual-level factors. At the community level, elders' chronic disease management can be influenced by healthcare resources in the community as discussed before. At the family level, both family support (emotional support, financial support, and instrumental support) and children's SES can be influential for elders' chronic disease management.

The arrow from family support to "chronic disease management" represents that

children's emotional, financial, and emotional support can all influence elders' chronic disease management. Children's emotional support may be encouraging for elders' healthcare utilization. Adult children may provide direct financial support for their parents' healthcare. They may also bring their parents to hospitals for physical exams. Thus, better family support can be associated with better health awareness among elders as well as better chronic disease management. In addition, other kinds of social support are likely to be beneficial for elders' chronic disease management, just as the family support from children, though not represented in Figure 1.

The arrow from "children's SES" to "chronic disease management" represents the impacts of children's education, income and social resources on their parents' healthcare. Currently, adult children of elders in China are generally better educated than their parents. Adult children are highly likely to make medical decisions for their parents and get involved in their parents' disease management process by choosing providers and treatment alternatives for their parents. Thus, adult children who are well-educated and resourceful may coordinate chronic disease management for their parents. In addition, well-educated children may also help their parents in managing chronic disease.

At the individual level, elders' chronic disease management can be influenced by elders' mental well-being, physical well-being, SES, and health insurance.

As represented by the arrow from "mental well-being" to "chronic disease management," elders' chronic disease management can be influenced by elders' mental well-being. It is possible that when elders were very depressed, they are not motivated to manage their chronic diseases well.

Moreover, elders' SES and health insurance can also be crucial for chronic disease management, represented by the arrow from "elders' SES" to "chronic disease management" and the arrow from "health insurance" to "chronic disease management" respectively. Elders with high SES may have better health literacy than elders with low SES. Thus, elders with high SES may manage their chronic disease better than elders with low SES. In addition, having health insurance can also be crucial to access to care. Rural elders may not be diagnosed in time if they seldom seek healthcare because of financial concerns.

The relation between "chronic disease management" and "physical well-being" is represented by the bidirectional arrow between these two concepts in Figure 1. Chronic disease management can be beneficial for elders' physical health. For chronic disease management, only people with the certain chronic disease will need to manage their chronic diseases. In turn, poor physical well-being may also lead the individual to manage their chronic diseases.

3.1.5. Summary

In summary, children's family support can be influenced directly by social norms, formal care resources, intergenerational relationships, children's SES, children's proximity, other kinds of social support, elders' SES, elders' mental well-being, and elders' physical well-being. Among all these factors, social norms, formal care resources, children's SES, children's proximity, elders' SES, and elders' mental and physical well-being can all mediate the indirect effects of passive urbanization on children's family support.

Elders' mental well-being can be influenced directly by passive urbanization, children's family support, other kinds of social support, elders' physical well-being, and

elders' SES, genetic endowment, and early environment. Among all these factors, children's family support, elders' physical well-being, and elders' SES may also mediate the indirect effects of passive urbanization on mental wellbeing.

Elders' chronic disease management can be directly influenced by formal care resources, children's SES, children's family support, other kinds of social support, elders' health insurance, elders' SES, and elders' mental well-being. All these factors except for other family support may mediate the indirect effects of passive urbanization on chronic disease management.

3.2 Research questions and hypotheses

In this study, I will test the following research hypotheses about the effects of passive urbanization on elders' mental well-being and chronic disease management.

1. What are the total effects of urbanization on elders' mental well-being?

The total effects here include both direct effects and indirect (mediated) effects, and the total effects can be estimated without controlling for potential mediators: elders' SES, elders' physical well-being, and children's family support.

Hypothesis 1: Passively urbanized elders have fewer depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

Rationale: Passive urbanization may have complex effects on elders' mental well-being. In the short term, compared to long-term rural elders, passively urbanized elders may have worse mental well-being, for they had experienced community transformation, housing demolition, and dramatic lifestyle changes, especially when the new communities were poorly planned and constructed. However, in the long term, if new communities were well

planned and constructed, rural elders may be satisfied with their improved income and living conditions in the long term. In addition, elders may receive more financial support and instrumental support after the community transformation, for their children may work and live locally due to improved job opportunities. Thus, the direct effect of passive urbanization on elders' mental well-being is perhaps negative, while the total effects of passive urbanization may be positive.

2. To what extent is the effect of urbanization on elders' mental well-being mediated by influencing children's family support?

Hypothesis 2a: Passively urbanized elders receive more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Rationale: Passively urbanized elders may receive more financial support and instrumental support, because their children may have more opportunities to work locally. When a rural village is urbanized or reconstructed, local farmland which is owned collectively by the village is likely to be expropriated or consolidated as well. Local residents will be compensated for the loss of land if their farmland is expropriated, usually for non-agricultural use. If their farmland is consolidated and rented to other farmers or agricultural companies, they will receive a rent. The rent is usually equivalent to the income they can have from doing the farming by themselves. Besides the compensation or the rent, local residents may also have opportunities to work for those new "owners" of the farmland. These job opportunities may attract adult children of passively urbanized elders to work and live close to their parents rather than migrate to faraway cities. Thus, mainly through improving

children's SES and proximity, reconstruction and urbanization of rural villages may lead to increased financial support and instrumental support from children.

Hypothesis 2b: Receiving more family support is associated with fewer depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

Rationale: Elders often perceive children's financial support and instrumental support as a sign of filial piety. Thus, family support from children can comfort elder parents and thus improve their mental well-being.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' mental well-being will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Rationale: Since children's family support will mediate part of the positive effects of passive urbanization, after controlling children's family support, the "total effects" of passive urbanization will be smaller than the total effects estimated in hypothesis 1.

3. What are the total effects of urbanization on elders' chronic disease management?

The total effects here include both direct effects and indirect (mediated) effects, and the total effects can be estimated without controlling for mediators: formal care resources, children's family support, children's SES, elders' SES, and health insurance.

Hypothesis 3: Passively urbanized elders manage their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Rationale: Passively urbanized communities may have better healthcare resources than rural areas, and passively urbanized elders may have better access to healthcare. In addition,

compared to long-term rural elders, passively urbanized elders may have more financial resources and more generous health insurance plans. Thus, compared to long-term rural elders, they may have more opportunities to have their chronic disease diagnosed and managed well.

4. To what extent is the effect of urbanization on elders' chronic disease management mediated by influencing children's family support?

Hypothesis 4a is the same as Hypothesis 2a above: Passively urbanized elders receive more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES.

Rationale: Family support from children can be crucial for elders' healthcare even after controlling for children's SES, and elders' SES, mental well-being, urbanization status, and other kinds of social support. Financial support from children may alleviate the elders' financial concern for chronic disease management. Instrumental support from children may help improve elders' treatment adherence. Thus, passively urbanized elders may manage their chronic conditions better due to increased family support.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Rationale: Since children's family support will mediate part of the positive effects of passive

urbanization, after controlling children's family support, the "total effects" of passive urbanization will be smaller than the total effects estimated in hypothesis 3.

CHAPTER FOUR: RESEARCH METHODOLOGY

In this chapter, I will discuss the research methodology of this study. I will describe the data source, analytic samples, measures, the study design, and the analytic approach.

4.1 Data source

I use the China Health and Retirement Longitudinal Study (CHARLS) for this study. CHARLS is a national representative survey sampling households with members aged 45 years or above in China. To facilitate cross-country comparisons, CHARLS was designed based on previous aging surveys such as the Health and Retirement Study (HRS), the English Longitudinal Study of Aging (ELSA), and the Survey of Health, Aging, and Retirement in Europe (SHARE). CHARLS is currently the most up-to-date public micro-database for scientific research on the middle-aged and elderly in China.

By the end of 2016, CHARLS had released data for the 2008 pilot, 2011 baseline national survey, 2012 pilot, 2013 wave 2 national survey, and 2014 wave 3 national survey (life history survey). In 2008, the pilot survey was implemented in two provinces: Gansu, a poor inland province, and Zhejiang, a rich coastal province. The pilot survey, covering 2,685 individuals living in 1,570 households, demonstrated that an HRS-type survey in China was feasible to complete. In 2011-2012, CHARLS conducted its national baseline survey, covering 450 villages/urban communities in 150 countries/districts across the country. In the national baseline survey, 17,708 individuals in 10,257 households were interviewed to reflect

the Chinese middle-aged and elderly population.

In this study, I use the national baseline data of CHARLS instead of the more recent follow-up data in 2013 due to the following concerns. First, the community survey was not included in the follow-up surveys by design, but I need community data to define my main analytic samples and my primary regressor (passive urbanization). Second, the 2013 national survey measured several key variables (e.g., informal care, financial transfers from non-resident children, and living arrangements of elders) in ways which were not consistent with the 2011 baseline survey. Specifically, I cannot construct one of the mediators (the informal care time provided by children) using the 2013 data set.

Sampling

The CHARLS national baseline survey was conducted in 28 provinces out of 31 provinces in mainland China. The CHARLS sample was representative of people aged 45 and over living in households, and institutionalized people were not included at baseline.

All samples were drawn in four stages: (1) county-level sampling, (2) neighborhood-level sampling, (3) household-level sampling, and (3) respondent-level sampling. At the first stage, county-level units (county or district) except for those in Tibet were randomly sampled after being stratified by region (East, Middle, and West), by urban district and rural county, and by GDP per capita. At the neighborhood level, administrative villages in rural areas and neighborhoods in urban areas were sampled as primary sampling units (PSUs). Probabilities proportional to size (PPS) was used to select 3 PSUs within each county or district. In each rural village or urban community, households were sampled from a frame which was constructed based on maps. Within each sampled household, a short

screening form was used to identify potential respondents. If a household had persons older than 40 who met the residence criterion of CHARLS, interviewers randomly selected one of them. If the chosen person was 45 or older, then he/she became the main respondent, and his or her spouse would also be interviewed.

Household survey and community survey

At baseline, CHARLS conducted both household and community surveys, to provide the context for behaviors at the household and individual levels. Data from individuals, households, and communities can be linked together.

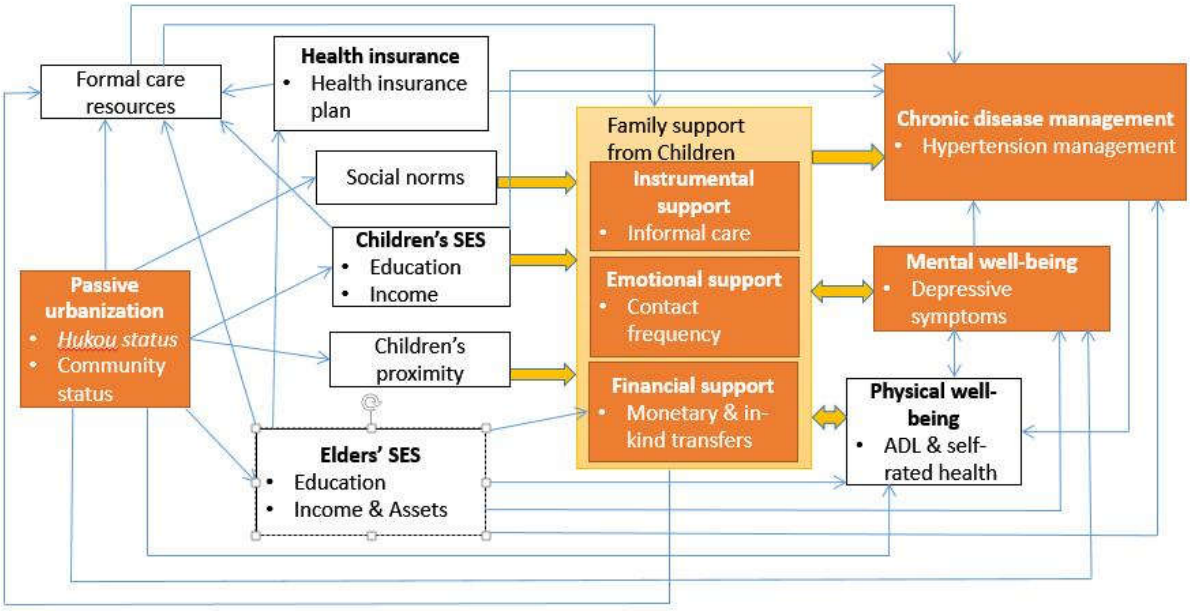
The CHARLS household survey is composed of eight sections: (1) household roster, (2) demographic background, (3) family, (4) health status and functioning, (5) healthcare and insurance, (6) work, retirement and pension, (7) income, expenditure and assets, and (8) house characteristics and interviewer observation.

In addition to the household survey, committees in all chosen rural villages and urban communities completed a community survey. The contents of the community survey include the following parts: (1) basic information about the community, (2) infrastructure and public facilities, (3) population and labor, (4) enterprises and wage, (5) migration, (6) health and insurance, (7) social policy, (8) community history, (9) epidemics and natural disaster, (10) production, income and price, and (11) interviewers' observations.

4.2 Study population and measures

Figure 2 represents how concepts in the conceptual model in Figure 1 are conceptualized in the measurement model. I will then discuss how these concepts will be operationalized in this study using the CHARLS data.

Figure 2 Measurement model



Note: The thin arrows represent the relationship between two concepts, and the thick arrows represent the relationship between one concept and all three kinds of family support. Concepts marked in bold were the concepts with empirical proxies (for instance, education and income are the empirical proxies of children's SES). Just as in Figure 1, some factors are not included in the figure for simplicity. Among these omitted factors, the number of female children, the number of male children, and other kinds of social support also have empirical proxies.

4.2.1 Study population and primary regressors

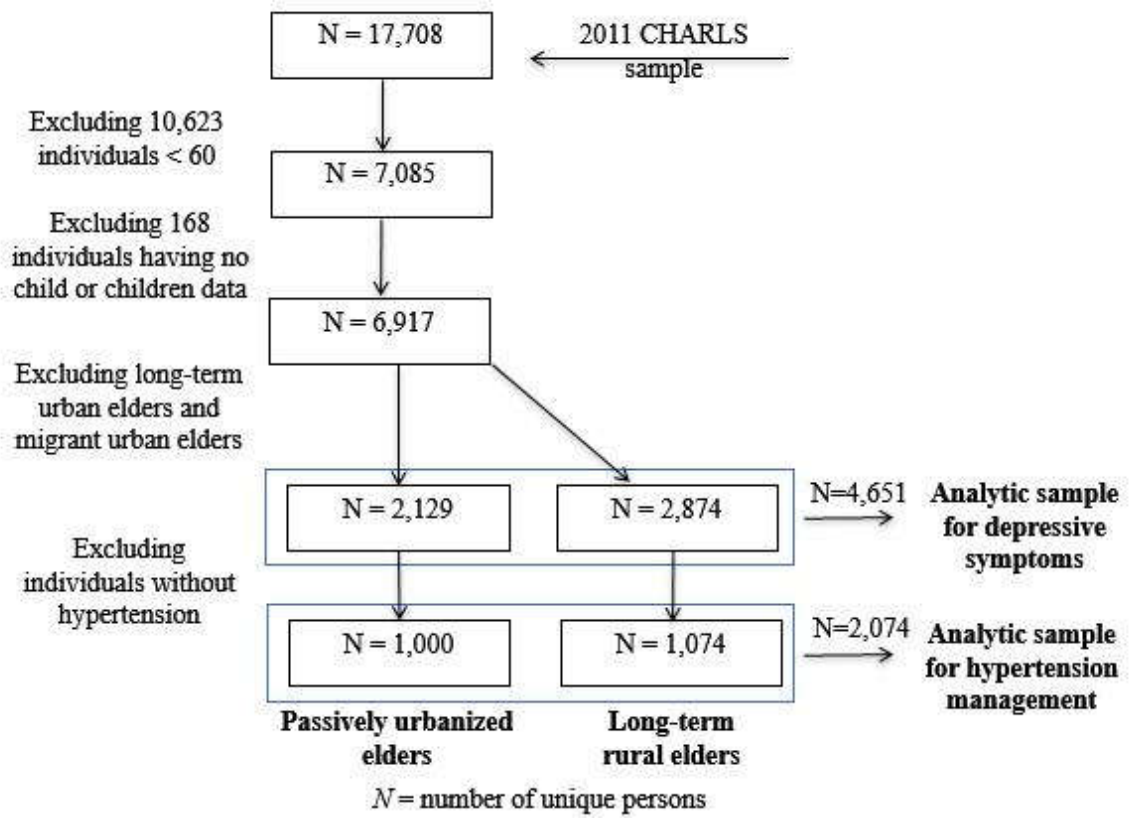
For this study, I focus on elders, defined as people aged 60 years or above in the 2011 baseline sample. In China, the National Bureau of Statistics, as well as other governmental agencies, counts people aged 60 years or above as the older population. Thus, I use 60 years, rather than 65 years, as the cut-off point for defining elders.

In addition, since I am primarily interested in the effects of family support by children, I exclude a small proportion (2.4% of elders over 60 years) of elders who did not have any child or children information.

Among all elderly parents in the sample, I compare passively urbanized elders with

long-term rural elders who did not migrate to urban areas and have not experienced passive urbanization. The independent variable which indicates these two groups is also the primary regressor in the analysis. Detailed definition of each group of elders is explained as below.

Figure 3 Sample of this study



Note: There are 17,714 unique individual IDs in the baseline dataset, although the CHARLS team reported having interviewed 17,708 individuals in their document and survey weights were only available for 17,708 individuals.

Passively urbanized elders

Among people aged 60 years or above, passively urbanized elders are those whose originally rural communities had undergone land expropriation and village consolidation since 2005. First, land expropriation and village consolidation were both measured in the community survey questionnaire of CHARLS. It was asked whether the community had experienced land expropriation since 2000 and village consolidation since 2005. As discussed

in Chapter Two, rural communities in China were often subject to passive urbanization in two main pathways: land expropriation directly caused by urban land expansion and village consolidation accelerated by a land policy called "increasing vs. decreasing balance." Second, for land expropriation, I only focus on what had happened since 2005 in originally rural communities. Land expropriation and housing demolition can also happen in urban communities in China. Since I primarily focus on the process of urbanization in China, I will not look at the effects of land expropriation in urban communities where residents have already been urbanized. Originally rural communities are defined by how the community was administered. In China, each rural village has a village committee office which was run by villager representatives, while each urban community has a community office which was run by resident representatives. Thus, at baseline, communities are categorized as an originally rural if they were managed by village committee offices, or community offices which had been changed from a village committee office before 2005, or both village committee and community offices. In addition, I had two considerations to set 2005 as the cut-off time point: I would like to explore the impacts of both village consolidation and land expropriation from the same time point, and people who have lived in an urbanized community for many years may have adapted to their new lifestyle.

In sensitivity analysis, passively urbanized elders are further categorized into subgroups based on the timing of passive urbanization or the location of communities. Based on the timing of passive urbanization, passively urbanized elders were grouped into elders who were passively urbanized in 2005-2008 and elders who were passively urbanized in 2009-2011. In order to detect potential short-term and long-term effects of passive

urbanization, I compare these two subgroups to long-term rural elders separately.

In addition, the analytic sample was also grouped into four subgroups depending on whether their communities had been "designated as the city planning area:" passively urbanized elders within the city planning area, passively urbanized elders outside the city planning area, long-term rural elders within the city planning area, and long-term rural elders outside the city planning area. In China, city planning areas cover urban areas, suburban areas, and other areas which should be controlled for future urban expansion. I use "city planning area" as a proxy indicator for suburban areas. This strategy is to address one potential concern for the study design: suburban areas might be more likely to have passive urbanization, and elders in suburban areas were more likely to have better health outcomes at the same time due to better economic opportunities and healthcare access, compared to relatively remote rural areas.

It is notable that this group of elders is defined mainly by community-level variables. The household survey of CHARLS did not ask whether the respondent had ever experienced housing demolition and land expropriation directly. Thus it is unknown what these passively urbanized elders had exactly experienced. However, measures of village consolidation and land expropriation at the community level are probably still valid to reflect individual experiences for a few reasons. First, both village consolidation and land expropriation are likely to happen to an entire village or community, due to logistic and administrative considerations. Second, even if only some of the villagers had experienced housing demolition and land expropriation, the dramatic changes in the community may impact all members of the community.

Long-term rural elders

Long-term rural elders should meet the following criteria: (1) the community where the respondent lived in was categorized as a rural area according to the National Bureau of Statistics; and (2) the respondent should hold an agricultural *hukou*. In addition, rural elders who have experienced village consolidation or land expropriation since 2005 are excluded.

4.2.2 Outcome variable

Mental well-being

I use a dichotomized version of the 10-item Center for Epidemiologic Studies Depression Scale (CES-D) which is available in CHARLS to measure elders' mental well-being. CES-D is one of the most common screening tests for identifying depressive symptoms in the general population. Studies have shown that the 10-item CES-D has comparable reliability and validity compared to the original 20-item scale (Andresen, Malmgren, Carter, & Patrick, 1994; Irwin, Artin, & Oxman, 1999). The translated CES-D has been found to have good reliability and validity among both rural and urban population in China (Han & Jia, 2012). Specifically, the 10-items CES-D used in CHARLS national baseline survey indicated adequate reliability and validity for the community-dwelling elders in China (Chen & Mui, 2014).

In CHARLS, the 10-item CES-D included the following questions: (1) I was bothered by things that don't usually bother me; (2) I had trouble keeping my mind on what I was doing; (3) I felt depressed; (4) I felt everything I did was an effort; (5) I felt hopeful about the future; (6) I felt fearful; (7) my sleep was restless; (8) I was happy; (9) I felt lonely; and (10) I could not get "going." The answers for CES-D were on a four-scale metric, from

"rarely or none of the time (<1 day)," to "some or little of the time (1-2 days)," to "occasionally or a moderate amount of the time (3-4 days)" to "most or all of the time (5-7 days)". These answers will be scored from 0 for rarely to 3 for most of the time for negative questions, and for positive questions, the scoring will be reversed (Radloff, 1977). If a respondent has a CES-D score equal to or higher than 10, he or she will be categorized as having high depressive symptoms.

Chronic disease management

As hypertension is the most prevalent chronic condition in China, I focus on the hypertension management using CHARLS data. Three variables were constructed based on both interview data and biomarker data to indicate: (1) whether a respondent knew his or her hypertension status; (2) whether the respondent's hypertension was treated; and (3) whether the respondent had managed his hypertension well.

In CHARLS baseline survey, each respondent's systolic and diastolic blood pressures were measured three times by a trained nurse using an HEM-7112 electronic monitor (Omron, Kyoto, Japan). The mean values for each respondent were calculated and recorded but only given to the respondent at the end of the interview. Respondents were asked if they had hypertension and whether they were taking hypertension medication, including both Chinese traditional medicine and modern Western medicine. Thus, a respondent is considered as having hypertension if he or she had a mean systolic blood pressure of ≥ 140 mmHg, or a mean diastolic blood pressure of ≥ 90 mmHg, and/or had self-reported current treatment for hypertension though his or her blood pressure might be under control (a mean systolic blood pressure of <140 mmHg and a mean diastolic blood

pressure of < 90 mmHg). Among people with hypertension, elders who self-reported to have previously been diagnosed with hypertension are considered to be aware of their hypertension. In addition, among people with hypertension, those who self-reported to be receiving any form of hypertension medications were considered to have been treated. Moreover, among people with hypertension, if a respondent had a mean systolic blood pressure of <140 mmHg and a mean diastolic blood pressure of < 90 mmHg, this respondent is considered to have controlled their hypertension well.

4.2.3 Covariates

Family support

In Chapter Three, I conceptualize children's family support for elders as a combination of three interrelated parts: emotional support, financial support and instrumental support. However, CHARLS did not have measures for children's emotional support. Thus, I use contact frequency with children as a proxy for children's emotional support, though it is not a perfect measure to assess the quality of intergenerational relationships. It is also notable that CHARLS only measured financial transfers from children who are not living with the respondent. There was no direct measure for the amount of financial transfers from co-resident children. However, the income of children who are living with the respondent will be included in the household income, which will be discussed later.

Children's financial support is a continuous variable calculated based on answers to this question: "how much of the following did you receive from this child in the past year?" For each child who did not live in the same household with parents, respondents needed to specify both the regular monetary or in-kind support (e.g., money or in-kind support every

month/quarter/half year/year, at fixed time) and non-regular monetary or in-kind support (e.g., money or in-kind support at Spring Festival or/and Mid-Autumn Festival or/and birthday or/and wedding or/and funeral or/and others). Respondents needed to specify the estimated monetary value of in-kind support. Thus, I calculate the total financial support received by each respondent by summing the amount of financial support from all of his or her non-resident children.

Children's instrumental support, or informal care, is a continuous variable calculated based on the answers to questions about elders' functional difficulties. Respondents were first asked about difficulties with their everyday activities. Then, for respondents who reported having difficulties with their everyday activities, they were asked: "who most often helps you with dressing, bathing, eating, getting out of bed, using the toilet, controlling urination and defecation, doing chores, preparing hot meals, shopping, managing money, making phone calls, taking medications?" For each helper chosen, the respondent needed to specify the number of helping days each month and the number of helping hours each day. Respondents reported no difficulty with everyday activities are assumed to receive no informal care. Thus, I measure children's instrumental help of each respondent by summing the total helping hours from all children of a respondent.

Contact frequency with children, the proxy for children's emotional support, is a binary variable created based on elders' living arrangements and the frequency of seeing a non-resident child. This binary variable is coded as 1 if a respondent lived with any children in the same household, or if a respondent saw at least one of his or her children daily.

Health insurance

Respondents' health insurance status is a binary variable measured by this question in the interview: "are you the policy holder/ primary beneficiary of any of the types of health insurance listed below?" Respondents can select more than one of the following answers: (1) Urban Employee-Basic Medical Insurance (UE-BMI), (2) Urban Residents Basic Medical Insurance (UR-BMI), (3) New Cooperative Medical Scheme (NCMS), (4) Urban and Rural Resident Medical Insurance, (5) government medical insurance, (6) Medical Aid, (7) private medical insurance purchased by respondent's union, (8) private medical insurance purchased by individual, (9) other medical insurance, and (10) no insurance. Respondents are categorized into two groups: persons covered by health insurance, and persons without health insurance coverage.

There are several rationales to create a binary variable indicating health insurance status. First, the majority of respondents in my analytic sample were covered by NCMS or UR-BMI. The sample size of respondents who were covered by other schemes of health insurance is small. According to the baseline report of CHARLS (National School of Development at Peking University, 2013), among respondents aged 60 and above: 3.9% were covered by government medical insurance; 16.3% of them were covered by UE-BMI; 6.3% were covered by UR-BMI; 65.9% were covered by NCMS; and only 2.2% were covered by private insurance and other insurance. In my analytic sample, the percentage of respondents who were covered by NCMS or UR-BMI was even higher than the total CHARLS sample, as respondents included in my analytic sample were mostly rural. Second, it might not be necessary to differentiate NCMS and UR-BMI, because both of them had limited benefits for outpatient services in 2011. Though health insurance benefits for outpatient services can be

important for hypertension management in China, UR-BMI just started to cover outpatient services nationwide in May, 2011, and NCMS only covered outpatient services in half of China at the end of 2010 (Ministry of Human Resources and Social Security of the People's Republic of China, 2011; Ministry of Health, 2010).

Physical well-being

Elders' physical well-being will be measured by self-reported health status, and the number of difficulties with activities of daily living (ADLs) and the number of difficulties with instrumental activities of daily living (IADLs).

For self-reported health status, each respondent in CHARLS was asked by two versions of questions: (1) "would you say your health is excellent, very good, good, fair, or poor;" or (2) "would you say your health is very good, good, fair, poor or very poor." Respondents were asked to rate their health status twice: once in the beginning of the health module and again at the end of the health module. Respondents were randomly assigned into two groups. The first group of respondents was asked the first version in the beginning and the second version at the end and vice versa for the second group of respondents. The second scale of self-reported health (very good, good, fair, poor or very poor) is used for this study. The second scale is chosen because according to the CHARLS data, Chinese elders, in general, hesitated to rate their general health as "excellent" (the Chinese translation of "excellent" in the questionnaire means "extremely good"), probably for cultural reasons.

In addition, elders' physical well-being is also measured by the number of difficulties with ADLs and the number of difficulties with IADLs. Respondents were asked whether they have difficulties in six ADLs (dressing, bathing, eating, getting into or out of

bed, toileting, controlling urination and defecation), and four IADLs (doing household chores, preparing hot meals, shopping and managing assets). If respondents reported that they needed help or could not fulfill an activity, they are considered as having difficulties with this ADL or IADL.

SES

Elders' SES is measured by their education, income, and assets. Elders' education was measured by a variable with three categories indicating elders' highest education level: no formal education, primary education, and more than primary education. Elders' income is measured by per capita household income. In CHARLS, respondents' income consists of the following parts: wage income and individual-based transfers, per capita household agricultural income, per capita household income from self-employed activities, and per capita household public transfer income. It is notable that elders' income calculated this way does not include private transfers from children who were not living with the respondent. A categorical variable is created to indicate the four quartiles of elders' per capita household income. The categorical variable is created for per capita household income has skewed distribution and negative values, and the impacts of income on the outcome may not be linear. Moreover, the assets of the respondent are calculated by per capita household assets, including one's residence, lands, and other assets. A categorical variable is also created to indicate the four quartiles of elders' per capita household assets.

At the same time, children's SES will be measured by children's education and income. For each respondent, his or her children's overall education level is measured by the number of children who had at least some college education; and his or her children's overall

income level is measured by the number of children whose household income exceeded 2000 yuan each year.

Other covariates

The measures of some other covariates are much more straightforward. These covariates include gender, marital status, residential region, age, and the number of male/female children. The respondent's marital status was a variable with three categories: being currently married and living with a spouse, being currently married but separated with the spouse temporarily, and being currently unmarried. Those who were divorced, widowed, and never married are categorized as being currently unmarried. The variable of the residential region had four categories: East China, Middle China, West China, and Northeast China. [1] This variable is included because different regions across China were likely to have different levels of urbanization, economic development, and social norms. Each respondent's age is measured as their age at the time when he or she was interviewed by CHALRS. As a large proportion of respondents reported their birth date in Chinese traditional calendar, I transform birth dates reported in Chinese traditional calendar to birth dates in the Gregorian calendar and then calculate the age at the time of interview. Lastly, the number of male/female children is calculated based on the number of male/female children living with respondents and the number of male/female children who were not living with respondents.

[1] The east region includes ten provinces and municipalities: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangxi, and Hainan. The middle region includes six provinces: Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan. The west region includes twelve provinces, municipalities, and autonomous regions: Neimenggu, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang. The northeast region includes three provinces: Liaoning, Jilin, and Heilongjiang. These regions were defined to reflect regional differences in social and economic development levels (National Bureau of Statistics of China, 2011).

All categorical variables were transformed into a series of dichotomous indicators with an omitted reference category.

4.3 Study design

By using the CHARLS national baseline data set, this study will be a cross-sectional study to compare passively urbanized elders to long-term rural elders, regarding their mental well-being and chronic disease management.

Cross-sectional studies are often faced with many challenges to draw a valid causal inference. However, by utilizing China's passive urbanization as a natural experiment, this study can address some of the crucial challenges for the cross-sectional study design. In a natural experiment, the claim that treatment assignment is as good as random needs to be justified. According to Dunning (2012), "the claim that treatment assignment is as good as random is likely violated if units self-select into treatment conditions." Study units are likely to self-select into treatment conditions, if they have relevant information about their treatment conditions, and have incentives and capacities to self-select into certain treatment conditions. This study is assessed according to these three criteria as below:

Information

In almost all cases of land requisition and most cases of village reconstruction, villagers will know about land requisition/ village reconstruction only after the government has announced to expropriate land from this village. However, in some cases of village reconstruction, villagers may self-select to reconstruct their villages. According to a survey covering 90 new communities in 2014, only 15.7% of new communities were built because of the requests of villagers (Ye et al., 2015).

Policy makers at the city level or provincial level usually know which village will undergo land requisition and village reconstruction. However, the decision-making process is also largely unknown to the public, and the reconstruction process is often not controlled by the central government. For instance, in 2011, the central government found out that Hebei province planned to reconstruct 7500 villages to create over 500 thousand construction land quotas, though they were only approved to create 12 thousand construction land quotas through village reconstruction (Tan, 2014). In theory, land requisition often happens in villages which are suitable for building factories, infrastructures, and other constructions, and village reconstruction often happens in villages where the area of construction land per capita is relatively large. In fact, local governments were often criticized as they "randomly" urbanize villages.

Incentives

Rural residents may have incentives and capacities to self-select to move into an urban style community when only parts of a village were reconstructed. Villagers who moved into an urban style community may be better prepared to life style changes than others. But in this study, passive urbanization is viewed as a community-level movement. I am estimating the average effects of passive urbanization across all communities. Thus the within-community self-selection will not affect the results.

Policy-makers may also have incentives to reconstruct villages which are suitable for urbanization. However, many local governments did not know what type of villages were suitable for urbanization in the beginning, since village reconstruction was a relatively new movement (Ye, 2015). In addition, in some regions, the village reconstruction was a universal

movement, rather a selective experiment. For instance, in the city of Dezhou, Shandong province, the government consolidated 60% of rural villages in only two years: 4980 rural villages had disappeared, and 3330 new communities were built by 2010. It was unlikely that the government selected these 4980 villages because they were all suitable for urbanization (Xu, 2010). In 2014, Shandong province announced that they planned to urbanize 21 thousand villages and about 30 million rural residents (about 30% of current rural residents) by 2030 (National Business Daily, 2014). In 2013, Shaanxi province planned to relocate over 25% of all its rural population to urban style new communities in only three to five years. Many other provinces are making similar urbanization plans (Ye et al., 2015). I will argue that the government was unlikely to know whether 25% or 30% of rural residents and their communities were ready for urbanization. In addition, to account for such bias mentioned above (villages which were better off were more likely to be urbanized), I include two variables indicating region and city planning area in my analysis.

Capacities

In the case of the land requisition, villagers, in general, were not able to self-select into treatment or control group. After the land requisition plan was announced, no one can migrate into the village as a registered resident. Villagers were also unlikely to migrate to other places, as they would not receive any compensation if they were no longer registered local residents.

In the case of village reconstruction, a small proportion of villagers may have the capacity to self-select into urban style communities. As farmers were not allowed to sell their land to developers for profits, only very rich villages may build the urban style communities

collectively without government investments. These villagers may have worked in the secondary or tertiary sector for a long time, or even have owned their factories, as in some coastal rural areas.

In summary, the two types of passive urbanization, land requisition, and village reconstruction, are both largely an exogenous process. In the process of land requisition, villages could not self-select into or out of the treatment, because of the lack of information and capacities. In the process of village reconstruction, rural residents and the policy-makers may select villages which were suitable for urbanization into treatment. If so, the effect of passive urbanization will be biased towards the positive direction. However, the proportion of self-selection was likely to be low (about 15% according to a previous study).

4.4 Analytic approach

The data are managed and analyzed using Stata 14.2. The data analysis involves three parts: multiple imputations, total effects estimation, and mediation analysis. Stratified analysis and sensitivity analysis will also be discussed in the end of this section.

4.4.1 Multiple Imputations

In both analytic samples, 38.2% were also missing data on at least one of the above measures. Notably, Table 2 shows the percent missing among the full sample (N=17,708). The full sample, instead of the analytic samples, is used in order to conduct multiple imputations with survey weights adjustments. Imputation of missing data was performed with chained equations in STATA using the mi impute chained command, resulting in 20 copies of imputed data. Multiple linear regression was used to impute continuous variables; logistic

regression was used to impute dichotomous variables; and multinomial logistic regression or ordered logistic regression was used to impute categorical variables (see Table 2).

4.4.2 Identification and estimation of the total effects

For the outcome of depressive symptoms greater than ten, I use logistic regression to estimate the effects of passive urbanization on having severe depressive symptoms. For the outcome of hypertension management, I use logistic regression to estimate the effects of passive urbanization on hypertension awareness, hypertension treatment, and hypertension control among the conditional sample of elderly with hypertension. For all estimations in this dissertation, average marginal effects (percentage point change) are reported[2].

Some argued that if the outcome is common, the logistic regression should not be used because the odds ratio does not approximate the risk ratio (Rothman, Greenland, & Lash, 2008). In this study, instead of the odds ratios, the model-adjusted risk differences are estimated and reported, based on published and well-accepted procedures for computing predictive margins for logistic models. The use of the logistic regression model avoids the problems of non-convergence of the log-binomial models, regardless of the type of covariates (Bieler, Brown, Williams, & Brogan, 2010)[3].

In these models, gender, age, marital status, and region are adjusted. Individual-level survey weights with household and individual non-response adjustment are used to account for complex survey design and clustering within each village/neighborhood. Gender, age, and

[2] The marginal effects and their confidence intervals are generated by "margins, dydx()" in Stata.

[3] When I used the log-binomial models (Generalized Linear Models with log link and binomial family) in this study, convergence cannot be achieved.

marital status are adjusted to improve the efficiency of models, as they can possibly influence the outcomes mentioned above, but cannot influence or be influenced by passive urbanization. The models also adjust for the region because different regions across China are likely to have different levels of economic development and social norms, which can be associated with both passive urbanization and elders' depressive symptoms. Since this study focuses on the total effects of passive urbanization, those potential consequences of passive urbanization that lie on the causal pathway are not controlled in the main analysis (e.g. elders' per capita household income/assets, elders' self-reported health status, etc.). Controlling for these potential mediating factors can bias the total effects estimation.

4.4.3 Identification and estimation of the mediated effects

I use mediation analysis to answer the other three research questions about the effects of passive urbanization mediated by children's family support. Researchers in a variety of social sciences, especially psychology, and epidemiology in more recent years, use mediation analysis to understand the mechanism of interest through which the predictor affects the outcome. The study of mediation can be traced back to the path analysis method developed by the geneticist Sewall Wright (1934). Currently, path analysis has become a special case of structural equation modeling (SEM). Most mediation analyses in psychological studies have been conducted using the SEM approach which estimates direct and indirect effects by modeling covariance and correlation matrices (Baron & Kenny, 1986; MacKinnon, 2008). In recent years, a causal inference approach of mediation analysis has been emphasized in the fields like epidemiology, due to the limitations of the traditional SEM approach (Pearl, 2001; Robins & Greenland, 1992). In this section, I will briefly review the

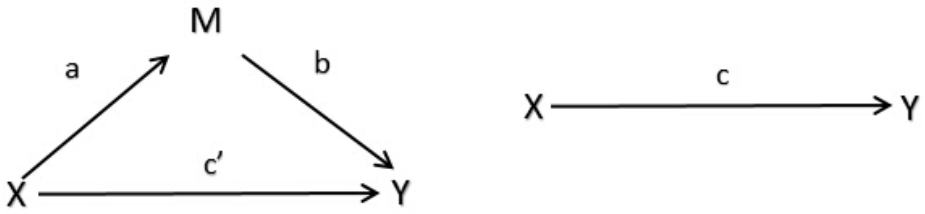
basic concepts, approaches, assumptions and limitations of each approach, and explain why I prefer to adopt the causal inference approach and how I will estimate the path-specific effects.

4.4.3.1 SEM approach to mediation analysis

The four steps to establish mediation

The SEM approach of mediation analysis in the field of psychology has been highly influenced by the work of Baron and Kenny (1986). In this approach of mediation analysis, there are four steps to establish mediation (Baron & Kenny, 1986; Judd & Kenny, 1981; James & Brett, 1984). Let "X" denote the independent variable of interest, "Y" the outcome of interest, "M" the mediator of interest, "a" the estimation of the effect of X on M, "b" the estimation of the effect of M on Y, "c" the estimation of total effect of X on Y, and "c'" the estimation of the direct effect of X on Y. The four steps are: (1) show that X is correlated with Y; (2) show that X is correlated with M (estimate and test path a in Figure 4); (3) show that M affects Y after controlling for X (estimate and test path b in Figure 4); (4) to establish that M completely mediates the X-Y relationship, the effect of X on Y controlling for M (path c') should be zero (the effects in both Steps three and four are estimated in the same equation).

Figure 4 The direct and indirect effects conceptualized by Baron and Kenny (1986)



These four steps are sufficient but not necessary to establish mediation. Step two and

three are considered as sufficient and necessary steps. Step four does not have to be met unless for testing complete mediation. Step one is also not required, due to the possibility of inconsistent mediation when c' is opposite in sign to ab (the product of a and b).

The decomposition of effects

In mediation analysis, the total effect can be decomposed into the direct effect and the indirect effect (c = c' + ab). The equation of "c = c' + ab" holds when the following assumptions are met: (1) ordinary least squares (OLS) regression is used for estimation; (2) the same set of observations is used in all the analyses, (3) and the same set of covariates is included in all the equations.

The indirect effect, which is often the estimation of interest, is often computed directly as the product of a and b. However, to test whether ab is equal to zero needs more considerations, as a and b can be correlated. The standard error of ab can often be generated by the Sobel Text, Bootstrapping and Monte Carlo method (MacKinnon, Lockwood, & Williams, 2004; Shrout & Bolger, 2002; Sobel, 1982)

Assumptions and challenges for this study

There are two sets of assumptions to identify the mediational model. First, mediation analysis shares all of the standard assumptions of the OLS model to achieve unbiased and efficient estimates (i.e., linearity; random sampling; no perfect collinearity; conditional expectation of errors is zero; errors have uniform variance and are uncorrelated). In addition, since mediation analysis will be based on a conceptual mediation model, some more assumptions about the conceptual model and the measurement model also need to be made to achieve an unbiased mediation model: (1) there should be no reverse causality in the

mediation model, even only between the mediator and the outcome variable; (2) there should be no omitted variables; (3) there should not be measurement error.

Challenges in conducting mediation analysis here include: (1) the CHARLS data were generated with complex survey design and respondents were clustered within each community/village; and (2) there are mediating confounders in my model (e.g. elders' income might confound the relationships between children's financial support and elders' depressive symptoms, and elders' income itself can be the consequence of passive urbanization). Thus, the four-step traditional approach of mediation analysis does not apply to my study (Baron & Kenny, 1986; Judd & Kenny, 1981; James & Brett, 1984). Structural Equation Modeling (SEM) with multilevel data and a binary outcome is a potential choice, but SEM makes assumptions about linearity and normality for all variables in the model (Vanderweele, 2016). In addition, SEM requires that there be no confounding in the relations between all variables, and such an assumption might be too strong in my case.

4.4.3.2 Causal mediation analysis

In this study, I conduct causal mediation analysis by using the causal inference school's definition of direct and indirect effects, checking my models with identification assumptions, and using G-estimation to estimate the mediated effects.

The decomposition of effects

The causal inference approach to mediation has different ways to conceptualize and decompose the total effects. Let "X_i" denote the independent variable of interest, "Y_i" the outcome of interest, and "M_i" the mediator of interest. Suppose X_i is a binary variable as in

this study (e.g., passive urbanization): X_i=1 denotes that a village was passively urbanized; X_i=0 denotes a counterfactual situation where THIS village was not passively urbanized. Just for simplicity, suppose Mi is also a binary variable (e.g., seeing children daily). Let Y_{1i} and M_{1i} respectively denote the counterfactual values of the outcome variable and mediator that would have been observed had X_i been set to 1 instead of 0. For instance, if a village was passively urbanized, Y_{1i} would be the depressive status of a villager in that village, and M_{1i} would be his or her contact frequency between children after passive urbanization. A counterfactual situation would be Y_{0i} (the depressive status of a villager in that village) and M_{0i} (his or her contact frequency between children) if THIS village was not urbanized passively. Then, the total effect (TE) of X on the outcome Y is defined as Y_{1i} - Y_{0i}; the total effect of X on the mediator M is defined as M_{1i} - M_{0i}. At the individual level, the counterfactual outcomes will never be observed, as a village was either passively urbanized or not. However, under some circumstances, we can observe the average effects at population level. There are several approaches to decomposing the total effect in the causal mediation school (Pearl, 2001; Robins & Greenland, 1992; Valeri & VanderWeele, 2013):

First, the total effect can be decomposed into the controlled direct effect (CDE) and the effect eliminated by fixing the mediator to a specific level (TE - CDE). The “portion eliminated (PE = [TE − CDE]/TE)” is also used to indicate the significant of a mediator (Vanderweele, 2014). Let Y_{xmi} denotes potential outcome value had X_i and M_i been set to x and m respectively. Let Y_{x*m*i} denotes potential outcome value had X_i and M_i been set, also possibly counter to fact, to x* and m* respectively. Then, CDE compares exposure level x to x* while fixing the mediator to a specific level and is defined as Y_{xm*i} - Y_{x*m*i} at the

individual level. Second, under additional assumptions, the total effect can also be decomposed into the pure (natural) direct effect (PDE) and the total natural indirect effect (TIE). By definition, the TIE captures the effect of the independent variable of interest on the outcome that operates by changing the mediator. Let Y_{xMx^*i} denote the outcome Y_i that would have occurred if X_i were fixed to x, and if M_i were fixed to the level, it would have had if X_i had been x*. Then, the PDE is defined as $Y_{xMx^*i} - Y_{x^*Mx^*i}$, and TIE is defined as $Y_{xMxi} - Y_{xMx^*i}$ at the individual level.

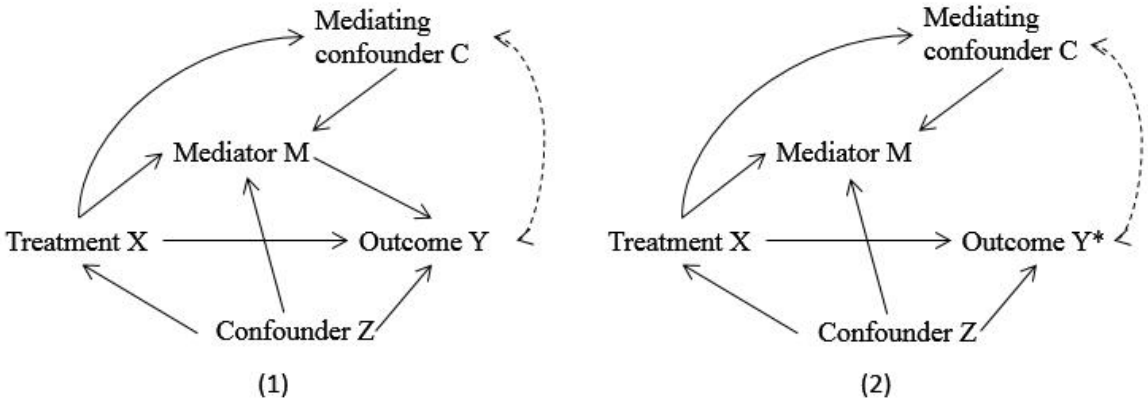
To identify the decomposed effects mentioned above, four identification assumptions need to be met: (1) the effect of X_i on the outcome Y_i is not confounded conditional on a set of covariates (confounders); (2) the effect of the mediator M_i on Y_i is not confounded conditional on X_i and a set of covariates (confounders); (3) the effect of X_i on M_i is not confounded conditional on a set of covariates (confounders); and (4) none of the confounders between M_i and Y_i are affected by X_i. The first three assumptions are required to identify CDE, while the last is required for identifying natural effects (PDE & TIE). In this study, as there are mediating confounders (i.e. identification assumption (4) is not met), I only decompose the total effect into CDE and PE.

G-estimation has been proposed to estimate CDE when mediating confounders are present, and a detailed proof of the process can be found elsewhere (Robins, 1994; Goetgeluk, Vansteelandt and Goetghebeur, 2008; Vansteelandt, 2009). In Figure 5, $\mathbf{C}_i$ denotes a set of mediating confounders (e.g., elders' income, physical health), and $\mathbf{Z}_i$ denotes a set of confounders which are not affected by X_i (e.g., gender, age, marital status). The goal of this method is to remove the indirect effect from the mediator M_i to the outcome Y_i (see Figure

5-(1)). When this indirect effect is removed from the total effects from the treatment X_i to Y_i, the effects X_i on Y_i* will be the controlled direct effect (see Figure 5-(2)). The average effect of M_i on Y_i is estimated by regression Y_i on X_i, $\mathbf{C}_i$, $\mathbf{Z}_i$,and M_i. In this model, all confounders between M_i and Y_i (X_i, $\mathbf{Z}_i$, and $\mathbf{C}_i$) have been controlled. Thus the coefficient of M (γ) is estimated without bias (see equation (1)).

$$E(Y_i| X_i, \mathbf{C}_i, \mathbf{Z}_i, M_i) = \delta_1 + \delta_2 X_i + \delta_3 \mathbf{C}_i + \delta_4 \mathbf{Z}_i + \gamma M_i \quad (1)$$

Figure 5 G-estimation



The next step is to generate Y_i* by subtracting γM_i from Y_i directly (see equation (2)). Then, when regressing Y_i* on X_i controlling for $\mathbf{Z}_i$, the coefficient of X_i will be the controlled direct effect after fixing the value of M_i (see equation (3)).

$$Y_i^* = Y_i - \gamma M_i \quad (2)$$

$$E(Y_i^*|X_i, \mathbf{Z}_i) = \beta_1 + \beta_2 X_i + \beta_3 \mathbf{Z}_i \quad (3)$$

In this study, all outcomes are binary. I use linear probability models to implement equation (1) and equation (3) above because sequential g-estimation is valid for risk difference point estimates (Acharya, Blackwell, & Sen, 2016). Standard errors are generated

by performing the estimation above in each bootstrap replication (Acharya, Blackwell, & Sen, 2016)[4].

For instance, the CDEs for the outcome of having severe depressive symptoms are estimated as described below. In the first linear probability model to implement equation (1), I control for children's family support and other variables which may confound the relationship between children's family support and elders' depressive symptoms. Specifically, the following covariates are included in the model: children's financial support, children's informal care hours, children's daily contact with parents, elders' education, per capita household income/wealth, self-rated health status, and the number of difficulties with ADLs/ADLs, in addition to all covariates included when estimating the total effects. Individual-level survey weights with household and individual non-response adjustment are also used as in the first part. Children's financial support is rescaled by dividing by 100, and children's informal care time is rescaled by dividing by 10, to make the regression coefficients more readable. Then I generate a set of new outcome variables by subtracting the products of the coefficient of mediators and the original values of mediators from the original outcome values. Specifically, I generate four new outcomes, by: subtracting the product of the coefficient of children's financial support and the original values of children's financial support, subtracting the product of the coefficient of children's informal care hours and the original values of children's informal care hours, subtracting the product of the coefficient of

[4] Stata cannot directly handle multiple imputations together. Thus, standard errors here are generated in a three-step process: (1) generate bootstrap samples from the original data with missing values; (2) impute missing values in each bootstrap sample; (3) run mi analyses (i.e., g-estimation procedures discussed above) in each of the bootstrap samples. It is notable that standard errors here (e.g., results in Table 8) are produced in ways different from other models and using different imputed samples (e.g., results in Table 6 and 7). Sampling errors might result in some inconsistencies when comparing controlled direct effects to total effects.

children's daily contact with parents and the original values of the variable indicating children's daily contact with parents, and subtracting all three products mentioned above. By using the original values of mediators, the CDEs are estimated while fixing all family support to the value of 0. Finally, I regress the new continuous outcome variables on passive urbanization and other covariates when estimating the total effects, using OLS regression with survey weights adjustments. Similar analysis is done for the outcomes of hypertension awareness, hypertension treatment, and hypertension control.

4.4.4 Stratified Analysis and Sensitivity Analysis

The main analyses of this study include the total effects estimation and mediation analysis for the analytic sample of depressive symptoms and hypertension management. The exact covariates controlled in each regression model are presented in Table 3. In each column of Table 3, "O" indicates the outcome variable and "X" indicates independent variables. "(+)" represents that according to the research hypothesis, this independent variable has a positive association with the outcome variable. "*" indicates that controlled direct effects, instead of regression coefficients of passive urbanization, are used for testing hypotheses 2c and 4c.

In the main analysis mentioned above, the sample is stratified by elders' living arrangements, since only financial support from non-resident children was measured in CHARLS and caregiving behaviors might vary across different living arrangements. Elders are then categorized into two groups: those living with at least one child in the same household, and those living without children.

In the sensitivity analyses, the total effects estimation and mediation analysis for the

analytic sample of depressive symptoms and hypertension management are further stratified by elders' gender, marital status, and physical well-being. Stratified analysis is included for detecting the moderating effects of these stratifying variables. When stratifying all analysis by marital status, elders are then categorized into two groups: those who were married (including those who temporarily separated with spouse), and those who were not currently married. When stratifying all analyses by physical well-being, elders are categorized into two groups: those who did not rate their health as poor or very poor, and those who rated their health as poor or very poor.

In addition, considering the potential effects of timing in passive urbanization, I further divide passively urbanized elders into two groups and redo all the analysis: those who were passively urbanized in 2005-2008, and those who were passively urbanized in 2009-2011.

Finally, after considering the potential influence of the city planning area, I further divide my analytic sample into four groups and redo all the analysis for each subgroup: passively urbanized elders within the city planning area, passively urbanized elders outside the city planning area, long-term rural elders within the city planning area, and long-term rural elders outside the city planning area. For passive urbanized communities within the city planning area, most of them were designated as the city planning area before they were passively urbanized, though some were designated after being passively urbanized. However, the city planning area could also be used as a proxy to indicate suburban areas. Communities within the city planning area might be more likely to be passively urbanized, and elders in those suburban areas might have better mental well-being even before passive urbanization.

In addition, passive urbanization might also have distinct effects within and outside the city planning area. Thus, by dividing my analytic sample into four groups, I account for the potential confounding effects as well as the effect modification effects (moderation) of the city planning area.

CHAPTER FIVE: RESULTS

5.1 Descriptive analysis

The two major outcomes, depressive symptoms and hypertension management, have different analytic samples. For depressive symptoms, the sample size is 4651, including 1973 passively-urbanized elders and 2678 long-term rural elders; and for hypertension awareness, hypertension treatment, and hypertension control, the sample size is 2074, including 1000 passively urbanized elders and 1074 long-term rural elders. The sample size for hypertension management outcomes is smaller than for depressive symptoms because only people with hypertension are included in the analytic sample for hypertension management. After survey weight adjustment using the individual weight with household and individual non-response adjustment in CHARLS data, descriptive statistics for outcomes, mediators, and covariates were presented in Table 4 and Table 5 respectively.

As shown in Table 4, in the total analytic sample for depressive symptoms (N=4651), 45.2% of them had a CES-D score over 10. Respondents were half women (50.1%), mostly married and lived with spouse (77.6%), and on average 69.5 years old. Most respondents had very limited education: 45.5% of respondents reported no formal education; another 44.6% had primary school level education; and only 9.9% had more than primary school level

education. Among respondents, mean per capita annual household income was 4692 yuan (approximately 683 US Dollar in 2017), and mean per capita household assets was 55980 yuan (approximately 8147 US Dollar in 2017). Regarding self-reported health status, 7.3% of them rated their health as very poor, and 31.0% of them rated their health as poor. Among respondents, the mean number of difficulties with ADLs (among all six ADLs) was 0.25, and the mean number of difficulties with IADLs (among all four IADLs) was 0.58. On average, respondents had 1.67 female children and 1.91 male children, and 73.3% of respondents saw at least one of their children daily. In addition, elders received 2426-yuan (approximately 353 US Dollar in 2017) financial transfer per year from non-resident children and 8.7-hour informal care per month from all children.

Also as shown in Table 4, when comparing passively urbanized elders (N=1973) to long-term rural elders (N=2678) in the analytic sample for depressive symptoms (N=4651), passively urbanized elders were less likely to have a CES-D score over 10 than long-term rural elders (41.9% vs. 47.8%, $p<0.05$). Long-term rural elders and passively urbanized elders were similar in terms of demographic characteristics (age, marital status, gender, and region). Both groups had relatively low level of education. However, passively urbanized elders on average had fewer female children (1.6 vs. 1.7, $p<0.05$) than long-term rural elders. At the same time, passively urbanized elders had higher per capita annual household income (5789 yuan vs. 3637 yuan, $p<0.001$) and received more financial support from non-resident children per year (3210 yuan vs. 1757 yuan, $p<0.05$), compared to long-term rural elders. Passively urbanized elders were also more likely to report having very good health (5.4% vs. 3.3%, $p<0.05$), more likely to report having good health (14.7% vs. 11.7%, $p<0.05$), and less likely

to report having poor health (28.1% vs. 33.6%, p<0.01), compared to long-term rural elders.

As shown in Table 5 in the total analytic sample for hypertension management (N=2074), more than half of all respondents with hypertension (54.0%) were aware of their hypertensive condition; less than half of them (45.6%) had treated hypertension; but only 13.9% of all hypertensive respondents controlled their blood pressure under 140/90 mmHg. More than half (54.8%) of respondents with hypertension were women. They were on average 70.3 years old, mostly married and living with a spouse (64.5%). Most respondents with hypertension had very limited education: 46.7% of respondents reported no formal education; another 44.0% had primary school level education; and only 9.3% had more than primary school level education. Among respondents, mean per capita annual household income was 4563 yuan (approximately 664 US Dollar in 2017), and mean per capita household assets was 48799 yuan (approximately 7102 US Dollar in 2017). On average, respondents had 1.74 female children and 1.96 male children, receiving 2610-yuan (approximately 380 US Dollar in 2017) financial transfer per year and 7.3-hour informal care per month from children. Regardless of low SES, only 5.5% of respondents did not have any health insurance.

Also as shown in Table 5, when comparing passively urbanized elders (N=1000) to long-term rural elders (N=1074) in the analytic sample for depressive symptoms (N=2074), compared to long-term rural elders, passive urbanized elders were more likely to be aware of their hypertensive condition (57.1% vs. 51.1%, p>0.05), to treat hypertension (49.0% vs. 42.4%, p>0.05), and to control their blood pressure under 140/90 mmHg (15.5% vs. 12.4%, p>0.05), though the differences were not statistically significant.

5.2 Main analysis

5.2.1 Depressive symptoms

The total effect of passive urbanization on elders' depressive symptoms is shown in Table 6. Passive urbanization was associated with a lower risk (marginal effect: -0.05, $p<0.05$) of having high depressive symptoms (having a CES-D score over 10), controlling for gender, age, marital status, and region. In this model, being female was associated with a higher risk (marginal effect: +0.14, $p<0.001$) of having severe depressive symptoms; having no spouse was associated with a higher risk (marginal effect: +0.06, $p<0.05$) of having severe depressive symptoms, compared to living with a spouse; and compared to living in East China, living in Middle China (marginal effect: +0.11, $p<0.001$), Northeast China (marginal effect: +0.11, $p<0.05$), and West China (marginal effect: +0.15, $p<0.001$) was associated with higher risk of having severe depressive symptoms, respectively.

As shown in Table 6, after controlling for mediators and other covariates – children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' physical well-being (number of difficult IADLs/ADLs, and self-reported health), the effects of being passively urbanized went away (marginal effect: +0.002, $p>0.05$). In this model, seeing one's children daily was associated with lower risk (marginal effect: -0.05, $p<0.01$) of having severe depressive symptoms compared to not seeing one's children daily. Female elders had a higher risk (marginal effect: +0.10, $p<0.001$) of having severe depressive symptoms than male elders. Compared to elders living with spouse, having no spouse was associated with a higher risk (marginal effect: +0.07, $p<0.01$) of having severe depressive symptoms. Being

one year older was associated with a lower risk (marginal effect: -0.004, $p<0.01$) of having severe depressive symptoms. Compared to elders in East China, elders in West China had a higher risk (marginal effect: +0.08, $p<0.01$) of having severe depressive symptoms respectively. Having one additional difficulty with an IADL was associated with higher risk (marginal effect: +0.06, $p<0.001$) of having severe depressive symptoms. Compared to elders with very good health, elders with fair health (marginal effect: +0.22, $p<0.001$), poor health (marginal effect: +0.41, $p<0.001$), and very poor health (marginal effect: +0.54, $p<0.001$) were more likely to have severe depressive symptoms, respectively. In addition, compared to elders with per capita household income in the highest quartile, those in the lowest quartile were more likely (marginal effect: +0.07, $p<0.05$) to have severe depressive symptoms. Compared to elders with per capita household wealth in the highest quartile, those in the lowest quartile (marginal effect: +0.10, $p<0.01$) and in the second lowest quartile (marginal effect: +0.14, $p<0.001$) were more likely to have severe depressive symptoms.

The effects of passive urbanization on children's financial support, informal care time, and the frequency of seeing one's children are shown in Table 7. Compared to long-term rural elders, passively urbanized elders received additional 1449 yuan (approximately 211 US dollar in 2017) ($p<0.05$) from children, controlling for elders' gender, marital status, age, region, and the number of female and male children. In this model, compared to elders in East China, elders in Northeast China and West China received 2339 ($p<0.05$) and 2600 ($p<0.05$) less financial support from children each year; and having one additional male child was associated with receiving 964-yuan ($p<0.05$) additional financial transfer from children.

For informal care time, after controlling for gender, marital status, age, region, and the number of female and male children, passive urbanization was associated with approximately one hour ($p>0.05$) less informal care from children on average, which was not statistically significant. In this model, compared to elders living with spouse, elders without spouse received 13.8 more hours ($p<0.001$) of informal care from children; being one year older was associated with 1.2-hour ($p<0.001$) more informal care from children; compared to elders in East China, elders in Middle China and West China received 8.1-hour ($p<0.01$) and 7.5-hour ($p<0.01$) more informal care from children respectively; and having one additional male child was associated with receiving 2.8 fewer hours ($p<0.05$) of informal care.

For daily contact with children, passive urbanization was not associated with a significantly higher probability of seeing one's children daily, after controlling for elders' gender, marital status, age, region, and the number of female and male children. In this model, compared to elders living with spouse, elders without spouse were more likely to see their children daily (marginal effects: +0.09, $p<0.001$); being 1-year older was associated with a higher probability (marginal effect: +0.004, $p<0.01$) of seeing one's children daily; and having additional one male child was associated with a higher probability (marginal effect: +0.04, $p<0.001$) of seeing one's children daily.

The controlled direct effects of children's financial support, informal care, and contact frequency are shown in Table 8. After fixing children's financial support at 0 yuan, passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.05, $p<0.01$) through pathways other than altering children's financial support. After fixing children's informal care at 0 hours, passive urbanization decreased the

probability of having severe depressive symptoms (marginal effect: -0.05, p<0.01) through pathways other than altering children's informal care. After fixing contact frequency with children at "not seeing children daily," passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.05, p<0.01) through pathways other than altering children' contact frequency. Also, after fixing children's financial support at zero yuan, fixing children's informal care at zero hours, and fixing contact frequency with children at "not seeing children daily" altogether, passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.05, p<0.01) through pathways other than altering children' family support.

The analysis described above is further stratified by elders' living arrangements, as elders co-residing with children may have distinct patterns of intergenerational support and CHARLS only measured financial support provided by non-resident children. Among elders who lived with children (N=2035) in the analytic sample for depressive symptoms, passively urbanized elders were less likely (marginal effect: -0.10, p<0.01) to have severe depressive symptoms (see Table 9). However, among elders who did not live with children (N=2616), passively urbanized elders were not significantly less likely to have severe depressive symptoms (marginal effects: +0.007, p>0.05) (see Table 9). Also as shown in Table 9, after controlling for mediators and other covariates – children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), and elders' physical well-being (number of difficult IADLs/ADLs, and self-reported health) – the effects of being passively urbanized went away in both subgroups of passively urbanized elders. Among elders who did not live with any

child, an additional 100-yuan in financial support from non-resident children each year was associated with a lower risk (marginal effect: -0.0005, $p<0.001$) of having severe depressive symptoms; and elders having daily contact with children were less likely (marginal effect: -0.05, $p<0.05$) to have severe depressive symptoms than elders having no daily contact with children (see Table 9). In addition, among elders living with children (N=2035), passively urbanized elders received 1101 yuan ($p<0.05$) more in financial support from non-resident children, while passively urbanized elders among elders who did not live with children did not receive significantly more financial support from non-resident children (see Table 10). In addition, the controlled direct effects of children's family support were only statistically significant among elders living with children. Among elders living with children, after fixing children's financial support at 0 yuan, passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.11, $p<0.001$) through pathways other than altering children's financial support. After fixing children's informal care at 0 hours, passive urbanization decreased in the probability of having severe depressive symptoms (marginal effect: -0.11, $p<0.001$) through pathways other than altering children's informal care. Also, after fixing children's financial support at zero yuan and fixing children's informal care at zero hours altogether, passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.11, $p<0.001$) through pathways other than altering children' family support. However, among elders who did not live with children, all controlled direct effects were small in magnitude and not statistically significant.

5.2.2 Hypertension management

The total effects of passive urbanization on elders' hypertension management are shown in Tables 12-14. Compared to long-term rural elders, passively urbanized were not more likely to know, treat, and control their hypertension, controlling for gender, age, marital status, and region. In these models, marital status, age, and region were associated with elders' hypertension management: compared to elders living with spouse, elders who temporarily separated with spouse were more likely to know (marginal effect: +0.28, $p<0.01$), more likely to treat (marginal effect: +0.28, $p<0.01$), but less likely to control their hypertension (marginal effect: -0.10, $p<0.05$); being one year older was associated with a lower probability of knowing their hypertension (marginal effect: -0.006, $p<0.01$), a lower probability of treating their hypertension (marginal effect: -0.006, $p<0.01$), and a lower probability (marginal effect: -0.005, $p<0.001$) of controlling their hypertension; and compared to elders in East China, elders in West China were less likely to know (marginal effect: -0.16, $p<0.001$), less likely to treat (marginal effect: -0.17, $p<0.001$), and less likely to control their hypertension (marginal effect: -0.08, $p<0.01$).

Also as shown in Table 12-14, after controlling for mediators and other covariates – children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan), passively urbanized were still not more likely to know, treat, and control their hypertension than long-term rural elders. In these models, marital status, age, region, education and children's education were also associated

with elders' hypertension management. Compared to elders living with spouse, elders who were temporarily separated from their spouse were less likely to know (marginal effect: -0.10, $p<0.05$), more likely to treat (marginal effect: +0.27, $p<0.01$), but less likely to control their hypertension (marginal effect: -0.10, $p<0.05$). Being one year older was associated with a lower probability of knowing their hypertension (marginal effect: -0.006, $p<0.05$), a lower probability of treating their hypertension (marginal effect: -0.005, $p<0.05$), and a lower probability of controlling their hypertension (marginal effect: -0.006, $p<0.001$). Compared to elders in East China, elders in West China were less likely to know (marginal effect: -0.07, $p<0.05$), less likely to treat (marginal effect: -0.15, $p<0.001$), and less likely to control their hypertension (marginal effect: -0.07, $p<0.01$). In addition, compared to elders with more than primary school level education, elders with no formal education were less likely to treat their hypertension (marginal effect: -0.12, $p<0.05$). Having one additional child having an annual income more than 20000 yuan was associated with a higher probability in knowing (marginal effect: +0.01, $p<0.05$) and treating (marginal effect: +0.03, $p<0.01$) one's hypertension, but a lower probability in controlling one's hypertension (marginal effect: -0.01, $p<0.05$).

The effects of passive urbanization on children's financial support, informal care time, and the frequency of seeing one's children are shown in Table 15. Compared to long-term rural elders, passively urbanized elders did not receive significantly more financial support and informal care from children, after controlling for elders' gender, marital status, age, region, and the number of female and male children. In the model for informal care, compared to elders living with spouse, elders without spouse received 11.1 more hours ($p<0.01$) of informal care from children; being one year older was associated with 0.9 hours

($p<0.05$) more informal care from children; and compared to elders in East China, elders in West China received 6.3 hours more informal care from children respectively. For daily contact with children, passive urbanization was not associated with a significantly higher probability of seeing one's children daily, after controlling for elders' gender, marital status, age, region, and the number of female and male children. In this model, having one additional male child was associated with a higher probability of seeing one's children daily (marginal effect: +0.05, $p<0.001$), and having one additional female child was associated with a higher probability of seeing one's children daily (marginal effect: 0.03, $p<0.05$).

The controlled direct effects of children's financial support, informal care and contact frequency on elders' hypertension management are shown in Table 16-18. After fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and altogether, passive urbanization did not result in significant increases in hypertension awareness, treatment, and control among elders.

The analysis described above is also further stratified by elders' living arrangements. Among elders who lived with children (N=869) in the analytic sample for hypertension management, passively urbanized elders were not more likely to know, to treat, and to manage their hypertension (see Table 19). However, among elders who did not live with children (N=1205), passively urbanized elders were more likely to treat (marginal effect: +0.08, $p<0.05$) and to manage (marginal effect: +0.10, $p<0.01$) their hypertension respectively (see Table 19). Also as shown in Table 19, after controlling for mediators and other covariates – children's family support (financial support, informal care, and contact

frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) – among elders living with children (N=869), passively urbanized elders were less likely to control their hypertension (marginal effect: -0.05, $p<0.05$); and an additional 100 yuan in financial support from non-resident children each year was associated with a higher probability of controlling hypertension (marginal effect: 0.0004, $p<0.05$) (see Table 19). Among elders who did not live with children (N=1205), passively urbanized elders were still more likely to treat (marginal effect: +0.08, $p<0.05$) and to control (marginal effect: +0.10, $p<0.01$) their hypertension respectively (see Table 19). Also, neither group of passively urbanized elders received significantly more family support from children than long-term rural elders (see Table 20). In addition, the controlled direct effects of children's family support were only statistically significant for hypertension treatment and control among elders who did not live with children (see Table 21). After fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and altogether, among elders who did not live with children, passive urbanization increased the probability of knowing hypertension status, treating hypertension, and controlling hypertension through pathways other than altering children's support.

5.3 Sensitivity Analysis

5.3.1 Descriptive Analysis

Descriptive results stratified by timing and place of passive urbanization were presented in the Appendix Table 1-2.

Among 1973 passively urbanized elders in the total analytic sample for depressive symptoms (N=4651), 637 respondents lived in planned areas, and 1250 respondents were newly urbanized in 2009-2011 (see Appendix Table 1)[5]. Those who were passively urbanized in 2009-2011 (newly urbanized elders) and those who were passively urbanized in 2005-2008 (early urbanized elders) are compared to long-term rural elders respectively. Compared to long-term rural elders, newly urbanized elders on average had fewer female children (1.58 vs. 1.74, $p<0.05$), were less likely to rate their health as poor (27.4% vs. 33.6%, $p<0.01$), were more likely to rate their health as very good (5.4% vs. 3.3%, $p<0.05$), were more likely to have education more than primary school (12.33% vs. 8.74%, $p<0.05$), and had higher per capita household income (5667 vs. 3637, $p<0.001$). Compared to long-term rural elders, early urbanized elders were more likely to rate their health as good (15.8% vs. 14.7%, $p<0.05$), and had higher per capita household income (6022 vs. 3637, $p<0.01$). Also in this table, those who were passively urbanized in planned areas (suburban areas) and those who were passively urbanized in unplanned areas (remote rural areas) are compared to long-term rural elders respectively. Compared to long-term rural elders, elders urbanized in suburban areas on average were less likely to have a CES-D score over 10 than long-term rural elders (37.1% vs. 47.8%, $p<0.01$), were more likely to see at least one of their children daily (79.8% vs. 71.5%, $p<0.05$), were more likely to live in East China (45.7% vs. 26.5%, $p<0.05$), and had higher per capita household income (6504 vs. 3637, $p<0.01$). Also, they were less likely to

[5] Among the 1973 passively urbanized elders here, there were 637 in planned areas and 1284 in unplanned areas. Also among the 1973 passively urbanized elders, there were 1250 elders who experienced passive urbanization in 2009-2011 and 715 elders who experienced passive urbanization in 2005-2008. Notably, there were missing data in the location of communities and the year of passive urbanization. Thus the sum of 637 and 1284 as well as the sum of 715 and 1250 is not equal to 1973.

rate their health as very poor (5.2% vs. 8.3%, $p<0.05$), less likely to rate their health as poor (24.3% vs. 31.0%, $p<0.001$), more likely to rate their health as fair (49.7% vs. 43.2%, $p<0.05$), and more likely to rate their health as very good (6.1% vs. 3.3%, $p<0.05\%$) than long-term rural elders. Meanwhile, compared to long-term rural elders, elders urbanized in remote rural areas were more likely to be female (53.7% vs. 50.8%, $p<0.05$), were more likely to rate their health as very good (5.3% vs. 3.3%, $p<0.05$), and had higher per capita household income (4950 vs. 3637, $p<0.05$).

In the total analytic sample for hypertension management (N=2074), 311 respondents lived in planned areas, and 625 respondents were newly urbanized in 2009-2011, among 985 passively urbanized elders (see Appendix Table 2). Every group of passively urbanized elders had higher per capita household income than long-term rural elders ($p<0.05$). Compared to long-term rural elders, early urbanized elders were more likely to rate their health as good (15.8% vs. 14.7%, $p<0.05$), and had higher per capita household income (6022 vs. 3637, $p<0.01$). Compared to long-term rural elders, early urbanized elders were more likely to be in Middle China, while those in planned areas were more likely to be in East China.

5.3.2 Depressive Symptoms

Since gender, marital status, physical health, the timing, and place of passive urbanization may modify the effect of passive urbanization, further stratified analyses were shown respectively in Appendix Table 3-17.

Stratified Analysis by Gender

After stratifying by gender, passive urbanization was not significantly associated with decreases in depressive symptoms, after controlling for age, marital status, and region (see Appendix Table 3). Passive urbanization was also not significantly associated with a decrease in depressive symptoms, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), and elders' physical well-being (number of difficult IADLs/ADLs, and self-reported health) (see Appendix Table 3). Also in this model, seeing one's children daily was associated with a lower risk among men (marginal effect: -0.05, $p<0.05$), in having severe depressive symptoms (see Appendix Table 4). Passive urbanization was not significantly associated with increases in family support, after controlling for age, marital status, region, and the number of female/male children (see Appendix Table 4). In addition, the controlled direct effects of children's family support were only statistically significant among women (marginal effect: +0.05, $p<0.05$) (see Appendix Table 5).

Stratified Analysis by Marital Status

After stratifying by marital status, passive urbanization was not significantly associated with a decrease in the probability of severe depressive symptoms, after controlling for age, gender, and region (see Appendix Table 6). Passive urbanization was also not significantly associated with a decrease in severe depressive symptoms, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' physical well-being (number of difficulties with IADLs/ADLs and self-reported health) (see Appendix Table 6). Also in this model, seeing one's children daily was associated with a

lower risk of severe depressive symptoms among both married elders (marginal effect: -0.05, $p<0.05$) and unmarried elders (marginal effect: -0.05, $p<0.05$) (see Appendix Table 6). Among married elders (N=3603), passively urbanized elders received 1059 yuan ($p<0.05$) more financial support from children, after controlling for age, gender, region, and the number of female/male children (see Appendix Table 7). Among married elders, only after fixing children's instrumental support at zero hours, passive urbanization decreased the probability of having severe depressive symptoms (marginal effect: -0.04, $p<0.05$) through pathways other than altering children' family support. Also, the controlled direct effects of children's family support were statistically significant among the unmarried (marginal effect: -0.08, $p<0.05$) (see Appendix Table 8).

Stratified Analysis by Physical Health

After stratifying by physical health, passive urbanization was not significantly associated with a decrease in depressive symptoms, after controlling for age, marital status, gender, and region (see Appendix Table 9). Passive urbanization was also not significantly associated with a decrease in depressive symptoms, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), and elders' physical well-being (number of difficulties with IADLs/ADLs) (see Appendix Table 9). Also in this model, seeing one's children daily was associated with a lower probability (marginal effect: -0.08, $p<0.001$) among elders reporting poor physical health (see Appendix Table 9). Among elders who did not rate their health as poor or very poor (N=2894), passively urbanized elders received 1171 yuan ($p<0.05$) more financial support from children, after controlling for age, marital status,

gender, region, and the number of female/male children (see Appendix Table 10). In addition, the controlled direct effects of children's family support were statistically significant among elders with good physical health (marginal effect: -0.05, $p<0.01$) (see Appendix Table 11).

Stratified Analysis by the Timing of Urbanization

After stratifying by the timing of urbanization, passive urbanization was not significantly associated with a decrease in depressive symptoms, after controlling for age, marital status, gender, and region (see Appendix Table 12). Passive urbanization was also not significantly associated with a decrease in depressive symptoms, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), and elders' physical well-being (number of difficult IADLs/ADLs, and self-reported health) (see Appendix Table 12). Also in this model, receiving 100 yuan in additional financial support from non-resident children was associated with a lower probability (marginal effect: -0.0004, $p<0.05$) among elders who were urbanized in 2005-2008; seeing one's children daily was associated with a lower probability (marginal effect: -0.05, $p<0.05$) among elders who were urbanized in 2009-2011 (see Appendix Table 12). Passive urbanization was not significantly associated with increases in family support, after controlling for age, marital status, region, and the number of female/male children (see Appendix Table 13). In addition, the controlled direct effects of children's family support were statistically significant in both groups (see Appendix Table 14).

Additional Analysis Including the City Planning Area

After dividing my analytic sample into four groups, compared to elders who lived in long-term rural communities outside the city planning area (reference group), elders in passively urbanized communities within the city planning area had a lower risk of having severe depressive symptoms (marginal effect: -0.09, $p<0.05$), but elders in long-term rural communities within the city planning area and passively urbanized communities outside the city planning area did not have lower risk (see Appendix Table 15). Elders in passively urbanized communities within the city planning area did not have significantly lower risk of having severe depressive symptoms than the reference group, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), and elders' physical well-being (number of difficult IADLs/ADLs, and self-reported health) (see Appendix Table 15). Also in this model, seeing children daily was associated with a lower risk (marginal effect: -0.05, $p<0.01$) of having severe depressive symptoms (see Appendix Table 15).

Compared to the reference group, long-term rural elders within the city-planning areas received 6.4 fewer hours of informal care ($p<0.01$) from children each month, and elders in passively urbanized communities within the city planning area were more likely (marginal effect: 0.105, $p<0.01$) to see their children daily (see Appendix Table 16).

In addition, only the controlled direct effects of being passively urbanized in communities within the city planning area were statistically significant (see Appendix Table 17). After fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and

altogether, passive urbanization within the city planning area decreased the risk of having severe depressive symptoms (marginal effect: -0.08, $p<0.01$) through pathways other than altering children's support.

5.3.3 Hypertension Management

Since gender, marital status, physical health, the timing, and place of passive urbanization may modify the effect of passive urbanization, further stratified analyses were shown in Appendix Tables 18-32.

Stratified Analysis by Gender

After stratifying by gender, passive urbanization was associated with an increase in controlling hypertension (marginal effect: +0.05, $p<0.05$) among women (N=1156) and an increase in knowing hypertension status (marginal effect: +0.09, $p<0.05$) among men (N=918), after controlling for age, marital status, and region (see Appendix Table 18). Passive urbanization was also associated with an increase in controlling hypertension among women (marginal effect: +0.05, $p<0.05$) and an increase in knowing hypertension status among men (marginal effect: +0.09, $p<0.05$), after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) (see Appendix Table 18). Among women (N=1156), passively urbanized elders were more likely to see their children daily (marginal effect: +0.07, $p<0.05$), after controlling for age, marital status, region, and the number of female/male children (see Appendix Table 19).

In addition, the controlled direct effects of children's family support were only statistically significant for hypertension awareness among men and hypertension control among women. Among male elders who did not live with children, after fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and altogether, passive urbanization, passive urbanization increased the probability of knowing hypertension status among men and increased the probability of controlling hypertension among women through pathways other than altering children's support (see Appendix Table 20).

Stratified Analysis by Marital Status

After stratifying by marital status, passive urbanization was associated with an increase in treating hypertension (marginal effect: +0.07, $p<0.05$) among married elders, after controlling for age, gender, and region (see Appendix Table 21). Passive urbanization was only associated with an increase in knowing hypertension status (marginal effect: +0.07, $p<0.05$) and treating hypertension among married elders (marginal effect: +0.08, $p<0.05$), after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) (see Appendix Table 21). Also in this model, an additional 10 hours of informal care was associated with an increase in controlling hypertension (marginal effect: +0.008, $p<0.01$) among married elders (see Appendix Table 21). Passive urbanization was not significantly associated with increases

in family support, after controlling for age, gender, region, and the number of female/male children (see Appendix Table 22).

In addition, the controlled direct effects of children's family support were only statistically significant for hypertension awareness and treatment among married elders. Among married elders, after fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and altogether, passive urbanization increased the probability of knowing hypertension status and treating hypertension through pathways other than altering children's support (see Appendix Table 23).

Stratified Analysis by Physical Health

After stratifying by physical health, passive urbanization was not significantly associated with improvement in hypertension management, after controlling for age, marital status, gender, and region (see Appendix Table 24). Passive urbanization was also not significantly associated with improvement in hypertension management, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) (see Appendix Table 24). Passive urbanization was not significantly associated with increases in family support, after controlling for age, gender, region, and the number of female/male children (see Appendix Table 25). In addition, the controlled direct effects of children's family support were mostly not statistically significant after stratifying by elders' self-rated physical health (see Appendix

Table 26). Only after fixing children's informal care at zero hours, elders with good physical health were more likely to treat their hypertension (marginal effect: +0.07, $p<0.05$).

Stratified Analysis by the Timing of Urbanization

After stratifying by the timing of urbanization, passive urbanization was not significantly associated with improvement in hypertension management, after controlling for age, marital status, gender, and region (see Appendix Table 27). Passive urbanization was also not significantly associated with improvement in hypertension management, after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) (see Appendix Table 27). Passive urbanization was not significantly associated with increases in family support, after controlling for age, gender, region, and the number of female/male children (see Appendix Table 28). In addition, the controlled direct effects of children's family support were not statistically significant after stratifying by the timing of urbanization (see Appendix Table 29). Only after fixing children's informal care at zero hours, elders who were passively urbanized in 2009-2011 were more likely to treat their hypertension (marginal effect: +0.06, $p<0.05$).

Additional Analysis Including the City Planning Area

After dividing my analytic sample into four groups, compared to elders who lived in long-term rural communities outside the city planning area (reference group), elders in long-term rural communities within the city planning area were less likely to know (marginal

effect: -0.21, $p<0.05$) and treat (marginal effect: -0.21, $p<0.05$) their hypertension (see Appendix Table 30). Elders in long-term rural communities within the city planning area were less likely to treat their hypertension (marginal effect: -0.19, $p<0.05$), after controlling for children's family support (financial support, informal care, and contact frequency), elders' SES (education, per capita household income, and per capita household assets), elders' health insurance status, and children's SES (the number of children having at least some college education/ having a yearly income more than 20000 yuan) (see Appendix Table 30).

Compared to the reference group, long-term rural elders within the city-planning areas were more likely to see their children daily (marginal effect: +0.12, $p<0.05$) (see Appendix Table 31). After fixing children's financial support, informal care, and contact frequency at zero yuan, zero hours and the reference level ("not seeing children daily") respectively and altogether, long-term rural elders in communities within the city planning area were less likely to know and treat their hypertension, but passively urbanized elders outside the city planning areas were more likely to control their hypertension (see Appendix Table 32).

5.4 Results summary

The results were summarized in Table 22-23 and as below.

5.4.1 Depressive symptoms

Compared to long-term rural elders, passively urbanized elders on average were less likely to have severe depressive symptoms (marginal effect: -0.05, $p<0.05$), in the reduced form model (only controlling for gender, age, marital status, region, but not controlling for

physical well-being, SES, and children's family support as in the structural form model). If the assumption that passively urbanized elders were comparable to long-term rural elders before urbanization is met, the 5-percentage point marginal effect will translate into a 10% change in the risk of severe depressive symptoms, as about 48% long-term rural elders had severe depressive symptoms. Although passively urbanized elders also received more financial support from children than long-term rural elders and having daily contact with children decreased the likelihood of having severe depressive symptoms among elders, children's family support did not mediate the effects of passive urbanization. The effects of passive urbanization on depressive symptoms and children's financial support and the effects of having daily contact with children on elders' depressive symptoms are consistent with the study hypotheses. However, the mediating effects of children's support were very small. The proportion eliminated (PE = [TE − CDE]/TE) was 4.3% for financial support, 6.5% for instrumental support, 2.2% for having daily contact, and close to 0% for all three kinds of family support. This is due to the lack of association between passive urbanization and having daily contact with children, as well as the lack of association between children's financial support with elders' depressive symptoms.

The negative association between passive urbanization and the risk of having severe depressive symptoms also differed across subgroups of elders. Two main moderators were elders' living arrangements and the location of communities. First, stratified analysis by elders' living arrangements in the reduced form models revealed that passive urbanization had a marginal effect of 10 percentage points ($p<0.01$) in decreasing the risk of having severe depressive symptoms among elders who lived with children, while such effects were small in

magnitude and not statistically significant among elders who did not live with children. Second, stratified analysis by the location of communities in the reduced form models showed that passive urbanization was only associated with significantly decreased depressive symptoms among elders who lived in suburban areas (marginal effects: -0.09, $p<0.05$).

5.4.2 Hypertension management

Compared to long-term rural elders, passively urbanized elders were not significantly more likely to know, treat, and control their hypertension, in the reduced form models (only controlling for gender, age, marital status, region, but not controlling for SES, health insurance, and children's family support as in the structural form models). However, the effects of passive urbanization differed across subgroups of elders as discussed below.

First, the effects of passive urbanization differed across living arrangements. In the reduced form models, among elders who lived with children, passively urbanized elders were not more likely to know, to treat, and to manage their hypertension, while among elders who did not live with children, passively urbanized elders were more likely to treat (marginal effect: +0.08, $p<0.05$) and to control their hypertension (marginal effect: +0.10, $p<0.01$). Among elders who did not live with children, the effects of passive urbanization on hypertension treatment and hypertension control did not diminish in the structural form models (controlling for SES, health insurance, and children's family support).

The magnitude of the effect of passive urbanization on hypertension management was not trivial among elders who did not live with children. About 51% of long-term rural elders with hypertension were aware of their hypertension; about 42% treated their

hypertension; and only about 12% controlled their hypertension. If the assumption that passively urbanized elders were comparable to long-term rural elders before urbanization is met, the marginal effect of 8 percentage points in hypertension treatment will translate into a 19% percent change and the marginal effect of 10 percentage points in hypertension control would translate into an 83% percent change.

Second, gender also modified the effects of passive urbanization on hypertension management. In the reduced form models, passive urbanization was associated with a significant increase (marginal effect: +0.09, $p<0.05$) in knowing hypertension status only among men, and a significant increase (marginal effect: +0.05, $p<0.05$) in controlling hypertension only among women. In the structural form models controlling for SES, health insurance, and children's family support, passive urbanization was still associated with a significant increase (marginal effect: +0.10, $p<0.01$) in knowing hypertension status only among men, a significant increase (marginal effect: +0.08, $p<0.05$) in treating hypertension only among men, and a significant increase (marginal effect: 0.05, $p<0.05$) in controlling hypertension only among women.

In addition, marital status also modified the effects of passive urbanization on hypertension management. In the reduced form models, passive urbanization was associated with a significant increase (marginal effect: +0.07, $p<0.05$) in treating hypertension only among married elders. In the structural form models controlling for SES, health insurance, and children's family support, passive urbanization was still associated with a significant increase (marginal effect: +0.07, $p<0.05$) in knowing hypertension status and a significant increase (marginal effect: +0.08, $p<0.05$) in treating hypertension, only among married

elders.

CHAPTER SIX: DISCUSSION

6.1 Results Interpretation

Mental health and chronic disease management among elders in rural China

In this study, 48% of long-term rural elders and 42% of passively urbanized elders had severe depressive symptoms. According to the 2011 baseline data of CHARLS, among all elders aged 60 and older in both rural and urban China, 40% of them had severe depressive symptoms (National School of Development at Peking University, 2013). Thus, rural elders, in general, were more vulnerable in mental well-being compared to urban elders. Notably, China's elders were more likely to have severe depressive symptoms than their Western counterparts. Among adults aged 65 and older from the 2002 waves of the US Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA), 17.6% of English elders and 14.6% of US elders had significant depressive symptoms (CES-D score ≥ 4 in 8-item CES-D) (Zivin *et al.*, 2010). Moreover, previous research in Western countries found a higher prevalence of depressive symptoms among older adults but a lower prevalence of clinically diagnosable depressive disorder (Aneshensel, Phelan, & Bierman, 2013). However, a previous epidemiologic study in China found a higher prevalence of clinically diagnosable depressive disorder among the older population compared to the younger population (Phillips et al., 2009). Thus, rural elders might be the most depressive population in China, and further research, as well as interventions, is warranted.

Among elders who had hypertension in the analytic sample, 54% were aware of their hypertension, and 45.6% had treated hypertension, but only 13.9% of all hypertensive elders controlled their blood pressure under 140/90 mmHg. The low levels of diagnosis, treatment, and control were consistent with other national studies in China (Lewington *et al.*, 2016; Wang *et al.*, 2015). Based on the large prospective China Kadoorie Biobank Study (N=500, 223), Lewington *et al*. (2016) reported that among adults aged 30 to 74, only 30.5% of those with hypertension had received a previous diagnosis; of these, only 46.4% were treated, and among those treated, only 29.6% achieved control of hypertension. According to a recent study which pooled data from 178 studies involving 2,901,464 participants in 30 provinces from 1999 to 2014, the overall prevalence, treatment, and control rates of hypertension in China were 28.9%, 35.3%, and 13.4%, respectively (Wang *et al*., 2015). Hypertension control in China is challenged by both the prevalence of major risk factors (high sodium intake) and insufficient responses from the health system to detect and treat hypertension (Feng, 2017).

Passive urbanization and intergenerational family support

Compared to long-term rural elders, passively urbanized elders on average received more financial support from non-resident children, but received a similar amount of informal care from children and had comparable contact frequency with children. When comparing passively urbanized elders to long-term rural elders, it is notable that the magnitude of increase in financial transfers is not trivial, relatively to either the annual individual income or the annual per capita household expenditure. The annual per capita household expenditure did not differ significantly between long-term rural elders and passively urbanized elders (5365.96 yuan vs. 6239.32 yuan, $p>0.05$). If the assumption that passively urbanized elders

were comparable to long-term rural elders before urbanization is met, long-term rural elders on average would have received 1449 yuan (41% of their annual individual income and 85% of their current received financial support from non-resident children) more than before had they been urbanized.

A possible explanation might be that children with greater financial capacity are likely to give more financial support to their parents (Lei *et al.*, 2012). In contemporary China, approximately 41% of elders aged 60 and over lived with an adult child, and another 34% had at least one adult child living in the same village/ neighborhood (Lei, Strauss, Tian, & Zhao, 2015). Thus, many passively urbanized elders probably had adult children nearby who could be affected by passive urbanization as well. Adult children might provide more financial support if their income increased after passive urbanization. Unfortunately, due to data limits, it is not possible to quantify the income and assets for each child of respondents using CHARLS.

Health consequences of passive urbanization

Compared to long-term rural elders, passively urbanized elders on average were less likely to have severe depressive symptoms. In general, the observed negative association between passive urbanization and the risk of having severe depressive symptoms is consistent with previous frameworks on the contextual factors of mental health. In order to further improve community environments and local residents' mental well-being, the specific community-level and individual-level mediators (e.g., healthcare utilization, physical health status, social activities within the community) for the effects of passive urbanization still need further research.

At the individual level, this finding might also result from improved socioeconomic status (e.g., income, wealth) at the individual level. Also according to the crisis theory discussed in Chapter Two, passive urbanization, as a major life event for rural elders, can have negative effects on elders' mental well-being. However, when elders have coped with their life transition successfully, passive urbanization may have positive effects on their mental well-being, leading to decreased depressive symptoms.

Moreover, community-level physical environments, social environments, and social services can influence both the physical and mental health of community dwellers in theory. Specifically, neighborhood-level processes can affect individuals' mental health through the experience of neighborhood conditions, socioeconomic status, biological factors, psychological dispositions, social resources, and health behaviors. The negative association between passive urbanization and the risk of having severe depressive symptoms might be because after reconstruction, rural communities had better physical environments, social environments, and social services, which may improve villagers' experience of neighborhood conditions. Previous studies also found that the number of amenities and organizations (e.g. basketball playground, swimming pool, outside exercise facilities, room for card games and chess games, room for Ping Pong) within the community was significantly associated with mental health among elders in China (Shen, 2014; Zurlo, Hu, & Huang, 2014).

Also consistent with previous theories, relevant moderators need to be taken into considerations when interpreting the impacts of passive urbanization on depressive symptoms among elders. First, the negative association between passive urbanization and the risk of having severe depressive symptoms was only significant among elders who lived with

children. This might be because, with strong social support systems, elders living with children might experience less psychological distress and adapt to a transitioning community more easily than empty-nesters. Moreover, passive urbanization was only associated with significantly decreased depressive symptoms among elders who lived in suburban areas. In other words, land requisition and village reconstruction (e.g. building a "new socialist countryside," or building "new rural communities") might particularly benefit elders in suburban areas. This might be because suburban areas had more job opportunities, higher land rent, and also higher monetary compensations for land loss under the circumstances of compulsory land requisition, compared to relatively remote rural areas.

Compared to long-term rural elders, passively urbanized elders were not significantly more likely to know, treat, and control their hypertension. According to the Behavioral Model of Health Services Use, individuals' health services use is influenced by a series of contextual and individual characteristics (Andersen, 1995; Andersen 2008). The lack of improvements in hypertension management among passively urbanized elders might be due to health system factors as well as individual-level factors. Passive urbanization might not necessarily improve local health providers' abilities to detect and treat hypertension. Without regular hypertension screening, local residents might not recognize their needs to treat and control hypertension. Future research is needed to identify specific healthcare factors related to the low awareness, treatment, and control rates of hypertension, as few studies have examined the health system factors (Huang, Song, He, & Feng, 2016).

The effects of passive urbanization on hypertension management also differed across subgroups of elders. First, among elders who did not live with children, passively urbanized

elders were more likely to treat and to control their hypertension. One possible explanation might be that active elders living with children took on more housekeeping tasks (e.g., caring for grandchildren) than empty nesters. Thus, empty nesters might have fewer competing tasks, and thus they could manage their chronic conditions better. Second, passive urbanization was associated with a significant increase in knowing hypertension status only among men, and a significant increase in controlling hypertension only among women. Although men and women did not differ significantly in their hypertension awareness, treatment or control rates, the modifying effects of gender on the impact of passive urbanization might still reflect gender differences in healthcare access and treatment adherence. In addition, passive urbanization was associated with a significant increase in treating hypertension only among married elders. This could indicate that living with a spouse might have different health implications compare to living with adult children: living with children might be associated with substantial time transfer from parents to children to take care of grandchildren and household chores while living with a spouse might be associated with more task sharing. Thus, passive urbanization was associated with a significant increase in treating hypertension only among married elders, due to social support and instrumental help from one's spouse.

Intergenerational family support and other factors related to elders' health

This study found that having daily contact with children, rather than financial support and instrumental support, decreased the likelihood of having severe depressive symptoms among elders. This is consistent with previous studies identifying family dynamics as an important but complex determinant for mental well-being among elders in China (Cheng, Chen, McBride, & Phillips, 2016; Lei, Sun, Strauss, Zhang, & Zhao, 2014; Yu, Li,

Cuijpers, Wu, & Wu, 2012). This study also found that among certain subgroups of elders, children's family support could improve elders' hypertension management. Among elders living with children, financial support from non-resident children could improve hypertension control. Among men and married elders, informal care provided by children could also improve hypertension control. Thus, instrumental help from children who are caregivers could improve elders' chronic disease management.

In addition, this study found striking regional disparities in depressive symptoms and hypertension management among elders in rural China even after controlling for elders' education and economic status. Compared to elders in East China, elders in West China were significantly more likely to have severe depressive symptoms, less likely to know their hypertension status, and less likely to treat and control their hypertension. China's regional health and healthcare disparities reflect contextual and structural inequalities in healthcare resources and have been well recorded by numerous previous studies (Chou & Wang, 2009; Fang *et al.*, 2010; Zhang & Kanbur, 2005). Since China launched its economic reform in 1978, China has experienced unprecedented economic growth and reductions in income poverty. However, this growth has been accompanied by dramatic increases in regional health inequality between rural and urban areas as well as across provinces, as the old foundations of healthcare provision have eroded. An unfortunate consequence of local governments' financial crisis is the withdrawal of local governments' investments in healthcare resources, resulting in enormous regional health disparities.

6.2 Limitations

Some limitations in study design and measures need to be considered when interpreting this study.

First, as a natural experiment, the "as-if random" assumption may be undermined when people self-select into the treatment or comparison group. The two types of passive urbanization, land requisition and village reconstruction, are both largely exogenous processes. In the process of land requisition, villages could not self-select into or out of the treatment, because of the lack of information and capacities. However, in the process of village reconstruction, rural residents and the policy-makers may select villages which were suitable for urbanization into treatment. Uncontrolled confounding, such as SES before urbanization, may exist, if the "as-if random" assumption is not met. If so, the effect of passive urbanization on depressive symptoms will be biased towards the positive direction. However, the proportion of self-selection was likely to be low (about 15%) (Ye & Zhang, 2015). In addition, passively urbanized elders are defined as those whose community had experienced land expropriation since 2005 and village consolidation since 2005. Those whose community had experienced land expropriation before 2005 are categorized as long-term rural elders since they still lived in rural areas and were registered as rural residents. Thus there might be a conservative bias due to such misclassification.

Second, there may be reverse causality between family support from children and elders' mental well-being. Receiving more children's financial support or informal care might lead to decreased depressive symptoms among elders, resulting in a negative linkage receiving family support and depressive symptoms. While elders' decreased depressive

symptoms might encourage children to continue their financial transfers (a negative linkage between children's financial support and elders' depressive symptoms), fewer depressive symptoms might lead to less informal care (a positive linkage between children's informal care and elders' depressive symptoms). Thus, the reverse causality between family support and elders' mental well-being might lead to a bias away from zero for the effect estimate of financial support on elders' mental well-being, but a bias towards zero for the effect estimate of informal care on elders' mental well-being.

The endogeneity between children's family support and elders' mental well-being and physical well-being might also lead to uncontrolled confounding when estimating the effects of family support from children on elders' chronic disease management. I did not control for elders' depressive symptoms and elders' physical well-being when estimating the effects of children's family support on elders' chronic disease management. Such omitted variable might result in uncontrolled confounding. However, controlling for elders' mental well-being and physical well-being which might be mediators of the effects of family support on elders' chronic disease could also lead to bias. In addition, stratified analysis by physical well-being did not influence the effect estimates of passive urbanization on chronic disease management. Thus, the omitted variables bias might be relatively small.

In addition, there are also limitations in measures of this study, especially in terms of family support.

First, CHARLS did not have direct measures of children's emotional support and intergenerational relationships. Thus, this study used children's contact frequency as a proxy for children's emotional support. Such a crude proxy could not reflect the complex

intergenerational relationship in rural China. A previous study categorized intergenerational relationships in rural China into five groups: (1) “tight-knit,” (2) “nearby but discordant,” (3) “distant discordant,” (4) “distant reciprocal,” and (5) “distant ascending” (Guo, Chi, & Silverstein, 2012). Parents and children can be geographically but not emotionally close to each other (“nearby but discordant”), and vice versa (“distant ascending”). In addition, the benefits of receiving support from children were found to be mediated by parents’ satisfaction with their children (Chen & Silverstein, 2000). Thus, having no direct measurements of parents’ satisfaction with their children and intergenerational relationships could lead to a conservative bias when estimating the impacts of intergenerational support on elders’ well-being.

Second, in measuring informal care received among those who had any difficulties in ADLs/IADLs, CHARLS only included a maximum of three caregivers, those who most often help a care recipient. Thus, the burden of informal care in this study could be underestimated for those who received instrumental support but had no difficulties in measured ADLs/IADLs and those who had more than three informal caregivers. Unfortunately, for the first circumstance, it is not possible to evaluate the magnitude of underestimation. For the second circumstance, when examining the number of caregivers, none of the respondents had three caregivers. Thus, the magnitude of underestimation due to limiting the number of caregivers should be relatively small. Moreover, such measurement errors are not likely to differ given the value of other variables. In other words, the underestimation of informal care hours is not likely to bias the findings in this study.

Moreover, CHARLS only measured financial support from non-resident children, as

resident children were those who lived with parents but were not independent economically. As resident children might contribute directly to the household income and assets, it is reasonable not to measure the financial transfers from resident children to parents. Thus, it is necessary to stratify the analysis by elders' living arrangements. However, the total effects of passive urbanization on elders' mental well-being and chronic disease management might not be identified in a stratified analysis by living arrangements. This is because elders' living arrangements could be affected by passive urbanization as well. As discussed in Chapter five and the section of 6.1, the impacts of passive urbanization on elders' mental well-being and chronic disease management differed conditioning on elders' living arrangements. Causal interpretation of these findings would need additional caution.

In addition to limitations in measurements, this study did not account for within-family clustering in the main analysis. CHARLS interviewed both the main respondent and his or her spouse in each sampled households with those who aged 45 years and older. However, such within-family clustering should be small as two persons at maximum were interviewed within a family. To account for the within-family clustering, I stratified the analysis by gender in sensitivity analysis. For the outcome of depressive symptoms, the direction and magnitude of effect estimates did not change after stratified analysis by gender, but the estimates were not statistically significant after stratified analysis. This might be because stratified analysis decreased the statistical power when splitting the sample. For the outcome of hypertension management, the impacts of passive urbanization differed between men and women, as discussed in section 5.4. Thus, within-family clustering might not be a major threat to the validity of effect estimates.

6.3 Implications for future research and policies

Policy implications

This study has numerous policy implications for aging policies, urbanization policies, and healthcare policies in China.

Caring for its rapidly aging population still seems to be a daunting task for China, especially in rural areas that will continue to have a higher proportion of elders than urban areas. Even the descriptive analysis in this study could reveal the fact that a strikingly large proportion of rural elders in China were living in extreme poverty, poor health, and depression. This study suggested that although financial transfers and instrumental support from children were often available for rural elders, family support was still insufficient to alleviate elders' mental sufferings and to remove barriers to essential healthcare. Thus, in addition to promoting filial piety, it is crucial for future aging policy to strengthen public transfers and provide appropriate services for rural elders.

First, current passive urbanization projects should be considered as an opportunity to provide community services and support to rural elders who could hardly be reached before. The findings in this dissertation suggest a reason for cautious optimism about the impacts of China's continuing state-led urbanization. This study used China's passive urbanization as a natural experiment because it was largely exogenous to local villagers. However, China's urbanization plan should not be implemented in a "as-if random" way. Future land requisition and village reconstruction projects should be well planned and implemented to create better living environment and more economic opportunities for rural elders and their family members. The urbanization movement should first be implemented in places which have the

potential to benefit local villagers most through land requisition and village reconstruction, such as villages in suburban areas. This study also suggested that certain subgroups, such as empty nesters, and elders without spouses, should be especially cared for during the process of community reconstruction.

Second, rural elders should receive more public financial transfers to protect them from extreme poverty. At present, financial and instrumental support outside of elders' family (e.g. pension and long-term care) is either insufficient or distributed with striking disparity, or both (Li, Zhang, Zhang, Zhang, Zhou, & Chen, 2013). In 2009, China launched the New Rural Pension Scheme (NRPS) which was first implemented in 320 pilot rural counties and was expanded to nearly all 2853 counties by 2012 (Chen, 2014; Liu & Sun, 2016). The amount of the basic pension varies considerably across counties and the minimum basic pension benefit was 55 yuan (approximately 8 U.S. dollars in 2017) per month initially, and increased to 70 yuan (approximately 10 US Dollar in 2017) in 2014. Previous studies have reported the beneficial impacts of NRPS on elders' well-being (Xie, 2015; Cheng, Liu, Zhang & Zhao, 2016). However, considering the extreme poverty among many rural elders, the NRPS should be further strengthened.

Moreover, this study revealed that elders' hypertension management did not improve along with increased income and enhanced mental well-being. Levels of hypertension awareness, treatment, and control were low among rural elders and striking regional disparities persisted, despite nearly universal health insurance coverage. These findings suggested that passive urbanization might not improve local health providers' abilities to detect and treat hypertension. Strengthening the rural healthcare delivery system in China

might be more challenging than improving the community-level physical and social environments. Also, the public health insurance coverage in rural China did not necessarily improve chronic disease management among rural residents.

Current passive urbanization projects should also be considered as an opportunity to improve healthcare access in rural China. In theory, it should be more convenient for residents living in a concentrated community to access healthcare than rural residents in remote areas. Thus, health promotion, screening, and treatment programs for hypertension and depression need to be routinely conducted in these communities. Primary care providers in village clinics and township health centers should be better trained to prepare for the rapid population aging in the community. Several policies can be strengthened or implemented to achieve these goals as discussed below.

The central government should continue supporting and expanding the Equalization of National Essential Public Health Services Package (NEPHSP) program to improve chronic disease management and narrow rural-urban and regional health disparities in China. In the most recent healthcare reform in 2009, China launched the NEPHSP program to narrow the rural-urban and regional health disparities. Since then, the central, provincial, municipal and county governments in China have been financing public health services, including free physical exams for elders and chronic disease management (Meng, Fang, Liu, Yuan & Xu, 2015; Yang *et al.*, 2016).

Future healthcare reform on the delivery system is also urgently needed to meet the growing health needs of the rapidly aging population. A well-functioning and integrated primary care system is needed to care for rural elders who had a high prevalence of

depressive symptoms and low levels of chronic disease management. Notably two-thirds of counties/districts in China still do not have any mental health providers, resulting in enormous treatment gaps in mental health treatments, especially among the elderly population. Integrating mental health services into China's primary care system might have the potential to close the treatment gaps and is also promising in improving the quality of healthcare. In 2016, the World Bank Group, WHO, and the Chinese central government released a report entitled "Healthy China: Deepening health reform in China, building high-quality and value-based service delivery." This report recommended China to fully adopt a "people-centered integrated care (PCIC)" model by integrating a well-functioning primary care system with large hospitals through "formal linkages, good data, and information sharing among providers and between providers and patients" (The World Bank, 2016). Unfortunately, it is not clear whether these suggestions will only remain aspirational goals or become parts of future healthcare reform.

Future research

This study has suggested that family dynamics in contemporary China are currently in transition during the process of rapid urbanization. Current patterns of intergenerational support as well as their impacts on elders' health can be highly complex. China's intergenerational support should be examined in the contexts of rapid urbanization, marriage squeeze due to striking sex-ratio imbalance, as well as the implementation and the end of "one-child" policy. Though many previous studies have touched these topics, timely research using up-to-date datasets is still in need as the Chinese society is changing rapidly in terms of its population policies and social norms.

Specifically, in the future I will explore transitioning living arrangements among elders, gender differences in providing and receiving intergenerational support, and health implications of changes in living arrangements and intergenerational support patterns. I will take advantage of the cohort study design of CHARLS to explore elders' living arrangements over time, determinants of living arrangement transitions, and examine elders' mental health, physical health, and functional trajectories in relation to their living arrangements. I am also interested in using CHARLS data to investigate within-family and between-family variations in intergenerational support both from parents to children and from children to parents.

This study has explored the health consequences of passive urbanization, and future research could be expanded to explore the health implications of active urbanization: China's internal migration. Most previous studies focused on rural empty-nesters who were left behind by their children who worked in cities as migrant workers. However, few studies have looked at the patterns of migration among elders in China. Considering the restriction of China's household registration system, future research is needed to examine the health and healthcare consequences of internal migration among elders in China. It will also be interesting to compare rural-urban elderly migrants and passively urbanized elders to identify the self-selection effects of migration.

Table 1 Major demographic indicators of China and the world (The World Bank, 2015)

	Low- and middle- income countries	High- income countries	China*
Total population in 2000 (millions)	4891.3	1210.7	1262.6
Total population in 2013 (millions)	5818.7	1306.4	1357.4
Total population in 2025 (millions)	6684.1	1357.7	1424.0
Total fertility rate in 1990	3.7	1.9	2.5
Total fertility rate in 2013	2.6	1.7	1.7
Proportion of population ages 65+ in 2013	6%	16%	9%
Life expectancy at birth in 1990	63	75	69
Life expectancy at birth in 2013	69	79	75
Proportion of urban population in 1990	39%	76%	36%
Proportion of urban population in 2013	47%	80%	53%

* The data of China does not include data from Taiwan, Hong Kong Special Administrative Region (SAR) and Macau SAR. The data of China is included in the data of low-and middle-income countries.

Table 2 Multiple imputations

Variable	Percent Missing among the full sample (N=17,708)	Imputation Method
For the Outcome of Depressive Symptoms		
Depressive symptoms	9.45%	Logistic regression
Mediators		
Children's financial transfers	1.26%	OLS regression
Children's informal care	0.95%	OLS regression
Daily contact with children	0.31%	Logistic regression
Main predictor		
Passively urbanized elders	0.02%	Logistic regression
Covariates		
Gender	0.09%	Logistic regression
Age	3.35%	OLS regression
Marital status	0.19%	Multinomial logistic regression
Region	0.02%	Multinomial logistic regression
Elders' per capita household income	16.98%	Ordered logistic regression
Elders' per capita household wealth	29.08%	Ordered logistic regression
Elders' education	0.01%	Ordered logistic regression
Number of difficult ADLs	2.10%	OLS regression
Number of difficult IADLs	1.46%	OLS regression
Self-rated health	0.84%	Ordered logistic regression
*For the Outcome of Hypertension Management**		
Hypertension awareness	62.37%	Logistic regression
Hypertension treatment	62.19%	Logistic regression
Hypertension control	66.90%	Logistic regression
Mediators		
Children's financial transfers	1.26%	OLS regression
Children's informal care	0.95%	OLS regression
Daily contact with children	0.31%	Logistic regression
Main predictor		
Passively urbanized elders	0.02%	Logistic regression
Covariates		
Gender	0.09%	Logistic regression
Age	3.35%	OLS regression
Marital status	0.19%	Multinomial logistic regression
Region	0.02%	Multinomial logistic regression
Elders' per capita household income	16.98%	Ordered logistic regression
Elders' per capita household wealth	29.08%	Ordered logistic regression
Elders' education	0.01%	Ordered logistic regression
Health insurance	1.39%	Logistic regression

* Responses were missing for the outcomes of hypertension management mainly because of the absence of hypertension. Conditioning on having hypertension, the percentages of missing data in hypertension awareness, treatment, and control among the analytic sample were only 0.49%, 0%, and 9.57%.

Table 3 Hypotheses and regression models summary

Hypothesis	1, 2c	2a, 4a	2a, 4a	2a, 4a	2b	3, 4c	3, 4c	3, 4c	4b, 4c	4b, 4c	4b, 4c
Outcomes											
Depressive symptoms	O				O						
Hypertension awareness						O			O		
Hypertension treatment							O			O	
Hypertension control								O			O
Mediators											
Children's financial transfers		O			X(+)				X(+)	X(+)	X(+)
Children's informal care			O		X(+)				X(+)	X(+)	X(+)
Daily contact with children				O	X(+)				X(+)	X(+)	X(+)
Main predictor											
Passively urbanization	X(+)/ X(+)*	X(+)	X(+)	X(+)	X(+)*	X(+)/ X(+)*	X(+)/ X(+)*	X(+)/ X(+)*	X(+)	X(+)	X(+)*
Covariates											
Gender	X	X	X	X	X	X	X	X	X	X	X
Age	X	X	X	X	X	X	X	X	X	X	X
Marital status	X	X	X	X	X	X	X	X	X	X	X
Region	X	X	X	X	X	X	X	X	X	X	X
Number of female children		X	X	X							
Number of male children		X	X	X							
Children's SES									X	X	X
Elders' SES					X				X	X	X
Health insurance									X	X	X
ADLs & IADLs					X						
Self-rated health					X						

Note: In each column, "O" indicates the outcome variable and "X" indicates independent variables. "(+)" represents that according to the research hypothesis, this independent variable has a positive association with the outcome variable. "X(+)*" indicates that controlled direct effects, instead of regression coefficients of passive

urbanization, are used for testing hypotheses 2c and 4c.

Summary of research hypotheses:

1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

2a (4a): Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support.

3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES.

4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 4 Descriptive statistics for the analytic sample of depressive symptoms

	Total sample N=4651	Long-term rural elders N=2678	Passively urbanized elders N=1973
Outcome Variables:			
% having severe depressive symptoms (CES-D scores ≥10), (95% CI)	45.15% (42.55%, 47.78%)	47.84% (44.43%, 51.27%)	41.93%* (38.09%, 45.88%)
Mediators:			
Children's financial transfers, yuan per year, mean (95% CI)	2425.74 (1772.05, 3079.42)	1757.00 (1436.23, 2077.78)	3209.91* (1848.09, 4571.73)
Children's informal care hours per month, mean (95% CI)	8.65 (6.09, 11.21)	9.33 (5.63, 13.04)	7.85 (4.37, 11.32)
% Seeing children daily, (95% CI)	73.31% (70.66%, 75.81%)	71.54% (67.97%, 74.87%)	75.39% (71.37%, 79.01%)
Covariates:			
% Female, (95% CI)	51.09% (49.64%, 52.54%)	50.82% (49.12%, 52.53%)	51.40% (48.96%, 53.83%)
Age, mean (95% CI)	69.48 (69.13, 69.83)	69.56 (69.06, 70.05)	69.38 (68.89, 69.88)
% currently married and lived with spouse, (95% CI)	69.25% (67.06%, 71.35%)	69.70% (67.27%, 72.02%)	68.71% (64.87%, 72.31%)
% Currently married but separated with spouse temporarily, (95% CI)	4.32% (2.96%, 6.29%)	3.79% (2.95%, 4.87%)	4.95% (2.48%, 9.61%)
% Currently not married, (95% CI)	26.43% (24.58%, 28.37%)	26.51% (24.24%, 28.90%)	26.34% (23.37%, 29.54%)
% east, (95% CI)	30.02% (24.53%, 36.15%)	26.59% (19.89%, 34.57%)	34.05% (25.54%, 43.74%)
% middle, (95% CI)	29.67% (24.25%, 35.74%)	32.19% (24.82%, 40.57%)	26.71% (19.25%, 35.78%)
% west, (95% CI)	36.23% (30.38%, 42.50%)	37.63% (29.97%, 45.96%)	34.58% (25.99%, 44.31%)
% northeast, (95% CI)	4.08% (2.29%, 7.17%)	3.59% (1.63%, 7.75%)	4.66% (2.02%, 10.39%)

Number of female children, mean (95% CI)	1.67 (1.61, 1.73)	1.74 (1.66, 1.82)	1.60* (1.50, 1.69)
Number of male children, mean (95% CI)	1.91 (1.85, 1.96)	1.95 (1.87, 2.02)	1.86 (1.78, 1.94)
Number of difficult ADLs, mean (95% CI)	0.25 (0.22, 0.29)	0.27 (0.22, 0.32)	0.23 (0.18, 0.28)
Number of difficult IADLs, mean (95% CI)	0.58 (0.52, 0.63)	0.59 (0.53, 0.66)	0.56 (0.48, 0.64)
% self-rating health as very poor, (95% CI)	7.34% (6.38%, 8.42%)	8.25% (6.94%, 9.77%)	6.27% (4.98%, 7.86%)
% self-rating health as poor, (95% CI)	31.02% (29.27%, 32.83%)	33.55% (31.37%, 35.81%)	28.05%** (25.41%, 30.86%)
% self-rating health as fair, (95% CI)	44.27% (42.12%, 46.44%)	43.15% (40.55%, 45.79%)	45.59% (42.10%, 49.13%)
% self-rating health as good, (95% CI)	13.11% (11.82%, 14.53%)	11.73% (10.25%, 13.39%)	14.74%* (12.62%, 17.14%)
% self-rating health as very good, (95% CI)	4.25% (3.47%, 5.20%)	3.32% (2.43%, 4.52%)	5.35%* (4.10%, 6.94%)
% Education, (95% CI)			
Primary education	45.45% (43.00%, 47.92%)	47.00% (44.02%, 50.00%)	43.63% (39.69%, 47.65%)
Primary school	44.64% (42.32%, 46.99%)	44.26% (41.48%, 47.09%)	45.09% (41.26%, 48.98%)
More than primary education	9.91% (8.68%, 11.29%)	8.74% (7.36%, 10.34%)	11.28% (9.27%, 13.65%)
Per capita household income, mean (95% CI)	4601.99 (4104.07, 5099.92)	3637.38 (3157.30, 4117.47)	5789.01*** (4905.85, 6672.16)
Per capita household assets, mean (95% CI)	55980.26 (19966.47, 91994.06)	51967.29 (-795.53, 104730.1)	61258.24 (15055.28, 107461.2)

Note: *p < .05, **p < .01, ***p<0.001, comparing to long-term rural elders

Table 5 Descriptive statistics for the analytic sample of hypertension management

	Total sample N=2074	Long-term rural elders N=1074	Passively urbanized elders N=1000
Outcome Variables:			
% hypertension awareness, (95% CI)	53.99% (50.11%, 57.82%)	51.15% (47.16%, 55.11%)	57.05% (50.41%, 63.45%)
% hypertension treatment, (95% CI)	45.58% (41.43%, 49.80%)	42.44% (38.13%, 46.87%)	48.96% (42.01%, 55.95%)
% Hypertension control, (95% CI)	13.86% (11.71%, 16.33%)	12.38% (10.03%, 15.18%)	15.45% (11.95%, 19.75%)
Mediators:			
Children's financial transfers, yuan per year, mean (95% CI)	2610.21 (1438.13, 3782.29)	1706.39 (1348.74, 2064.05)	3585.42 (1186.66, 5984.18)
Children's informal care hours per month, mean (95% CI)	7.26 (4.31, 10.21)	7.45 (4.15, 10.75)	7.06 (2.08, 12.04)
% Seeing children daily, (95% CI)	75.74% (72.30%, 78.87%)	74.14% (70.13%, 77.78%)	77.45% (71.69%, 82.33%)
Covariates:			
% Female, (95% CI)	54.78% (51.16%, 58.35%)	55.55% (52.11%, 58.94%)	53.95% (47.48%, 60.29%)
Age, mean (95% CI)	70.29 (69.76, 70.83)	70.33 (69.63, 71.02)	70.26 (69.44, 71.08)
% currently married and lived with spouse, (95% CI)	64.49% (60.18%, 68.58%)	65.64% (61.62%, 69.45%)	63.26% (55.45%, 70.42%)
% Currently married but separated with spouse temporarily, (95% CI)	4.70% (1.73%, 12.10%)	2.44% (1.63%, 3.65%)	7.12% (1.85%, 23.76%)
% Currently not married, (95% CI)	30.81% (27.67%, 34.15%)	31.92% (28.23%, 35.85%)	29.63% (24.61%, 35.19%)
% east, (95% CI)	34.26% (27.27%, 42.01%)	29.87% (22.16%, 38.93%)	38.97% (27.79%, 51.44%)
% middle, (95% CI)	27.79% (22.05%,	30.76% (22.99%,	24.59% (16.86%,

	34.37%)	39.81%)	34.40%)
% west, (95% CI)	33.54% (27.31%, 40.40%)	35.58% (27.58%, 44.48%)	31.34% (22.26%, 42.12%)
% northeast, (95% CI)	4.42% (2.41%, 7.96%)	3.78% (1.59%, 8.73%)	5.10% (2.18%, 11.46%)
Number of female children, mean (95% CI)	1.74 (1.65, 1.84)	1.84 (1.72, 1.95)	1.64* (1.49, 1.79)
Number of male children, mean (95% CI)	1.96 (1.89, 2.04)	1.98 (1.88, 2.09)	1.94 (1.84, 2.04)
Number of children having at least some college education, mean (95% CI)	0.12 (0.09, 0.15)	0.11 (0.07, 0.15)	0.13 (0.09, 0.17)
Number of children having a yearly income ≥ 20000 yuan, mean (95% CI)	0.90 (0.77, 1.03)	0.80 (0.65, 0.95)	1.01 (0.79, 1.22)
% no health insurance, (95% CI)	5.63% (4.25%, 7.42%)	4.77% (2.99%, 7.55%)	6.55% (4.64%, 9.18%)
% Education, (95% CI)			
No formal education	46.67% (42.88%, 50.51%)	48.19% (44.32%, 52.07%)	45.05% (38.57%, 51.70%)
Primary school	44.00% (40.06%, 48.02%)	43.00% (39.56%, 46.50%)	45.09% (37.95%, 52.43%)
More than primary education	9.32% (7.78%, 11.14%)	8.82% (6.80%, 11.37%)	9.86% (7.63%, 12.67%)
Per capita household income, mean (95% CI)	4563.28 (3892.87, 5233.68)	3492.39 (2933.88, 4050.90)	5727.50*** (4568.44, 6886.57)
Per capita household assets, mean (95% CI)	48799.42 (17248.32, 80350.52)	51694.35 (-1679.48, 105068.20)	45444.39 (17031.48, 73857.31)

Note: *p < .05, **p < .01, ***p<0.001, comparing to long-term rural elders

Table 6 The effects of passive urbanization on depressive symptoms (Hypothesis 1 & 2b, N=4651)

Variable	Marginal Effects (95% CI)	
	Hypothesis 1 (reduced form model)	Hypothesis 2b (structural form model)
Being passively urbanized	-0.046* (-0.091, -0.001)	0.002 (-0.036, 0.041)
Children's monetary & in-kind transfers		-0.0002 (-0.0006, 0.0001)
Children's informal care hours		0.004 (-0.0001, 0.009)
Seeing children daily		-0.050** (-0.086, -0.015)
Female	0.136*** (0.106, 0.166)	0.098*** (0.065, 0.131)
Marital status		
With spouse	Ref	Ref
Temporarily separated with spouse	-0.096 (-0.201, 0.009)	-0.049 (-0.155, 0.056)
No spouse	0.058* (0.013, 0.102)	0.068** (0.028, 0.109)
Age	0.002 (-0.0003, 0.005)	-0.004** (-0.006, -0.001)
Region		
East	Ref	Ref
Middle	0.109*** (0.052, 0.165)	0.044 (-0.004, 0.093)
Northeast	0.109* (0.015, 0.204)	0.041 (-0.042, 0.124)
West	0.149*** (0.092, 0.206)	0.077** (0.027, 0.126)
Elders' education		
More than primary school		Ref
Primary school		0.048 (-0.003, 0.100)
No formal education		0.041 (-0.018, 0.100)
Number of difficult ADLs		0.003 (-0.032, 0.038
Number of difficult IADLs		0.058*** (0.038, 0.079)
Self-reported health		
Very good		Ref
Good		0.044 (-0.032, 0.119)
Fair		0.216*** (0.146, 0.286)
Poor		0.411*** (0.339, 0.483)
Very poor		0.544*** (0.450, 0.638)
Per capita household income		
Fourth quartile(highest)		Ref
Third quartile		0.010 (-0.063, 0.083)
Second quartile		0.033 (-0.034, 0.101)
First quartile (lowest)		0.074* (0.007, 0.140)
Per capita household wealth		
Fourth quartile(highest)		Ref
Third quartile		0.025 (-0.042, 0.092)
Second quartile		0.099** (0.037, 0.162)
First quartile (lowest)		0.137*** (0.073, 0.201)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 7 The effects of passive urbanization on children's family support (Hypothesis 2a, N=4651)

	Marginal Effects (95% CI)		
Hypothesis	Financial support	Informal care	Daily contact
Passively urbanized elders	1449.44*	-0.95	0.043
	(78.31, 2820.56)	(-5.53, 3.62)	(-0.009, 0.094)
Female	-801.53	3.60	0.013
	(-2466.68, 863.62)	(-0.28, 7.49)	(-0.006, 0.031)
Marital status			
With spouse	Ref	Ref	Ref
Temporarily separated with	217.03	0.78	-0.064
spouse	(-1882.88, 2316.94)	(-2.50, 4.05)	(-0.200, 0.072)
No spouse	746.41	13.83***	0.092***
	(-1732.92, 3225.74)	(8.23, 19.42)	(0.053, 0.131)
Age	-23.64	1.18***	0.004**
	(-93.28, 46.00)	(0.71, 1.66)	(0.001, 0.007)
Region			
East	Ref	Ref	Ref
Middle	-2026.82	8.14**	-0.028
	(-4062.88, 9.23)	(2.20, 14.08)	(-0.089, 0.032)
Northeast	-2338.63*	13.06	0.019
	(-4413.33, -263.92)	(-3.35, 29.46)	(-0.086, 0.124)
West	-2599.97*	7.51**	0.001
	(-4631.98, -567.96)	(2.49, 12.53)	(-0.061, 0.063)
Number of female children	764.50	0.13	0.008
	(-98.29, 1627.30)	(-1.90, 2.16)	(-0.006, 0.022)
Number of male children	964.28**	-2.81*	0.040***
	(242.14, 1686.43)	(-5.31, -0.31)	(0.022, 0.059)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Table 8 The effect of passive urbanization on depressive symptoms mediated by family support (Hypothesis 2c, N=4651)

Estimate (95% CI)	Children's financial support	Children's instrumental support	Daily contact	All family support
Controlled direct effect	-0.048** (-0.078, -0.017)	-0.049** (-0.080, -0.017)	-0.047** (-0.078, -0.016)	-0.046** (-0.076, -0.015)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension control compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 9 The effects of passive urbanization on depressive symptoms stratified by living arrangements (Hypothesis 1 & 2b, N=4651)

	Living with children N=2035		Not living with children N=2616	
Marginal Effects (95% CI)	Hypothesis 1	Hypothesis 2b	Hypothesis 1	Hypothesis 2b
Passively urbanized elders	-0.100**	-0.043	0.007	0.042
	(-0.163, -0.037)	(-0.100, 0.013)	(-0.047, 0.062)	(-0.003, 0.088)
Children's monetary & in-kind transfers		-0.00001		-0.0005**
		(-0.0004, 0.0004)		(-0.0008, -0.0001)
Children's informal care hours		0.004		0.019
		(-0.002, 0.009)		(-0.012, 0.049)
Children's daily contact		--		-0.052*
				(-0.096, -0.009)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 10 The effects of passive urbanization on children's family support stratified by living arrangements (Hypothesis 2a, N=4651)

	Living with children N=2035			Not living with children N=2616		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	1101.44 (35.01, 2037.90)	-2.45 (-11.44, 6.55)	--	2117.89 (-498.96, 4734.74)	-0.23 (-2.17, 1.71)	0.019 (-0.048, 0.087)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Table 11 The effects of passive urbanization on depressive symptoms mediated by children's family support stratified by living arrangements (Hypothesis 2c, N=4651)

	Living with children N=2035			Not living with children N=2616			
Marginal effects (95% CI)	Financial support	Instrumental support	All family support	Financial support	Instrumental support	Daily contact	All family support
Controlled direct effect	-0.108*** (-0.155, -0.060)	-0.108*** (-0.155, -0.060)	-0.107*** (-0.155, -0.060)	0.010 (-0.033, 0.054)	0.008 (-0.035, 0.054)	0.008 (-0.036, 0.051)	0.011 (-0.032, 0.054)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 12 The effect of passive urbanization on hypertension awareness (Hypothesis 3 & 4b, N=2074)

Variable	Marginal effects (95% CI)	
	Hypothesis 3 (reduced form model)	Hypothesis 4b, 4c (structural form model)
Being passively urbanized	0.035 (-0.023, 0.094)	0.028 (-0.012, 0.068)
Children's monetary & in-kind transfers		0.000001 (-0.00003, 0.00003)
Children's informal care hours		0.003 (-0.001, 0.006)
Seeing children daily		-0.022 (-0.060, 0.017)
Female	0.029 (-0.025, 0.083)	-0.012 (-0.050, 0.025)
Currently married		
With spouse	Ref	Ref
Temporarily separated with spouse	0.281** (0.115, 0.446)	-0.096* (-0.186, -0.006)
No spouse	-0.017 (-0.084, 0.050)	-0.032 (-0.080, 0.016)
Age	-0.006** (-0.010, -0.002)	-0.006* (-0.009, -0.003)
Region		
East	Ref	Ref
Middle	-0.055 (-0.128, 0.019)	-0.022 (-0.078, 0.034)
Northeast	0.066 (-0.056, 0.189)	0.016 (-0.093, 0.124)
West	-0.160*** (-0.234, -0.085)	-0.069** (-0.121, -0.017)
Having no health insurance		-0.014 (-0.083, 0.055)
Elders' education		
More than primary school		Ref
Primary school		-0.040 (-0.100, 0.020)
No formal education		-0.027 (-0.094, 0.040)
Per capita household income		
Fourth quartile(highest)		Ref
Third quartile		-0.024 (-0.092, 0.043)
Second quartile		-0.022 (-0.096, 0.051)
First quartile (lowest)		-0.032 (-0.102, 0.038)
Per capita household wealth		
Fourth quartile(highest)		Ref
Third quartile		-0.002 (-0.061, 0.058)
Second quartile		-0.005 (-0.071, 0.061)
First quartile (lowest)		0.020 (-0.049, 0.089)
Number of children having at least some college education		-0.015 (-0.050, 0.020)
Number of children having a yearly income more than 20000 yuan		0.013* (0.001, 0.026)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 13 The effect of passive urbanization on hypertension treatment (Hypothesis 3 & 4b, N=2074)

Variable	Marginal effects (95% CI)	
	Hypothesis 3 (reduced form model)	Hypothesis 4b, 4c (structural form model)
Being passively urbanized	0.042 (-0.019, 0.103)	0.034 (-0.025, 0.093)
Children's monetary & in-kind transfers		0.0002 (-0.0002, 0.0006)
Children's informal care hours		0.002 (-0.004, 0.008)
Seeing children daily		0.005 (-0.048, 0.058)
Female	0.017 (-0.039, 0.074)	0.052 (-0.007, 0.111)
Currently married		
With spouse	Ref	Ref
Temporarily separated with spouse	0.283* (0.058, 0.507)	0.272** (0.069, 0.476)
No spouse	-0.012 (-0.078, 0.054)	-0.004 (-0.070, 0.062)
Age	-0.006** (-0.010, -0.002)	-0.005* (-0.009, -0.001)
Region		
East	Ref	Ref
Middle	-0.043 (-0.124, 0.038)	-0.038 (-0.121, 0.044)
Northeast	0.020 (-0.142, 0.182)	0.012 (-0.144, 0.168)
West	-0.171*** (-0.247, -0.094)	-0.149*** (-0.224, -0.074)
Having no health insurance		-0.068 (-0.183, 0.046)
Elders' education		
More than primary school		Ref
Primary school		-0.054 (-0.142, 0.033)
No formal education		-0.122* (-0.218, -0.026)
Per capita household income		
Fourth quartile(highest)		Ref
Third quartile		0.008 (-0.114, 0.130)
Second quartile		-0.018 (-0.143, 0.106)
First quartile (lowest)		-0.015 (-0.137, 0.107)
Per capita household wealth		
Fourth quartile(highest)		Ref
Third quartile		-0.033 (-0.136, 0.071)
Second quartile		-0.012 (-0.118, 0.095)
First quartile (lowest)		0.017 (-0.085, 0.120)
Number of children having at least some college education		0.003 (-0.066, 0.072)
Number of children having a yearly income more than 20000 yuan		0.028** (0.006, 0.050)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 14 The effect of passive urbanization on hypertension control (Hypothesis 3 & 4b, N=2074)

Variable	Marginal effects (95% CI)	
	Hypothesis 3 (reduced form model)	Hypothesis 4b, 4c (structural form model)
Being passively urbanized	0.031 (-0.009, 0.071)	0.028 (-0.012, 0.068)
Children's monetary & in-kind transfers		0.000001 (-0.00003, 0.00003)
Children's informal care hours		0.003 (-0.001, 0.006)
Seeing children daily		-0.022 (-0.060, 0.017)
Female	-0.013 (-0.050, 0.024)	-0.012 (-0.050, 0.025)
Currently married		
With spouse	Ref	Ref
Temporarily separated with spouse	-0.097* (-0.187, -0.007)	-0.096* (-0.186, -0.006)
No spouse	-0.034 (-0.082, 0.014)	-0.032 (-0.080, 0.016)
Age	-0.005*** (-0.008, -0.003)	-0.006*** (-0.009, -0.003)
Region		
East	Ref	Ref
Middle	-0.021 (-0.078, 0.036)	-0.022 (-0.078, 0.034)
Northeast	0.018 (-0.087, 0.122)	-0.016 (-0.093, 0.124)
West	-0.076** (-0.128, -0.023)	-0.069** (-0.121, -0.017)
Having no health insurance		-0.014 (-0.083, 0.055)
Elders' education		
More than primary school		Ref
Primary school		-0.040 (-0.100, 0.020)
No formal education		-0.027 (-0.094, 0.040)
Per capita household income		
Fourth quartile(highest)		Ref
Third quartile		-0.024 (-0.092, 0.043)
Second quartile		-0.022 (-0.096, 0.051)
First quartile (lowest)		-0.032 (-0.102, 0.038)
Per capita household wealth		
Fourth quartile(highest)		Ref
Third quartile		-0.002 (-0.061, 0.058)
Second quartile		-0.005 (-0.071, 0.061)
First quartile (lowest)		-0.020 (-0.049, 0.089)
Number of children having at least some college education		-0.015 (-0.050, 0.020)
Number of children having a yearly income more than 20000 yuan		-0.013* (0.001, 0.026)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 15 The effects of passive urbanization on children's family support (Hypothesis 4a, N=2074)

	Marginal Effects (95% CI)		
Hypothesis	Financial support	Informal care	Daily contact
Passively urbanized elders	2035.31	0.081	0.032
	(-567.26, 4637.88)	(-5.39, 5.55)	(-0.030, 0.094)
Female	-1969.25	0.77	0.005
	(-5681.31, 1742.82)	(-5.01, 6.56)	(-0.036, 0.046)
Marital status			
With spouse	Ref	Ref	Ref
Temporarily separated with	-1780.46	2.46	0.089
spouse	(-5155.39, 1594.47)	(-2.70, 7.62)	(-0.076, 0.253)
No spouse	1875.06	11.06**	0.054
	(-2510.04, 6260.17)	(4.56, 1.76)	(-0.001, 0.109)
Age	-10.58	0.90*	0.003
	(-117.70, 96.53)	(0.19, 1.61)	(-0.001, 0.007)
Region			
East	Ref	Ref	Ref
Middle	-2251.30	6.84	-0.055
	(-5741.72, 1239.12)	(-3.12, 1.68)	(-0.128, 0.017)
Northeast	-3217.60	12.22	0.008
	(-7391.44, 956.24)	(-6.61, 31.03)	(-0.113, 0.130)
West	-3110.23	6.31*	0.026
	(-6647.81, 427.36)	(1.05, 11.57)	(-0.104, 0.052)
Number of female children	1138.37	-0.58	0.026*
	(-521.82, 2798.55)	(-4.29, 3.13)	(0.004, 0.047)
Number of male children	1422.14	-3.13	0.052***
	(-109.59, 2953.87)	(-7.20, 9.33)	(0.028, 0.076)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Table 16 The effect of passive urbanization on hypertension awareness mediated by family support (Hypothesis 4c, N=2074)

Estimate (95% CI)	Children's financial support	Children's instrumental support	Daily contact	All family support
Controlled direct effect	0.026 (-0.029, 0.081)	0.036 (-0.019, 0.092)	0.036 (-0.020, 0.091)	0.026 (-0.029, 0.082)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension control compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 17 The effect of passive urbanization on hypertension treatment mediated by family support (Hypothesis 4c, N=2074)

Estimate (95% CI)	Children's financial support	Children's instrumental support	Daily contact	
Controlled direct effect	0.031 (-0.018, 0.080)	0.042 (-0.007, 0.092)	0.042 (-0.007, 0.092)	0.031 (-0.018, 0.080)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension control compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 18 The effect of passive urbanization on hypertension control mediated by family support (Hypothesis 4c, N=2074)

Estimate (95% CI)	Children's financial support	Children's instrumental support	Daily contact	All family support
Controlled direct effect	0.030 (-0.004, 0.063)	0.029 (-0.004, 0.063)	0.030 (-0.002, 0.063)	0.030 (-0.003, 0.063)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension control compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 19 The effect of passive urbanization on hypertension management stratified by living arrangements (Hypothesis 3 & 4b, N=2074)

	Living with children N=869		Not living with children N=1205	
Marginal effects (95% CI)	Hypothesis 3	Hypothesis 4b	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness				
Passively urbanized elders	-0.002	-0.002	0.067	0.068
	(-0.087, 0.082)	(-0.097, 0.067)	(-0.008, 0.142)	(-0.002, 0.139)
Children's monetary &		0.0001		0.00006
in-kind transfers		(-0.0006, 0.0008)		(-0.0001, 0.0002)
Children's informal care		0.001		0.010
hours		(-0.006, 0.008)		(-0.005, 0.024)
Children's daily contact		--		0.050
				(-0.016, 0.114)
Outcome: Hypertension Treatment				
Passively urbanized elders	-0.005	-0.020	0.082*	0.080*
	(-0.088, 0.078)	(-0.101, 0.060)	(0.005, 0.159)	(0.006, 0.154)
Children's monetary &		0.0002		0.0001
in-kind transfers		(-0.0004, 0.0009)		(-0.0001, 0.0003)
Children's informal care		0.001		0.011
hours		(-0.005, 0.007)		(-0.003, 0.026)
Children's daily contact				0.032
				(-0.027, 0.092)
Outcome: Hypertension Control				
Passively urbanized elders	-0.035	-0.051*	0.101**	0.104**
	(-0.081, 0.011)	(-0.098, -0.004)	(0.038, 0.163)	(0.045, 0.162)
Children's monetary &		0.0004*		-0.0003
in-kind transfers		(0.0001, 0.0007)		(-0.0006, 0.0001)
Children's informal care		0.0018		0.005
hours		(-0.0009, 0.0046)		(-0.007, 0.018)
Children's daily contact		--		0.001
				(-0.049, 0.052)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Table 20 The effects of passive urbanization on children's family support stratified by living arrangements (Hypothesis 3 & 4b, N=2074)

	Living with children N=869			Not living with children N=1205		
Marginal Effects (95% CI)	Financial support†	Instrumental support	Daily contact	Financial support†	Instrumental support	Daily contact
Passively urbanized elders	910.31 (-465.02, 2285.64)	1.205 (-8.686, 1.110)	--	3202.38 (-1836.09, 8240.85)	-1.765 (-5.640, 2.110)	0.025 (-0.064, 0.113)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Table 21 The effect of passive urbanization on hypertension management mediated by children's family support stratified by living arrangements (Hypothesis 4c, N=2074)

	Hypertension awareness		Hypertension treatment		Hypertension control	
Controlled direct effect estimate (95% CI)	Living with children	Not living with children	Living with children	Not living with children	Living with children	Not living with children
Financial support	-0.024 (-0.118, 0.070)	0.069* (0.005, 0.134)	-0.029 (-0.114, 0.056)	0.081** (0.030, 0.132)	-0.042 (-0.093, 0.009)	0.104*** (0.057, 0.151)
Instrumental support	-0.004 (-0.098, 0.091)	0.072* (0.008, 0.135)	-0.006 (-0.093, 0.082)	0.085** (0.034, 0.136)	-0.036 (-0.086, 0.014)	0.101*** (0.053, 0.148)
Daily contact	-	0.069* (0.006, 0.133)	-	0.082** (0.031, 0.133)	-	0.101*** (0.054, 0.148)
All family support	-0.024 (-0.118, 0.069)	0.071* (0.006, 0.135)	-0.030 (-0.114, 0.055)	0.083** (0.032, 0.134)	-0.042 (-0.094, 0.009)	0.104*** (0.057, 0.151)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Table 22 Results summary for the outcome of depressive symptoms

Hypothesis	Support Hypothesis (Y/N)	Support main analysis results (Y/N)
Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.		
Main analysis	Y	-
Stratified analysis		
Living with children	Y	Y
Not living with children	N	N
Women	N	N
Men	N	N
Married	N	N
Unmarried	N	N
Good health	N	N
Poor health	N	N
Passively urbanized in 2005-2008	N	N
Passively urbanized in 2009-2011	N	N
Passively urbanized in remote rural areas	N	N
Passively urbanized in suburban areas	Y	Y
Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.		
Main analysis	Y (only in financial support)	-
Stratified analysis		
Living with children	Y (only in financial support)	Y
Not living with children	N	N
Women	Y (only in financial support)	Y
Men	N	N
Married	Y (only in financial support)	Y
Unmarried	N	N
Good health	Y (only in financial support)	Y
Poor health	N	N
Passively urbanized in 2005-2008	N	N
Passively urbanized in 2009-2011	N	N
Passively urbanized in remote rural areas	N	N
Passively urbanized in suburban areas	Y (only in contact frequency)	N

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

Main analysis	Y (only in contact frequency)	-
-Stratified analysis		
Living with children	N	N
Not living with children	Y (in financial support and contact frequency)	N
Women	Y (only in contact frequency)	Y
Men	Y (only in contact frequency)	Y
Married	Y (only in contact frequency)	Y
Unmarried	Y (only in contact frequency)	Y
Good health	N	N
Poor health	Y (only in contact frequency)	Y
Passively urbanized in 2005-2008	Y (only in financial support)	N
Passively urbanized in 2009-2011	Y (only in contact frequency)	N
Passively urbanized in remote rural areas	Y (only in financial support)	N
Passively urbanized in suburban areas	Y (only in financial support)	N

*Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' mental well-being become smaller, compared to the effects of passive urbanization before controlling for children's family support.**

Main analysis	N	-
Stratified analysis		
Living with children	N	Y
Not living with children	N	Y
Women	N	Y
Men	N	Y
Married	N	Y
Unmarried	N	Y
Good health	N	Y
Poor health	N	Y
Passively urbanized in 2005-2008	N	Y

Passively urbanized in 2009-2011	N	Y
Passively urbanized in remote rural areas	N	Y
Passively urbanized in suburban areas	N	Y

Note: *Controlled direct effects, instead of regression coefficients of passive urbanization, are used for testing hypotheses 2c and 4c.

Table 23 Results summary for the outcome of hypertension management

Hypothesis	Support Hypothesis (Y/N)	Support main analysis results (Y/N)
Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.		
Main analysis	N	-
Stratified analysis		
Living with children	N	Y
Not living with children	Y (in hypertension treatment and control)	N
Women	Y (in hypertension control)	N
Men	Y (in hypertension awareness)	N
Married	Y (in hypertension awareness and treatment)	N
Unmarried	N	Y
Good health	N	Y
Poor health	N	Y
Passively urbanized in 2005-2008	N	Y
Passively urbanized in 2009-2011	N	Y
Passively urbanized in remote rural areas	N	Y
Passively urbanized in suburban areas	N	Y
Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.		
Main analysis	N	-
Stratified analysis		
Living with children	N	Y
Not living with children	N	Y
Women	N	Y
Men	N	Y
Married	N	Y
Unmarried	N	Y
Good health	N	Y
Poor health	N	Y
Passively urbanized in 2005-2008	N	Y
Passively urbanized in 2009-2011	N	Y
Passively urbanized in remote rural areas	N	Y
Passively urbanized in suburban areas	N	Y
Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status,		

and children's SES.		
Main analysis	N	-
Stratified analysis		
Living with children	Y (only in financial support for hypertension control)	N
Not living with children		
Women	N	Y
Men	Y (only in informal care for hypertension control)	N
Married	Y (only in informal care for hypertension control)	N
Unmarried	N	Y
Good health	N	Y
Poor health	N	Y
Passively urbanized in 2005-2008	Y (only in informal care for hypertension awareness)	N
Passively urbanized in 2009-2011	N	Y
Passively urbanized in remote rural areas	N	Y
Passively urbanized in suburban areas	N	Y

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.*

Main analysis	N	-
Stratified analysis		
Living with children	N	Y
Not living with children	N	Y
Women	N	Y
Men	N	Y
Married	N	Y
Unmarried	N	Y
Good health	N	Y
Poor health	N	Y
Passively urbanized in 2005-2008	N	Y
Passively urbanized in 2009-2011	N	Y
Passively urbanized in remote rural areas	N	Y
Passively urbanized in suburban areas	N	Y

Note: *Controlled direct effects, instead of regression coefficients of passive urbanization, are used for testing hypotheses 2c and 4c.

Appendix:

Appendix Table 1 Descriptive statistics considering the role of timing and location for depressive symptoms (with survey weights)

	Passively urbanized elders in planned areas, N=637	Passively urbanized elders in unplanned areas, N=1284	Those who were passively urbanized in 2009-2011, N=1250	Those who were passively 6rbanized in 2005-2008, N=715
Outcome Variables:				
% having depressive symptoms (CES-D scores ≥10), (95% CI)	37.06%** (31.73%, 42.73%)	46.40% (41.87%, 51.00%)	43.10% (38.37%, 47.97%)	40.33% (33.91%, 47.09%)
Mediators:				
Children's financial transfers, yuan per year, mean (95% CI)	4542.52 (944.68, 8140.37)	2099.87 (1369.79, 2829.96)	2390.03 (1410.87, 3369.19)	4736.68 (1360.36, 8113.00)
Children's informal care hours per month, mean (95% CI)	9.88 (2.96, 16.80)	7.07 (2.97, 11.17)	8.95 (4.26, 13.65)	5.94 (1.20, 10.69)
% Seeing children daily, (95% CI)	79.82%* (73.07%, 85.22%)	71.51% (66.38%, 76.15%)	75.11% (69.71%, 79.83%)	75.88% (69.77%, 81.09%)
Covariates:				
% female, (95% CI)	50.54% (47.83%, 53.24%)	53.71%* (51.54%, 55.87%)	51.29% (48.01%, 54.55%)	51.38% (47.93%, 54.81%)
Age, mean (95% CI)	69.26 (68.43, 70.11)	69.60 (68.99, 70.21)	69.18 (68.58, 69.79)	69.70 (68.85, 70.55)
% Currently married and lived with spouse, (95% CI)	71.83% (65.77%, 77.19%)	68.76% (65.20%, 72.12%)	68.48% (63.10%, 73.40%)	69.66% (64.81%, 74.11%)
% Currently married but separated with spouse temporarily, (95% CI)	2.73% (1.42%, 5.16%)	3.21% (2.24%, 4.56%)	5.07% (1.81%, 13.39%)	4.30% (2.86%, 6.44%)
% Currently not married, (95% CI)	25.44% (20.15%, 31.57%)	28.03% (24.72%, 31.60%)	26.45% (22.60%, 30.71%)	26.03% (21.65%, 30.95%)
% east, (95% CI)	45.67%* (29.98%, 62.27%)	26.46% (17.04%, 38.65%)	31.25% (21.27%, 43.33%)	38.19% (23.97%, 54.76%)
% middle, (95% CI)	23.00% (11.64%, 40.40%)	26.88% (17.79%, 38.45%)	30.41% (20.52%, 42.52%)	20.35% (11.24%, 34.02%)
% west, (95% CI)	28.32% (15.48%,	40.73% (29.49%,	36.09% (25.29%,	32.34% (19.42%,

	46.03%)	53.03%)	48.51%)	48.65%)
% northeast, (95% CI)	3.00%	5.93%	2.25%	9.12%
	(0.42%, 18.57%)	(2.36%, 14.12%)	(0.50%, 9.44%)	(3.33%, 22.66%)
Number of female children,	1.40***	1.69	1.58*	1.63
mean (95% CI)	(1.22, 1.58)	(1.59, 1.79)	(1.47, 1.68)	(1.44, 1.83)
Number of male children,	1.82	1.90	1.84	1.90
mean (95% CI)	(1.67, 1.96)	(1.81, 2.00)	(1.74, 1.93)	(1.77, 2.03)
Number of difficult ADLs,	0.17	0.26	0.21	0.26
mean (95% CI)	(0.12, 0.23)	(0.20, 0.32)	(0.16, 0.27)	(0.17, 0.35)
Number of difficult IADLs,	0.47	0.63	0.56	0.56
mean (95% CI)	(0.36, 0.58)	(0.52, 0.73)	(0.46, 0.66)	(0.43, 0.69)
% self-rating health as very	5.24%*	7.03%	6.11%	6.65%
poor, (95% CI)	(3.56%, 7.64%)	(5.30%, 9.28%)	(4.53%, 8.21%)	(4.66%, 9.40%)
% self-rating health as poor,	24.28%***	31.11%	27.38%**	29.21%
(95% CI)	(20.29%,	(28.01%,	(23.91%,	(25.32%.
	28.76%)	34.39%)	31.14%)	33.44%)
% self-rating health as fair,	49.67%*	41.92%	47.30%	42.97%
(95% CI)	(44.44%,	(38.34%,	(42.87%,	(37.49%,
	54.90%)	45.58%)	51.78%)	48.62%)
% self-rating health as good,	14.75%	14.61%	13.83%	15.79%*
(95% CI)	(11.61%,	(12.14%,	(11.22%,	(12.60%,
	18.57%)	17.49%)	16.93%)	19.62%)
% self-rating health as very	6.06%*	5.33%*	5.38%*	5.38%
good, (95% CI)	(4.06%, 8.95%)	(3.76%, 7.49%)	(3.89%, 7.38%)	(3.38, 8.45%)
% education, (95% CI)				
No formal education	41.90%	47.16%	42.07%	46.79%
	(35.21%,	(42.83%,	(37.24%,	(40.17%,
	48.91%)	51.54%)	47.06%)	53.53%)
Primary school	46.20%	42.69%	45.61%	43.66%
	(40.37%,	(38.45%,	(40.63, 50.67%)	(37.86%,
	52.13%)	47.04%)		49.64%)
More than primary	11.90%	10.15%	12.33%*	9.54%
education	(8.58%, 16.28%)	(8.07%, 12.69%)	(9.70%, 15.55%)	(6.88%, 13.10%)
Per capita household income,	6504.45**	4949.93*	5666.63***	6022.05**
mean (95% CI)	(4776.99,	(3962.91,	(4668.48,	(4310.09,
	8231.91)	5936.95)	6664.78)	7734.01)
Per capita household income	48199.96	70117.76	70943.1	43982.82
, mean (95% CI)	(17871.67,	(736.76,	(659.56,	(16524.14,
	78528.26)	139498.7)	141226.6)	71441.5)

Note: *p < .05, **p < .01, ***p<0.001, comparing to long-term rural elders

Appendix Table 2 Descriptive statistics considering the role of timing and location for hypertension management (with survey weights)

	Passively urbanized elders in planned areas, N=637	Passively urbanized elders in unplanned areas, N=1284	Those who were passively urbanized in 2009-2011, N=1250	Those who were passively urbanized in 2005-2008, N=715
Outcome Variables:				
% hypertension awareness, (95% CI)	54.28% (43.78%, 64.41%)	54.34% (48.29%, 60.27%)	60.32% (51.94%, 68.13%)	51.51% (41.14%, 61.76%)
% hypertension treatment, (95% CI)	44.65% (34.68%, 55.06%)	46.78% (40.92%, 52.73%)	51.61% (42.36%, 60.76%)	44.33% (34.83%, 54.26%)
% hypertension control, (95% CI)	16.70% (10.72%, 25.08%)	16.36% (12.42%, 21.25%)	14.76% (10.59%, 20.20%)	16.47% (10.95%, 24.02%)
Mediators:				
Children's financial transfers, yuan per year, mean (95% CI)	6318.27 (-1151.36, 13787.91)	2102.15 (1458.54, 2745.76)	2356.54 (1434.12, 3278.96)	5810.71 (-644.97, 12266.39)
Children's informal care hours per month, mean (95% CI)	11.52 (-2.78, 25.83)	5.04 (2.10, 7.97)	8.74 (1.33, 16.15)	4.23 (-0.19, 8.65)
% Seeing children daily, (95% CI)	83.70% (76.90%, 88.79%)	71.63% (63.81%, 78.34%)	78.62% (71.89%, 84.09%)	75.47% (64.08%, 84.14%)
Covariates:				
% female, (95% CI)	56.89% (49.25%, 64.22%)	57.03% (52.64%, 61.31%)	54.09% (44.74%, 63.15%)	53.43% (46.18%, 60.53%)
Age, mean (95% CI)	70.18 (68.74, 71.61)	70.62 (69.76, 71.48)	69.66 (68.62, 70.70)	71.27 (70.20, 72.34)
% Currently married and lived with spouse, (95% CI)	69.84% (60.23%, 77.98%)	64.88% (59.68%, 69.75%)	62.86% (51.27%, 73.14%)	64.11% (56.52%, 71.05%)
% Currently married but separated with spouse temporarily, (95% CI)	1.74% (0.71%, 4.19%)	2.54% (1.50%, 4.25%)	9.18% (1.78%, 36.00%)	3.27% (1.76%, 5.98%)
% Currently not married, (95% CI)	28.41% (20.14%, 38.45%)	32.58% (27.67%, 37.90%)	27.96% (21.49%, 35.49%)	32.62% (25.63%, 40.49%)
% east, (95% CI)	51.23%* (33.52%, 68.63%)	28.28% (16.30%, 44.40%)	37.06% (23.66%, 52.79%)	41.48% (23.42%, 62.16%)

% middle, (95% CI)	22.35% (10.65%, 41.00%)	25.91% (16.34%, 38.50%)	29.95% (19.25%, 43.40%)	15.58%* (7.71%, 28.97%)
% west, (95% CI)	22.52% (11.05%, 40.47%)	39.51% (27.15%, 53.36%)	30.23% (19.46%, 43.71%)	33.71% (18.90%, 52.59%)
% northeast, (95% CI)	3.90% (0.54%, 23.13%)	6.30% (2.49%, 15.06%)	2.77% (0.61%, 11.61%)	9.23% (3.26%, 23.47%)
Number of female children, mean (95% CI)	1.39 (1.13, 1.66)	1.73 (1.55, 1.91)	1.64 (1.47, 1.81)	1.64 (1.35, 1.92)
Number of male children, mean (95% CI)	1.88 (1.67, 2.09)	1.98 (1.87, 2.09)	1.91 (1.79, 2.03)	2.00 (1.83, 2.17)
Number of children having at least some college education, mean (95% CI)	0.11 (0.06, 0.16)	0.14 (0.10, 0.19)	0.13 (0.08, 0.17)	0.14 (0.07, 0.20)
Number of children having a yearly income ≥ 20000 yuan, mean (95% CI)	0.90 (0.63 1.18)	1.06 (0.75, 1.37)	0.90 (0.74, 1.05)	1.21 (0.73, 1.69)
% no health insurance, (95% CI)	6.58% (3.64%, 11.61%)	6.82% (4.53%, 10.14%)	8.23% (5.56%, 12.02%)	3.74% (2.05%, 6.70%)
% education, (95% CI)				
No formal education	48.12% (39.47%, 56.88%)	48.40% (42.08%, 54.78%)	43.30% (34.81%, 52.20%)	48.49% (39.19%, 57.90%)
Primary school	42.05% (34.97%, 49.47%)	42.44% (35.73%, 49.43%)	45.33% (35.83%, 55.19%)	44.23% (34.17%, 54.79%)
More than primary education	9.83% (6.67%, 14.25%)	9.16% (6.86%, 12.15%)	11.37% (8.33%, 15.33%)	7.28% (4.75%, 11.00%)
Per capita household income, mean (95% CI)	6269.48** (4641.66, 7897.30)	5169.47* (3906.68, 6432.26)	5492.07** (4210.59, 6773.54)	6171.15* (3874.12, 8468.18)
Per capita household income, mean (95% CI)	53427.01 (22626.67, 84227.35)	47033.93 (4665.99, 89401.87)	45036.02 (3554.87, 86517.16)	46522.33 (20855.61, 72189.04)

Note: *p < .05, **p < .01, ***p<0.001, comparing to long-term rural elders

Appendix Table 3 The effects of passive urbanization on depressive symptoms stratified by gender (Hypothesis 1 & 2b, N=4651)

Marginal Effects (95% CI)	Women N=2333		Men N=2318	
	Hypothesis 1	Hypothesis 2b	Hypothesis 1	Hypothesis 2b
Passively urbanized elders	-0.052 (-0.109, 0.004)	0.0003 (-0.047, 0.048)	-0.039 (-0.091, 0.013)	-0.006 (-0.042, 0.053)
Children's monetary & in-kind transfers		-0.0002 (-0.0005, 0.0002)		-0.0004 (-0.0009, 0.0002)
Children's informal care hours		0.004 (-0.003, 0.010)		0.004 (-0.003, 0.012)
Children's daily contact		-0.045 (-0.093, 0.002)		-0.051* (-0.097, -0.005)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region. (Gender is omitted here.)

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status. (Gender is omitted here.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 4 The effects of passive urbanization on children's family support stratified by gender (Hypothesis 2a, N=4651)

	Women N=2333			Men N=2318		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	870.92 (-5.29, 1747.13)	-0.42 (-8.17, 7.34)	0.037 (-0.014, 0.088)	2192.69 (-459.31, 4844.69)	-1.62 (-5.52, 2.28)	0.044 (-0.014, 0.102)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Gender is omitted here.)

Appendix Table 5 The effects of passive urbanization on depressive symptoms mediated by children's family support stratified by gender (Hypothesis 2c, N=4651)

Marginal effects (95% CI)	Financial support	Instrumental support	Daily contact	All family support
Women	-0.050*	-0.052*	-0.050*	-0.048*
N=2333	(-0.097, -0.003)	(-0.099, -0.006)	(-0.097, -0.003)	(-0.095, -0.001)
Men	-0.043	-0.043	-0.043	-0.040
N=2318	(-0.088, 0.003)	(-0.089, 0.003)	(-0.089, 0.003)	(-0.086, 0.005)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Gender is omitted here.)

Appendix Table 6 The effects of passive urbanization on depressive symptoms stratified by marital status (Hypothesis 1 & 2b, N=4651)

	Married N=3603		Unmarried N=1048	
Marginal Effects (95% CI)	Hypothesis 1	Hypothesis 2b	Hypothesis 1	Hypothesis 2b
Passively urbanized elders	-0.037 (-0.087, 0.013)	0.011 (-0.032, 0.055)	-0.070 (-0.146, 0.005)	-0.019 (-0.085, 0.048)
Children's monetary & in-kind transfers		-0.0004 (-0.001, 0.0001)		-0.00004 (-0.0001, 0.0001)
Children's informal care hours		0.003 (-0.004, 0.009)		0.006 (-0.001, 0.013)
Children's daily contact		-0.045* (-0.085, -0.005)		-0.054* (-0.127, -0.020)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region. (Marital status is omitted here.)

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status. (Marital status is omitted here.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 7 The effects of passive urbanization on children's family support stratified by marital status (Hypothesis 2a, N=4651)

	Married N=3603			Unmarried N=1048		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	1058.73* (28.88, 2088.57)	-0.52 (-3.20, 2.16)	0.046 (-0.015, 0.107)	2632.87 (-1924.72, 7190.46)	-3.10 (-17.99, 11.79)	0.026 (-0.028, 0.080)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Marital status is omitted here.)

Appendix Table 8 The effects of passive urbanization on depressive symptoms mediated by children's family support stratified by marital status (Hypothesis 4c, N=4651)

Marginal effects (95% CI)	Financial support	Instrumental support	Daily contact	All family support
Married	-0.036	-0.038*	-0.037	-0.034
N=3603	(-0.072, 0.00001)	(-0.075, -0.001)	(-0.073, 0.00005)	(-0.070, 0.002)
Unmarried	-0.080*	-0.082*	-0.081*	-0.078*
N=1048	(-0.155, -0.005)	(-0.158, -0.007)	(-0.155, -0.006)	(-0.155, -0.002)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Marital status is omitted here.)

Appendix Table 9 The effects of passive urbanization on depressive symptoms stratified by physical health (Hypothesis 1 & 2b, N=4651)

	Poor physical health N=1762		Good physical health N=2889	
Marginal Effects (95% CI)	Hypothesis 1	Hypothesis 2b	Hypothesis 1	Hypothesis 2b
Passively urbanized elders	0.012	0.028	-0.045	-0.012
	(-0.046, 0.069)	(-0.025, 0.081)	(-0.096, 0.006)	(-0.060, 0.036)
Children's monetary & in-kind transfers		-0.0003		-0.0002
		(-0.0007, 0.0001)		(-0.0006, 0.0002)
Children's informal care hours		0.012		0.0005
		(-0.010, 0.033)		(-0.006, 0.007)
Children's daily contact		-0.084***		-0.030
		(-0.132, -0.036)		(-0.076, 0.016)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region. (Self-reported health is omitted.)

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status. (Self-reported health is omitted.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 10 The effects of passive urbanization on children's family support stratified by physical health (Hypothesis 2a, N=4651)

	Poor physical health N=1762			Good physical health N=2889		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	2042.08 (-1533.68, 5617.83)	1.53 (-8.92, 11.98)	0.025 (-0.039, 0.090)	1170.78* (155.55, 2186.02)	-1.37 (-4.71, 1.97)	0.051 (-0.005, 0.108)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Self-reported health is omitted.)

Appendix Table 11 The effects of passive urbanization on depressive symptoms mediated by children's family support stratified by physical health (Hypothesis 2c, N=4651)

Marginal effects (95% CI)	Financial support	Instrumental support	Daily contact	All family support
Poor physical health	0.018	0.015	0.017	0.020
N=1762	(-0.036, 0.072)	(-0.039, 0.068)	(-0.036, 0.070)	(-0.033, 0.073)
Good physical health	-0.052**	-0.052**	-0.051**	-0.051**
N=2889	(-0.089, 0.015)	(-0.091, 0.014)	(-0.090, -0.013)	(-0.088, -0.013)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level. (Self-reported health is omitted.)

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Self-reported health is omitted.)

Appendix Table 12 The effects of passive urbanization on depressive symptoms stratified by time (Hypothesis 1 & 2b)

	Passively urbanized in 2005-2008 N=3393		Passively urbanized in 2009-2011 N=3928	
Marginal Effects (95% CI)	Hypothesis 1	Hypothesis 2b	Hypothesis 1	Hypothesis 2b
Passively urbanized elders	-0.059	-0.008	-0.039	0.009
	(-0.130, 0.011)	(-0.068, 0.052)	(-0.089, 0.011)	(-0.033, 0.051)
Children's monetary & in-kind transfers		-0.0004*		-0.0002
		(-0.0007, -0.00001)		(-0.0005, 0.0002)
Children's informal care hours		0.003		0.004
		(-0.003, 0.010)		(-0.001, 0.009)
Children's daily contact		-0.039		-0.047*
		(-0.081, 0.004)		(-0.085, -0.008)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 13 The effects of passive urbanization on children's family support stratified by time (Hypothesis 2a)

	Passively urbanized in 2005-2008 N=3393			Passively urbanized in 2009-2011 N=3928		
Marginal Effects (95% CI)	Financial support†	Instrumental support	Daily contact	Financial support†	Instrumental support	Daily contact
Passively urbanized elders	2865.60 (-258.89, 5990.09)	-3.19 (-8.07, 1.70)	0.043 (-0.027, 0.113)	693.80 (-309.49, 1697.97)	0.08 (-5.24, 5.39)	0.043 (-0.020, 0.107)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a (4a): Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Appendix Table 14 The effects of passive urbanization on depressive symptoms mediated by children's family support stratified by time (Hypothesis 2c)

Marginal effects (95% CI)	Financial support	Instrumental support	Daily contact	All family support
Passively urbanized in 2005-2008 N=3393	-0.065** (-0.114, 0.016)	-0.062* (-0.110, 0.014)	-0.061* (-0.110, 0.013)	-0.063* (-0.112, -0.014)
Passively urbanized in 2009-2011 N=3928	-0.037* (-0.070, -0.004)	-0.041* (-0.075, -0.008)	-0.039* (-0.072, -0.006)	-0.035* (-0.068, -0.002)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Appendix Table 15 The effects of passive urbanization on depressive symptoms including the city planning area (Hypothesis 1 & 2b, N=4651)

Variable	Marginal Effects (95% CI)	
	Hypothesis 1 (reduced form model)	Hypothesis 2b (structural form model)
Long-term rural & Outside the city planning area	Ref	Ref
Long-term rural & Within the city planning area	0.017 (-0.089, 0.123)	0.009 (-0.080, 0.097)
Passively urbanized & Outside the city planning area	-0.023 (-0.076, 0.029)	-0.002 (-0.045, 0.042)
Passively urbanized & Within the city planning area	-0.087* (-0.153, -0.020)	-0.021 (-0.080, 0.038)
Children's monetary & in-kind transfers		-0.0002 (-0.0005, 0.00005)
Children's informal care hours		0.004 (-0.0005, 0.009)
Seeing children daily		-0.050** (-0.087, -0.013)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 1: Passively urbanized elders had less depressive symptoms than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 2b: Receiving more family support was associated with less depressive symptoms, controlling for gender, age, marital status, region, physical well-being, SES, and urbanization status.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 16 The effects of passive urbanization on children's family support including the city planning area (Hypothesis 2a, N=4651)

	Marginal Effects (95% CI)		
Hypothesis	Financial support	Informal care	Daily contact
Long-term rural & Outside the city planning area	Ref	Ref	Ref
Long-term rural & Within the city planning area	-150.66 (-1468.97, 1167.65)	-6.35** (-10.90, -1.80)	0.053 (-0.047, 0.154)
Passively urbanized & Outside the city planning area	570.40 (-351.86, 1492.67)	-3.18 (-8.29, 1.93)	0.014 (-0.048, 0.075)
Passively urbanized & Within the city planning area	3090.94 (-346.65, 6528.52)	2.00 (-4.90, 8.90)	0.105** (0.037, 0.174)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Appendix Table 17 The effects of passive urbanization on depressive symptoms mediated by children's family support including the city planning area (Hypothesis 2c, N=4651)

Controlled direct effect (95% CI)	Children's financial support	Children's instrumental support	Daily contact	All family support
Long-term rural & Outside the city planning area	Ref	Ref	Ref	
Long-term rural & Within the city planning area	0.019 (-0.072, 0.110)	0.038 (-0.051, 0.127)	0.039 (-0.050, 0.129)	0.021 (-0.070, 0.113)
Passively urbanized & Outside the city planning area	-0.012 (-0.045, 0.022)	-0.011 (-0.045, 0.022)	-0.012 (-0.046, 0.022)	-0.011 (-0.045, 0.022)
Passively urbanized & Within the city planning area	-0.078** (-0.128, -0.028)	-0.078** (-0.128, -0.029)	-0.075** (-0.124, -0.026)	-0.075** (-0.125, -0.026)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on depressive symptoms compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 2c: After controlling for children's family support, the effects of passive urbanization on elders' depressive symptoms become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Appendix Table 18 The effect of passive urbanization on hypertension management stratified by gender (Hypothesis 3 & 4b, N=2074)

Marginal effects (95% CI)	Women N=1156		Men N=918	
	Hypothesis 3	Hypothesis 4b	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness				
Passively urbanized elders	-0.013 (-0.092, 0.066)	-0.019 (-0.094, 0.056)	0.087* (0.014, 0.160)	0.097** (0.026, 0.169)
Children's monetary & in-kind transfers		-0.0001 (-0.0007, 0.0006)		0.0002 (-0.0003, 0.0007)
Children's informal care hours		-0.002 (-0.009, 0.004)		0.013 (-0.006, 0.032)
Children's daily contact		0.011 (-0.062, 0.085)		0.005 (-0.071, 0.081)
Outcome: Hypertension Treatment				
Passively urbanized elders	0.010 (-0.072, 0.093)	0.001 (-0.076, 0.077)	0.069 (-0.006, 0.145)	0.079* (0.003, 0.155)
Children's monetary & in-kind transfers		0.0001 (-0.0005, 0.0007)		0.0001 (-0.0003, 0.0006)
Children's informal care hours		-0.003 (-0.010, 0.003)		0.010 (-0.001, 0.022)
Children's daily contact		-0.003 (-0.076, 0.069)		0.004 (-0.065, 0.073)
Outcome: Hypertension Control				
Passively urbanized elders	0.053* (0.004, 0.103)	0.048* (0.00004, 0.096)	0.011 (-0.042, 0.065)	0.020 (-0.037, 0.078)
Children's monetary & in-kind transfers		0.000001 (-0.0004, 0.0004)		0.000001 (-0.00003, 0.00003)
Children's informal care hours		-0.001 (-0.005, 0.003)		0.004 (-0.001, 0.010)
Children's daily contact		-0.022 (-0.073, 0.029)		-0.020 (-0.074, 0.034)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region. (Gender is omitted here.)

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. (Gender is omitted here.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 19 The effects of passive urbanization on children's family support stratified by gender (Hypothesis 4a, N=2074)

	Women N=1156			Men N=918		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	771.30 (-397.31, 1939.91)	3.57 (-4.88, 12.03)	0.066* (0.002, 0.130)	3725.54 (-2207.53, 9658.60)	-4.46 (-10.66, 17.43)	-0.022 (-0.100, 0.057)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Gender is omitted here.)

Appendix Table 20 The effect of passive urbanization on hypertension management mediated by children's family support stratified by gender (Hypothesis 4c, N=2074)

	Hypertension awareness		Hypertension treatment		Hypertension control	
Estimate (95% CI)	Women	Men	Women	Men	Women	Men
Controlled direct effect						
Financial support	-0.027 (-0.093, 0.039)	0.087* (0.003, 0.171)	-0.008 (-0.074, 0.059)	0.068 (-0.008, 0.144)	0.054** (0.018, 0.091)	0.010 (-0.050, 0.070)
Instrumental support	-0.009 (-0.077, 0.059)	0.093* (0.011, 0.175)	0.012 (-0.056, 0.080)	0.074 (-0.002, 0.149)	0.055** (0.019, 0.090)	0.009 (-0.049, 0.067)
Daily contact	-0.012 (-0.080, 0.057)	0.090* (0.007, 0.173)	0.010 (-0.059, 0.080)	0.070 (-0.006, 0.147)	0.056** (0.020, 0.093)	0.007 (-0.052, 0.066)
All family support	-0.026 (-0.092, 0.040)	0.090* (0.008, 0.173)	-0.005 (-0.071, 0.061)	0.070 (-0.004, 0.145)	0.056** (0.019, 0.093)	0.010 (-0.049, 0.069)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Gender is omitted here.)

Appendix Table 21 The effect of passive urbanization on hypertension management stratified by marital status (Hypothesis 3 & 4b, N=2074)

	Married N=1522		Unmarried N=552	
Marginal effects (95% CI)	Hypothesis 3	Hypothesis 4b	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness				
Passively urbanized elders	0.064	0.071*	-0.027	-0.046
	(-0.001, 0.128)	(0.007, 0.136)	(-0.128, 0.074)	(-0.144, 0.053)
Children's monetary & in-kind transfers		0.0003		0.0002
		(-0.0004, 0.0004)		(-0.0006, 0.001)
Children's informal care hours		0.012		-0.0001
		(-0.001, 0.025)		(-0.007, 0.007)
Children's daily contact		0.007		0.012
		(-0.051, 0.065)		(-0.115, 0.139)
Outcome: Hypertension Treatment				
Passively urbanized elders	0.072*	0.077*	-0.022	-0.043
	(0.005, 0.139)	(-0.008, 0.146)	(-0.123, 0.080)	(-0.140, 0.054)
Children's monetary & in-kind transfers		0.0002		0.0002
		(-0.0002, 0.0006)		(-0.0005, 0.001)
Children's informal care hours		0.008		-0.0001
		(-0.001, 0.016)		(-0.007, 0.007)
Children's daily contact		0.007		-0.018
		(-0.050, 0.063)		(-0.134, 0.098)
Outcome: Hypertension Control				
Passively urbanized elders	0.038	0.031	0.017	0.003
	(-0.013, 0.090)	(-0.021, 0.082)	(-0.041, 0.075)	(-0.052, 0.058)
Children's monetary & in-kind transfers		0.0001		-0.000001
		(-0.0002, 0.0005)		(-0.00003, 0.00001)
Children's informal care hours		0.008**		0.0005
		(0.003, 0.013)		(-0.003, 0.004)
Children's daily contact		-0.024		-0.028
		(-0.072, 0.023)		(-0.099, 0.043)

Note: Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region. (Marital status is omitted here.)

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. (Marital status is omitted here.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 22 The effects of passive urbanization on children's family support stratified by marital status (Hypothesis 4a, N=2074)

	Married N=1522			Unmarried N=552		
Marginal Effects (95% CI)	Financial support†	Instrumental support	Daily contact	Financial support†	Instrumental support	Daily contact
Passively urbanized elders	630.43 (-369.84, 1630.71)	-1.15 (-3.61, 1.32)	0.063 (-0.005, 0.131)	5466.63 (-3225.35, 14158.61)	2.49 (-13.40, 18.38)	-0.035, (-0.122, 0.051)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Marital status is omitted here.)

Appendix Table 23 The effect of passive urbanization on hypertension management mediated by children's family support stratified by marital status (Hypothesis 4c, N=2074)

	Hypertension awareness		Hypertension treatment		Hypertension control	
Estimate (95% CI)	Married	Unmarried	Married	Unmarried	Married	Unmarried
Controlled direct effect						
Financial support	0.072* (0.006, 0.138)	-0.050 (-0.159, 0.058)	0.080** (0.020, 0.141)	-0.051 (-0.151, 0.050)	0.026 (-0.019, 0.071)	0.019 (-0.036, 0.074)
Instrumental support	0.079* (0.013, 0.144)	-0.027 (-0.139, 0.084)	0.087** (0.026, 0.147)	-0.023 (-0.130, 0.083)	0.029 (-0.015, 0.072)	0.017 (-0.035, 0.069)
Daily contact	0.078* (0.013, 0.142)	-0.028 (-0.139, 0.083)	0.087* (0.027, 0.147)	-0.024 (-0.131, 0.083)	0.030 (-0.014, 0.074)	0.017 (-0.036, 0.069)
All family support	0.073* (0.008, 0.138)	-0.047 (-0.154, 0.060)	0.082** (0.022, 0.141)	-0.049 (-0.148, 0.051)	0.030 (-0.015, 0.074)	0.018 (-0.037, 0.073)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Marital status is omitted here.)

Appendix Table 24 The effect of passive urbanization on hypertension management stratified by physical health (Hypothesis 3 & 4b, N=2074)

	Poor health N=812		Good health N=1156	
Marginal effects (95% CI)	Hypothesis 3	Hypothesis 4b	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness				
Passively urbanized elders	0.016	0.010	0.055	0.049
	(-0.073, 0.105)	(-0.074, 0.094)	(-0.010, 0.119)	(-0.015, 0.113)
Children's monetary & in-kind transfers		0.0002		0.0001
		(-0.0004, 0.0007)		(-0.0003, 0.0006)
Children's informal care hours		-0.002		0.021
		(-0.008, 0.004)		(-0.004, 0.045)
Children's daily contact		0.003		0.019
		(-0.079, 0.085)		(-0.049, 0.087)
Outcome: Hypertension Treatment				
Passively urbanized elders	0.015	0.0006	0.066	0.054
	(-0.074, 0.104)	(-0.076, 0.077)	(-0.003, 0.135)	(-0.014, 0.123)
Children's monetary & in-kind transfers		0.0001		0.0002
		(-0.0005, 0.0007)		(-0.0003, 0.0006)
Children's informal care hours		-0.003		0.017
		(-0.010, 0.003)		(-0.001, 0.036)
Children's daily contact		-0.003		0.025
		(-0.076, 0.069)		(-0.041, 0.090)
Outcome: Hypertension Control				
Passively urbanized elders	0.039	0.040	0.036	0.030
	(-0.028, 0.107)	(-0.028, 0.109)	(-0.006, 0.078)	(-0.013, 0.073)
Children's monetary & in-kind transfers		-0.00001		0.0002
		(-0.0005, 0.0003)		(-0.0001, 0.0004)
Children's informal care hours		0.001		0.005
		(-0.003, 0.006)		(-0.002, 0.011)
Children's daily contact		-0.041		0.001
		(-0.106, 0.024)		(-0.043, 0.044)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region. (Self-reported health is omitted.)

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. (Self-reported health is omitted.)

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 25 The effects of passive urbanization on children's family support stratified by physical health (Hypothesis 4a, N=2074)

	Poor physical health N=810			Good physical health N=1264		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	4470.89 (-3066.98, 12008.75)	4.441 (-8.715, 17.597)	0.039 (-0.041, 0.119)	799.80 (-268.32, 1867.92)	-1.829 (-6.175, 2.517)	0.027 (-0.040 , 0.095)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a (4a): Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children. (Self-reported health is omitted.)

Appendix Table 26 The effect of passive urbanization on hypertension management mediated by children's family support stratified by physical health (Hypothesis 4c, N=2074)

	Hypertension awareness		Hypertension treatment		Hypertension control	
Estimate (95% CI)	Poor health N=810	Good health N=1264	Poor health N=810	Good health N=1264	Poor health N=810	Good health N=1264
Controlled direct effect						
Financial support	0.003 (-0.080, 0.087)	0.050 (-0.022, 0.122)	0.005 (-0.073, 0.083)	0.056 (-0.012, 0.124)	0.030 (-0.035, 0.094)	0.041 (-0.001, 0.083)
Instrumental support	0.015 (-0.071, 0.102)	0.060 (-0.011, 0.132)	0.017 (-0.064, 0.098)	0.069* (0.001, 0.137)	0.030 (-0.036, 0.095)	0.040 (-0.001, 0.081)
Daily contact	0.014 (-0.072, 0.100)	0.058 (-0.014, 0.130)	0.016 (-0.065, 0.096)	0.067 (-0.002, 0.136)	0.032 (-0.032, 0.097)	0.040 (-0.001, 0.082)
All family support	0.005 (-0.078, 0.089)	0.052 (-0.019, 0.123)	0.008 (-0.070, 0.086)	0.057 (-0.010, 0.125)	0.031 (-0.033, 0.095)	0.041 (-0.0004, 0.083)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support. (Self-reported health is omitted.)

Appendix Table 27 The effect of passive urbanization on hypertension management stratified by time (Hypothesis 3 & 4b)

	Passively urbanized in 2005-2008 N=1494		Passively urbanized in 2009-2011 N=1741	
Marginal effects (95% CI)	Hypothesis 3	Hypothesis 4b	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness				
Passively urbanized elders	-0.004	-0.011	0.060	0.054
	(-0.104, 0.096)	(-0.103, 0.080)	(-0.002, 0.121)	(-0.007, 0.116)
Children's monetary &		0.0002		-0.00001
in-kind transfers		(-0.0003, 0.0007)		(-0.0005, 0.0004)
Children's informal care		0.007*		0.001
hours		(0.001, 0.014)		(-0.005, 0.008)
Children's daily contact		0.012		0.027
		(-0.054, 0.078)		(-0.031, 0.085)
Outcome: Hypertension Treatment				
Passively urbanized elders	0.014	0.004	0.060	0.052
	(-0.080, 0.109)	(-0.081, 0.089)	(-0.007, 0.126)	(-0.014, 0.117)
Children's monetary &		0.0002		0.0001
in-kind transfers		(-0.0003,		(-0.0003,
		0.0007)		0.0006)
Children's informal care		0.005		0.002
hours		(-0.001, 0.012)		(-0.004, 0.009)
Children's daily contact		0.004		0.018
		(-0.059, 0.067)		(-0.037, 0.073)
Outcome: Hypertension Control				
Passively urbanized elders	0.038	0.035	0.026	0.022
	(-0.018, 0.094)	(-0.017, 0.086)	(-0.020, 0.072)	(-0.026, 0.070)
Children's monetary &		-0.0001		0.0002
in-kind transfers		(-0.0005, 0.0002)		(-0.00003, 0.0005)
Children's informal care		0.003		0.003
hours		(-0.002,		(-0.001, 0.006)
		0.008)		
Children's daily contact		-0.001		-0.013
		(-0.041, 0.040)		(-0.057, 0.030)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES.

The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 28 The effects of passive urbanization on children's family support stratified by time (Hypothesis 4a)

	Passively urbanized in 2005-2008 N=1494			Passively urbanized in 2009-2011 N=1741		
Marginal Effects (95% CI)	Financial support	Instrumental support	Daily contact	Financial support	Instrumental support	Daily contact
Passively urbanized elders	4074.68 (-2051.90, 10201.25)	-4.312 (-8.937, 0.312)	0.001 (-0.107, 0.108)	724.69 (-311.09, 1760.47)	2.407 (-4.798, 9.611)	0.050 (-0.018, 0.118)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 2a (4a): Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Appendix Table 29 The effect of passive urbanization on hypertension management mediated by children's family support stratified by time (Hypothesis 4c)

	Hypertension awareness		Hypertension treatment		Hypertension control	
Estimate (95% CI)	Passively urbanized in 2005-2008	Passively urbanized in 2009-2011	Passively urbanized in 2005-2008	Passively urbanized in 2009-2011	Passively urbanized in 2005-2008	Passively urbanized in 2009-2011
Controlled direct effect						
Financial support	-0.026 (-0.098, 0.047)	0.056 (-0.007, 0.120)	-0.008 (-0.071, 0.055)	0.053 (-0.006, 0.113)	0.038 (-0.011, 0.088)	0.024 (-0.014, 0.062)
Instrumental support	-0.003 (-0.080, 0.075)	0.061 (-0.001, 0.124)	0.017 (-0.054, 0.087)	0.059* (0.0004, 0.118)	0.040 (-0.008, 0.088)	0.023 (-0.014, 0.060)
Daily contact	-0.006 (-0.083, 0.071)	0.060 (-0.003, 0.123)	0.014 (-0.056, 0.084)	0.059 (-0.0004, 0.118)	0.039 (-0.010, 0.087)	0.025 (-0.011, 0.062)
All family support	-0.023 (-0.096, 0.049)	0.056 (-0.008, 0.119)	-0.006 (-0.070, 0.057)	0.053 (-0.006, 0.112)	0.039 (-0.010, 0.088)	0.024 (-0.014, 0.062)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level.

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

Appendix Table 30 The effect of passive urbanization on hypertension management including the city planning area (Hypothesis 3 & 4b, N=2074)

	Marginal effects (95% CI)	
	Hypothesis 3	Hypothesis 4b
Outcome: Hypertension Awareness		
Long-term rural & Outside the city planning area	Ref	Ref
Long-term rural & Within the city planning area	-0.207* (-0.409, -0.005)	-0.192 (-0.394, 0.009)
Passively urbanized & Outside the city planning area	0.032 (-0.027, 0.092)	0.027 (-0.032, 0.086)
Passively urbanized & Within the city planning area	0.005 (-0.102, 0.111)	0.00003 (-0.107, 0.107)
Children's monetary & in-kind transfers		0.0001 (-0.0002, 0.0004)
Children's informal care hours		0.002 (-0.004, 0.009)
Children's daily contact		0.015 (-0.041, 0.071)
Outcome: Hypertension Treatment		
Long-term rural & Outside the city planning area	Ref	Ref
Long-term rural & Within the city planning area	-0.205* (-0.374, 0.035)	-0.187* (-0.361, -0.014)
Passively urbanized & Outside the city planning area	0.048 (-0.017, 0.113)	0.040 (-0.023, 0.103)
Passively urbanized & Within the city planning area	-0.005 (-0.113, 0.103)	-0.010 (-0.118, 0.099)
Children's monetary & in-kind transfers		0.0002 (-0.0002, 0.0006)
Children's informal care hours		0.002 (-0.004, 0.008)
Children's daily contact		-0.010 (-0.043, 0.062)
Outcome: Hypertension Control		
Long-term rural & Outside the city planning area	Ref	Ref
Long-term rural & Within the city planning area	-0.007 (-0.115, 0.102)	0.004 (-0.109, 0.116)
Passively urbanized & Outside the city planning area	0.037 (-0.011, 0.084)	0.033 (-0.012, 0.077)
Passively urbanized & Within the city planning area	0.020 (-0.045, 0.085)	0.020 (-0.050, 0.091)
Children's monetary & in-kind transfers		-0.000002 (-0.00003, 0.00003)
Children's informal care hours		0.003 (-0.059, 0.017)
Children's daily contact		-0.021 (-0.059, 0.017)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 3: Passively urbanized elders managed their hypertension better than long-term rural elders, controlling for gender, age, marital status, and region.

Hypothesis 4b: Receiving more family support was associated with better hypertension management, controlling for elders' gender, age, marital status, region, health insurance, SES, urbanization status, and children's SES. The amount of children's monetary & in-kind transfers was divided by 100, and the amount of children's informal care hours was divided by 10.

Appendix Table 31 The effects of passive urbanization on children's family support including the city planning area (Hypothesis 4a, N=2074)

	Marginal Effects (95% CI)		
Hypothesis	Financial support	Informal care	Daily contact
Long-term rural & Outside the city planning area	Ref	Ref	Ref
Long-term rural & Within the city planning area	-133.41 (-2992.76, 2725.93)	-4.74 (-9.54, 0.06)	0.125 (-0.005, 0.255)
Passively urbanized & Outside the city planning area	683.90 (-373.09, 1740.89)	-3.04 (-7.31, 1.22)	-0.005 (-0.086, 0.075)
Passively urbanized & Within the city planning area	4757.09 (-2434.37, 11948.55)	5.54 (-7.70, 18.78)	0.124** (0.057, 0.191)

Note: *p < .05; **p < .01, ***p < .001

Hypothesis 4a: Passively urbanized elders received more family support from children than long-term rural elders, controlling for gender, age, marital status, region, and the number of female/male children.

Appendix Table 32 The effect of passive urbanization on hypertension management mediated by children's family support including the city planning area (Hypothesis 4c, N=2074)

Controlled direct effect (95% CI)	Children's financial support	Children's instrumental support	Daily contact	All family support
Outcome: Hypertension Awareness				
Long-term rural & Outside the city planning area	Ref	Ref	Ref	Ref
Long-term rural & Within the city planning area	-0.194* (-0.373, -0.016)	-0.226** (-0.393, -0.059)	-0.229* * (-0.396, -0.061)	-0.193* (-0.371, -0.015)
Passively urbanized & Outside the city planning area	0.005 (-0.056, 0.066)	0.015 (-0.047, 0.076)	0.014 (-0.047, 0.075)	0.006 (-0.054, 0.067)
Passively urbanized & Within the city planning area	-0.021 (-0.109, 0.067)	-0.019 (-0.105, 0.068)	-0.019 (-0.106, 0.068)	-0.023 (-0.110, 0.065)
Outcome: Hypertension Treatment				
Long-term rural & Outside the city planning area	Ref	Ref	Ref	
Long-term rural & Within the city planning area	-0.185* (-0.330, -0.040)	-0.222** (-0.353, -0.092)	-0.223** (-0.354, -0.093)	-0.183* (-0.328, -0.039)
Passively urbanized & Outside the city planning area	0.016 (-0.040, 0.072)	0.027 (-0.029, 0.084)	0.027 (-0.029, 0.082)	0.017 (-0.039, 0.073)
Passively urbanized & Within the city planning area	-0.033 (-0.110, 0.043)	-0.029 (-0.105, 0.046)	-0.029 (-0.106, 0.047)	-0.034 (-0.109, 0.042)
Outcome: Hypertension Control				
Long-term rural & Outside the city planning area	Ref	Ref	Ref	
Long-term rural & Within the city planning area	0.017 (-0.086, 0.120)	0.001 (-0.091, 0.094)	0.003 (-0.089, 0.095)	0.020 (-0.082, 0.123)
Passively urbanized & Outside the city planning area	0.051* (0.012, 0.090)	0.048* (0.010, 0.087)	0.047* (0.009, 0.085)	0.050* (0.011, 0.089)
Passively urbanized & Within the city planning area	0.032 (-0.020, 0.085)	0.033 (-0.019, 0.085)	0.037 (-0.015, 0.086)	0.033 (-0.019, 0.086)

Note: *p < .05; **p < .01, ***p < .001

Controlled direct effect (CDE) is the effect of passive urbanization on hypertension management compared to long-term rural elders while fixing the mediator (family support) to a specific level

Hypothesis 4c: After controlling for children's family support, the effects of passive urbanization on hypertension management will become smaller, compared to the effects of passive urbanization before controlling for children's family support.

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