

Measuring Multidimensional Poverty Reduction for the Chinese Elderly

— Based on 2010 and 2016 Data from the China Family Panel Studies (CFPS)

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Abstract: Based on data gathered from the China Family Panel Studies (CFPS) in 2010 and 2016, this paper examines income poverty and multidimensional poverty among the Chinese elderly. Compared with the non-elderly population, poverty incidence was relatively lower among China's elderly population in 2010, but the elderly poor were significantly more poor. By 2016, the level of poverty became more or less the same between elderly and non-elderly people. Compared with 2010, the poverty incidence on various deprived dimensions and the average share of deprivation for the elderly fell sharply in 2016 by an average of 30 and 10 percentage points, respectively. Reduction in poverty incidence was 10 percentage points higher for the rural elderly than for the urban elderly. After estimating the multidimensional poverty index for the elderly by the “two no worries and three guarantees” criteria, we found that the intensity of multidimensional poverty was only about half that of the income poverty. The “two worries,” i.e. the lack of food and clothing, contributed more to multidimensional poverty than did what the “three guarantees” target i.e. education, healthcare and housing, especially on income and residential energy dimensions. Elderly healthcare contributed more than 20% to the “three guarantees.”

Keywords: targeted poverty reduction, elderly poverty, multidimensional poverty

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1. Introduction

China has seen a dramatic decline in its poverty incidence amid rapid economic growth since reform and opening up in 1978. Over the past three decades, China has lifted some 700 million people out of poverty (Xian, *et al.*, 2016; Ryder, 2017). By the end of 2019, 5.51 million people remained in poverty, and rural poverty incidence was 0.6%.¹ With the implementation of the poverty reduction campaign in 2015, progress has been made in targeted poverty reduction. Between 2012-2019, China had lifted 93.48 million rural residents out of poverty on a cumulative basis.² China's poverty reduction campaign aims to eradicate absolute poverty by 2020, targeting impoverished regions and groups. Among them, a key target group is the elderly population.

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¹ Source: Website of the Central People's Government of the People's Republic of China, http://www.gov.cn/shuju/2019-02/28/content_5369454.htm.

² Source: *Statistical Communiqué of the People's Republic of China on the 2019 National Economic and Social Development* from the website of the National Bureau of Statistics (NBS), http://www.stats.gov.cn/tjsj/zxfb/201902/t20190228_1651265.html.

Middle-aged and elderly people make up a big proportion of the registered poor. By the end of 2017, over 16% of registered poor people in China were aged 65 years or above. A key contributor to poverty is severe and chronic illnesses. By the end of 2017, 40% of registered poor people were incapacitated due to illnesses, and 14% were in poverty due to incapacitation.³ For these reasons, elderly people are a key target group for achieving China's poverty reduction goals.

According to Amartya Sen, elderly persons and especially those who are ill cannot move around and live alone; thus need more income and health services to maintain normal standards of living (Sen, 1999). In aging societies in both the developing and developed worlds, elderly poverty has become an issue of public concern. Since most elderly people are too old to work and require more health and caregiving services, they are more vulnerable to poverty. According to the United Nations *Global Outlook: World Economic Overview 2006-2007*, "80% of the world's elderly people lack sufficient protection against health, disability, and income risks. In the developing world, 342 million elderly people do not have adequate income security, and if the current pension policy remains the same, this number will rise to 1.2 billion by 2050."⁴ In aging societies across the developed world, pension sustainability also comes into question.

After becoming an aging society in 2000, China is set to grapple with an aging population and elderly poverty as key issues on the policy agenda in the long run. Compared with younger adults, the elderly, especially the rural elderly, are more vulnerable to poverty. In the countryside, it is not uncommon to see elderly people spend their life's savings or run into debt on their children's schooling and marriage. However, there has been a paucity of research on elderly poverty. Hence, this paper employs the 2010 and 2016 data from the China Family Panel Studies (CFPS) for a comparative study on the multidimensional poverty among the elderly in order to examine the poverty-reducing effects of China's poverty reduction campaign for elderly persons; therefore providing policy advice for achieving the poverty reduction goals of 2020 and beyond.

The remainder of this paper is structured as follows: Section 2 offers a literature review; Section 3 elaborates the research framework; Section 4 introduces the research methodology and data; Section 5 compares the estimated results of "two no worries and three guarantees" policy; the final section offers conclusions and policy advice.

2. Literature Review

2.1 Review of Domestic and International Research

Given the different data sources, definitions, and methodologies, it is impractical to perform an international comparison of elderly poverty. To date, no study has been carried out on the overall status of elderly poverty worldwide. Based on the elderly welfare systems and pension systems across the world, we may still conduct a regional comparison of elderly poverty in similar countries or regions. Most EU member states identify the elderly poverty threshold as 60% of the median income.⁵ Recently, EU member states have employed material deprivations and income poverty criteria for monitoring poverty and social exclusion (Zaidi, 2009).⁶

The US official definition of elderly poverty is based on income poverty, i.e. pre-tax income falls short of meeting basic needs for housing, food, and clothing. The US Census Bureau identifies 48 types of poverty criteria based on household type and structure and estimates the size of the elderly population

³ Calculated based on 2018 data from the then State Council Leading Group Office of Poverty Alleviation and Development.

⁴ From UN website *Global Outlook: World Economic Overview 2006-07*, <https://www.un.org/chinese/esa/economic/review07/ageing6.html>.

⁵ Living Standards, Poverty and Inequality in the UK:2015, The Institute for Fiscal Studies.

⁶ US Census Bureau. <https://www2.census.gov/programs-surveys/cps/tables/time-series/historical-poverty-thresholds/thresh18.xls>.

each year (O'Brien *et al.*, 2010). In the developing world, the aging population poses grave and pressing challenges, and elderly poverty is a key question to be researched. Such research, however, did not start until recently and had no commonly accepted research instruments and frameworks to follow (Phillipson and Biggs, 1998).⁷

Studies on Africa, the Caribbean, and the Asia-Pacific regions found that elderly poverty was defined as the inability to meet economic and social functions and responsibilities. In practice, elderly people in extreme poverty refer to those without adequate income security, family or social support, and are in poor health but lack adequate healthcare (Gorman and Heslop, 2002). Gorman and Heslop (2002) found that in developing countries from those regions, instead of single dimensions such as income or spending, elderly poverty is characterized by multidimensional attributes, including health services, healthcare, caregiving, and social support. Based on studies in Ghana and some other African countries, Le Roux (1995) found that income security and social support were equally important to the elderly. However, the lack of health and financial services, market opportunities, and other public policies for the elderly in developing countries had dimmed the welfare-enhancing effects of income-supporting policies such as pension funds for the elderly. Based on a study of five communities in Cambodia, Kato (2000) found family support to older people to be risky. Older people from 20 out of the 70 sampled households had to raise grandchildren, but only 6% of the rural elderly and 12% of the urban elderly suggested that they had received sufficient support from their children to meet their daily spending needs. Zimmer and Kim (2001) found that in Cambodia, young people could not support their children and their parents, causing poverty to be passed on from parents to grandchildren.

Studies on elderly poverty by Chinese academics are few and focus only on income poverty. Based on China's census data of 2000 and sample survey information about urban and rural elderly people, Wang and Zhang (2005) analyzed the size, living conditions, and poverty incidence of China's elderly population. They found that 33% of the 130 million elderly people were still employed in the workforce, compared to the 67% who were not. Nationwide, China had 9.21 million to 11.68 million elderly persons in poverty, with a poverty incidence of 7.1%-9.0%. Policy-wise, income support should be offered to elderly persons in poverty or on the verge of poverty and prevent any further increase of poverty within the elderly population. With the poverty gap index, Sun and Zhang (2005) discussed the status and trends of elderly poverty in some provinces and municipalities in the 1990s based on survey data of 1992 and 2000 from the China Research Center on Aging for urban households with elderly persons. Applying the China Health and Nutrition Survey data of 2006, Wang *et al.* (2012) employed an ordered logit model for measuring the perceived welfare status of Chinese elderly, and put forth the concept of "subjective welfare poverty." According to estimates, income poverty incidence was 9.7% among China's rural elderly in 2006, which was 4.2 times the official rural poverty incidence of 2.3%. The elderly population has become a special poor group in China, with the rural, female, and oldest old being the most vulnerable to poverty. Based on data from the demographic census and the urban and rural elderly population survey, Yu (2003) estimated the nationwide poverty incidence for the elderly population in China to be in the range of 28% to 35% (21% to 30% for cities and 27% to 39% for the countryside), i.e. one in three elderly persons in China was impoverished. According to data from the NBS, the then State Council Leading Group Office of Poverty Alleviation and Development, as well as the Ministry of Civil Affairs, there were about 18 million urban residents and 30 million rural residents in absolute poverty in 2000. Elderly persons made up more than half of the urban poor and the vast majority of the rural poor. Some academics have investigated multidimensional poverty for the elderly. For instance, Ma *et al.* (2016) employed data from the China Health and Retirement Longitudinal Study (CHARLS) to

⁷ Phillipson, Chris, and Simon Biggs. 1998. "Modernity and Identity: Themes and Perspectives in the Study of Older Adults." *Journal of Aging and Identity*, 3(1), 11-23.

create the multidimensional elderly poverty index involving health, economic security, living standards, and social participation dimensions using the AF method (Alkire and Foster, 2011) at the community and household levels.

In a nutshell, elderly poverty is manifested in multidimensional and long-term poverty. Aside from income poverty, elderly poverty often finds expression in the lack of basic public services. Therefore, research on elderly poverty from an income perspective alone cannot reflect a full picture of elderly people's needs. Elderly poverty incidence, whether estimated with the Engel's coefficient, basic living standards, consumption poverty, or subjectively reported by elderly persons themselves, is a result based on single-dimensional or a few indicators, thus underestimating the real picture of elderly poverty. Hence, there is a need to measure elderly poverty with integrated multidimensional indicators. The feasible capability theory and the multidimensional poverty model were developed based on such theories to measure multidimensional poverty for the Chinese elderly.

Unlike previous studies that focused on households and communities, this paper targets individual elderly persons for measuring multidimensional poverty. Under the basic requirements of "two no worries and three guarantees," a multidimensional poverty index is designed to reflect on the conclusions of existing studies as well as international poverty criteria and principles, including those from the United Nations Sustainable Development Goals (SDGs), and the progress and methodologies of research on multidimensional poverty. This paper will discuss the targeting mechanism for multidimensional elderly poverty, and the definition, causes, measurement, and prevention of elderly poverty from a multidimensional perspective.

3. Research Framework

The measurement and policy intervention of poverty can be traced back to the 1950s, when both developed and developing nations started to define their poverty lines. The national poverty line aims to identify the poor and provide a basis for antipoverty policy interventions. Commonly, poverty is defined as the "deprivation of welfare," and the definition of welfare is generally based on consumption or income (Rowntree, 1901). Therefore, the most common method for measuring poverty is determining a poverty line that meets the basic needs according to observable household consumption, spending, or income level. For the convenience of international comparison, the World Bank has established the poverty lines of 1.25 US dollars and 2 US dollars on a purchasing power parity (PPP) basis. Most OECD countries define the poverty line as 50% of the median income. Eighty-six developing countries have their respective official poverty lines based on the food poverty line's sum to meet a certain calorific need as well as the non-food poverty line (Huang, Wang, Xu, 2010).

There are similarities and uniqueness between elderly and general poverty issues. Such dimensions as economic status, education, healthcare, and housing are common aspects of poverty. Aside from these common dimensions, elderly poverty involves additional dimensions of vulnerability, illness, and disabilities. The oldest old and elderly women in poverty pose unique challenges.

In this paper, poverty is defined by the following criteria:

(1) Income poverty: The national poverty threshold is followed for defining income poverty for the rural elderly, and urban elderly poverty is defined by either the urban poverty line converted from the national rural poverty alleviation threshold adjusted for urban and rural purchasing power or the average standards of national urban subsistence protection ("*Dibao*").

(2) Multidimensional poverty criteria: China's poverty reduction goal is summed up as "two no worries and three guarantees," i.e. rural residents in relative poverty should be free from worries about food and clothing and should have guaranteed access to compulsory education, basic healthcare, and housing. At a workshop on poverty reduction in deeply poor regions, General Secretary Xi Jinping stressed that although it was relatively easy to achieve the "two no worries" on food and clothing, it

remained a tall order to guarantee access to compulsory education, basic healthcare and housing for all.⁸ Based on the reality, we should identify the “two no worries and three guarantees” as criteria for elderly poverty and adopt relevant indicators for elderly poverty. Given the relative ease of securing food and clothing, only the most representative indicators should be selected.

4. Estimating Multidimensional Poverty: Methodology and Data Source

4.1 Methodology for Estimating Elderly Income Poverty

Before creating the multidimensional evaluation index for “two no worries and three guarantees,” our first step is to measure the income poverty of the elderly people given the importance of income to ensuring “two no worries and three guarantees.”

4.1.1 Income poverty criteria

Data samples can be divided into urban and rural subsamples. Accordingly, poverty thresholds are differentiated across cities and the countryside. In 2015, China’s rural poverty line was defined by an annual per capita disposable income of 2,855 yuan. We consider two methodologies for determining the urban poverty line:

(i) Ratio between urban and rural household per capita disposable incomes, which is calculated by the following equation: Urban poverty line = (Urban household per capita disposable income ÷ Rural household per capita income) × Rural poverty line. Based on the rural poverty line, we may arrive at the urban poverty line by introducing urban and rural income gaps. In 2015, China’s urban and rural per capita disposable incomes were 31,195 yuan and 11,422 yuan, respectively, with an urban-rural income ratio of 2.73. After conversion, we have arrived at the urban poverty line of 7,797 yuan in annual per capita disposable income, which is converted into the 2010 constant price of 5,316 yuan by the urban consumer price index (CPI).

(ii) Average urban subsistence protection (*Dibao*) threshold. According to the *Statistical Communique on the Development of Social Services in 2015* released by the Ministry of Civil Affairs,⁹

Table 1: Urban and Rural Income Poverty Thresholds (Annual per Capita Disposable Income)

Income poverty	Calculation basis	Poverty line of 2015 (current price)	Poverty line of 2015 (constant price)
Urban	Urban-rural income ratio	7,797 yuan	5,316 yuan
	Average urban subsistence allowance	5,413 yuan	3,690 yuan
Rural	National standard	2,855 yuan	2,300 yuan

Source: *China Statistical Yearbook 2016*, *China Rural Poverty Monitoring Report 2016*, and *Statistical Communique on the Development of Social Services in 2015*. The constant price of 2010 is calculated based on CPI.

Note: In Column 2, “average urban subsistence allowance” is cited from Yang (2011).

⁸ Source: The former State Council Leading Group Office of Poverty Alleviation and Development, http://www.cpad.gov.cn/art/2019/8/15/art_624_101861.html.

⁹ Source: http://www.china.com.cn/news/txt/2016-07/11/content_38855906_4.htm.

17.01 million persons from 9.57 million households across China's urban areas received subsistence allowances at an average rate of 451.1 yuan per person/month, i.e. 5,413 yuan per year, which is converted into the 2010 constant price of 3,690 yuan by the urban household consumer price index (CPI).

Based on the above analysis, urban and rural income poverty thresholds are expressed in the following table. Since the income threshold has been converted into the constant price of 2010, we use the poverty threshold of 2,300 yuan for the rural population and the two poverty thresholds of urban-rural income ratio and the average standard of urban subsistence allowance, respectively.

4.1.2 Estimation method

This paper employs the weighted poverty gap index (Foster-Greer-Thorbecke index, or FGT index) put forth by Foster *et al.* (1984) to estimate income poverty. The FGT method comprises the following three aspects:

(i) The size of the elderly poor population is observed with poverty incidence:

$$P_0 = q/n \quad (1)$$

In equation (1), P_0 is poverty incidence, q is poor population below the poverty line, and n is the total population.

(ii) Poverty gap index is utilized to analyze the degree of poverty, i.e. poverty depth;

$$P_1 = \frac{1}{n} \sum_{i=1}^q \frac{z-y_i}{z} = P_0 \left(1 - \frac{\mu_q}{z}\right) \quad (2)$$

In equation (2), P_1 is the poverty gap index, which reflects the distance between the poor group's income and the poverty line to estimate poverty depth. μ_q is the per capita income of the total population below the poverty line, z is the poverty line, and y_i is the income of individual i .

(iii) Squared poverty gap (SPG) index is employed to estimate the internal income distribution gap within the poor population:

$$P_2 = \frac{1}{n} \sum_{i=1}^q \left(\frac{z-y_i}{z}\right)^2 \quad (3)$$

In equation (3), P_2 is the squared poverty gap (FGT) index, reflecting poverty intensity. People in more poverty deviate more from the poverty line. Compared with P_1 , the poorest poor are given greater weight.

4.2 Measuring Multidimensional Elderly Poverty by “Two No Worries and Three Guarantees”

4.2.1 Indicators of “two no worries and three guarantees” and weights

“Two no worries and three guarantees” means that the rural poor should be free from worries about food and clothing and have guaranteed access to housing, healthcare and compulsory education. Specific requirements are shown in Table 2:

“Two no worries”: (i) We use household per capita disposable income as an indicator for food and clothing consumption, the bulk of which occurs in cash, and define urban and rural household disposable incomes of 5,316 yuan and 2,300 yuan in 2010 constant price as deprivation thresholds, respectively; (ii) An important aspect of “no worry about food” is access to safe drinking water, the lack of which is deemed as a deprivation threshold.

“Three guarantees”: (i) Housing security is measured by “household crowding,” and a crowded household is deemed as a deprivation; (ii) Healthcare protection is denoted by “health status” and “health insurance participation,” and poor health and lack of health insurance are deemed as deprivations; (iii) Education is expressed by “level of education,” and failure to complete primary school education is

Table 2: Multidimensional Elderly Poverty Indicators for “Two No Worries and Three Guarantees”

Dimension	Indicator	Definition	Deprivation threshold
Two no worries	Per capita disposable income	Sum of incomes available for final consumption spending and savings, including wage income, net operating income, net asset income, and net transfer income.	By the 2010 constant price, rural residents with an annual per capita disposable income less than 2,300 yuan are assigned the value of 1, and urban residents with an annual per capita disposable income less than 5,316 yuan are assigned the value of 1.
	Access to safe drinking water	“Access to safe drinking water” indicator from the CFPS database is adopted.	Those without access to safe drinking water are assigned the value of 1.
Three guarantees	Household crowding	“Household crowding” indicator is adopted to measure housing conditions. According to CFPS explanations, the level of household crowding is divided into seven grades from “Very crowded” to “Very spacious”, and larger number denotes more spacious housing conditions.	Degree of household crowding at 1 or 2 is assigned the value of 1.
	Health insurance participation	“Type of medical insurance” is adopted as the indicator for measuring healthcare security. According to CFPS explanations, medical insurance includes basic medical insurance for urban and rural residents, supplementary medical insurance, medical insurance for urban employees, public funded medical insurance, among others.	Lack of health insurance coverage is assigned the value of 1.
	Level of education	Level of education includes the uneducated, primary school, junior middle school, high school and college or above education.	Level of education below primary school is assigned the value of 1.

Source: Compiled by the authors.

deemed as a deprivation.

Each indicator is given equal weight, i.e. “two no worries” and “three guarantees” are each given a 1/2 weight, and each dimension corresponds to four sub-indicators each with a 1/8 weight. For instance, household per capita disposable income and household crowding is each given a 1/8 weight.

4.2.2 Creation of a multidimensional poverty index

Referencing the calculation method for the global multidimensional poverty index developed by the Oxford University on behalf of the United Nations, this paper compares the value of each individual on various dimensions and the threshold or poverty line for each dimension (as shown in Table 2) to identify each individual’s poverty status on various dimensions. If an individual is poor, the value is 1; otherwise, the value is 0.

Multidimensional poverty index $M=H \cdot A$, where $H_{(k)}$ is multidimensional poverty incidence. k is the number of poverty dimensions. An individual who is poor on more than k dimensions is deemed as multidimensionally poor. $A_{(k)}$ is the average number of dimensions on which an individual is deprived.

The multidimensional poverty index can be decomposed by such factors as urban or rural residents and regions. Following this logic, sample can be decomposed into several subgroups.

The contribution of each dimension to multidimensional poverty can be estimated.

4.2.3 Data sources

This paper employs the 2010 and 2016 data from the China Family Panel Studies (CFPS) conducted

by the Institute of Social Science Survey (ISSS), Peking University. Considering the uniqueness of poverty, the adult questionnaire data from the CFPS is selected as samples for analysis.

The CFPS 2010 database includes 33,435 samples, including 6,991 samples of elderly persons aged 60 years or above, accounting for 20.9% of the total sample size. Within the elderly group, elderly persons aged below 65 years, between 65 and 69 years, between 70 and 79 years, and 80 years or above account for 36.4%, 24.7%, 30.7% and 8.2%, respectively. There are 3,560 (50.9%) elderly men and 3,431 (49.1%) elderly women, respectively, as well as 429 elderly persons who lived alone (household size is 1), making up for 6.1% of the elderly sample size.

The CFPS 2016 database includes 33,296 adults, from which we have identified 7,617 samples of elderly persons, or 23% of the total sample size. Among elderly persons aged above 60 years, those aged below 65 years, between 65 and 69 years, between 70 and 79 years, and 80 years or above account for 37.0%, 27.5%, 28.2% and 7.2%, respectively. Among the 7,617 elderly person samples, 3,805 are male and 3,812 are female, as shown in Figure 2. There are 501 elderly persons who lived alone, or 6.6% of the total elderly sample size.

Since access to safe drinking water is absent from the adult database, we linked the adult database in the CFPS to the CFPS households database to capture information about access to safe drinking water by household codes. If there are two adults in a household with access to safe drinking water and residential energy, both adults in the household are identified as having access to safe drinking water and residential energy, accordingly. Our 2010 samples include 3,250 urban elderly persons and 3,741 rural elderly persons, accounting for 46% and 54%, respectively. Our 2016 samples include 3,569 urban elderly persons, or 46.9%, and 4,048 rural elderly persons, or 53.1%. The CFPS data covers 28 provinces, municipalities and autonomous regions with more numerous samples for Henan, Gansu, Shanghai and Liaoning and very few samples for some provinces.

5. Estimation Results of Income Poverty and Multidimensional Poverty

5.1 Results of Income Poverty Estimation

This section calculates elderly income poverty in 2010 and 2016, respectively, to obtain elderly income poverty incidence, poverty gap index, and squared poverty gap index.

5.1.1 Poverty incidence

Based on the two poverty lines, we estimated overall urban and rural poverty status. By the poverty line calculated with the urban and rural income ratio, China's elderly poverty incidence was 67.0% and 30.6% in 2010 and 2016, respectively. By the subsistence protection criteria, the elderly poverty incidence was 64.4% and 26.8% in these two years, respectively. It can be found that from 2010 to 2016, urban and rural elderly poverty incidence both decreased substantially (down by over 35 percentage points), and urban elderly poverty incidence fell more sharply.

Furthermore, we analyzed urban and rural elderly income poverty in 2010 and 2016 by such categories as gender, age, living alone, and level of education, as shown in Tables 3. Gender-wise (as shown in Table 3), elderly women were more likely to be poor than elderly men whether in the countryside or cities, but the gender difference for rural elderly poverty is smaller. Compared with 2010, greater achievements were made in reducing poverty among elderly women, especially rural poverty incidence among elderly women in cities, in 2016.

The difference in urban and rural poverty incidence is concentrated in the age group between 60 and 70 years. Take elderly persons aged between 60 and 65 years, for instance, their poverty incidence decreased by close to or more than 13 percentage points in 2016 from 2010, as shown in Table 4.

As shown in Table 5, there was no big volatility in poverty incidence for elderly persons living

Table 3: Gender-Specific Analysis of Urban and Rural Poverty Incidence in 2010 and 2016 (%)

Gender	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Male	By urban and rural income ratio	27.54	30.58	12.72	16.91	-14.82	-13.67
	By subsistence protection criteria	24.89	30.58	8.81	16.91	-16.08	-13.67
Female	By urban and rural income ratio	36.95	38.52	13.95	17.16	-23.01	-21.36
	By subsistence protection criteria	34.18	38.52	9.76	17.16	-24.42	-21.36
Difference	By urban and rural income ratio	-9.42	-7.94	-1.23	-0.25		
	By subsistence protection criteria	-9.29	-7.94	-0.95	-0.25		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 4: Age-Specific Analysis of Urban and Rural Poverty Incidence in 2010 and 2016 (%)

Gender	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
60-65 years	By urban and rural income ratio	24.92	26.12	11.19	13.32	-13.74	-12.80
	By subsistence protection criteria	21.94	26.12	7.62	13.32	-14.32	-12.80
66-70 years	By urban and rural income ratio	13.57	17.05	6.86	9.75	-6.71	-7.31
	By subsistence protection criteria	12.62	17.05	4.69	9.75	-7.93	-7.31
71-75 years	By urban and rural income ratio	12.25	12.80	4.24	6.23	-8.01	-6.58
	By subsistence protection criteria	11.54	12.80	3.04	6.23	-8.50	-6.58
Above 75 years	By urban and rural income ratio	13.75	13.12	4.38	4.78	-9.37	-8.35
	By subsistence protection criteria	12.98	13.12	3.24	4.78	-9.75	-8.35

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

alone in 2010 and 2016, which was below 5%. Elderly persons living with others, however, experienced a higher poverty incidence, especially in the countryside, but their poverty incidence fell by more than 35 percentage points in 2016 from 2010.

Table 6 offers an analysis of urban and rural elderly income poverty by the level of education. Most elderly persons who became much better off in 2016 from 2010 received either no education or primary school education. It can also be found that poverty incidence for uneducated rural elderly persons also decreased substantially, indicating the policy effects of “two no worries and three guarantees.”

5.1.2 Poverty gap index

Judging by the estimated results of the poverty gap index, the depth of poverty is higher in the

Table 5: Urban and Rural Poverty Incidence in 2010 and 2016 for Living Alone Status (%)

Living Alone Status	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Seniors living with others	By urban and rural income ratio	60.43	75.29	24.52	31.31	-35.91	-43.98
	By subsistence protection criteria	55.57	75.29	16.71	31.31	-38.86	-43.98
Seniors living alone	By urban and rural income ratio	4.06	4.25	2.15	2.76	-1.91	-1.49
	By subsistence protection criteria	3.51	4.25	1.87	2.76	-1.64	-1.49
Difference	By urban and rural income ratio	56.37	71.05	22.37	28.56		
	By subsistence protection criteria	52.06	71.05	14.84	28.56		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 6: Urban and Rural Poverty Incidence in 2010 and 2016 by the Level of Education (%)

Level of education	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Uneducated	By urban and rural income ratio	32.89	58.74	21.87	29.91	-11.02	-28.83
	By subsistence protection criteria	30.09	58.74	15.40	29.91	-14.69	-28.83
Primary school	By urban and rural income ratio	13.91	14.49	3.32	3.20	-10.59	-11.29
	By subsistence protection criteria	12.46	14.49	2.09	3.20	-10.37	-11.29
Junior middle school	By urban and rural income ratio	9.69	5.02	1.28	0.94	-8.41	-4.08
	By subsistence protection criteria	8.86	5.02	0.89	0.94	-7.97	-4.08
High school	By urban and rural income ratio	5.08	1.02	0.11	0.02	-4.97	-0.99
	By subsistence protection criteria	4.83	1.02	0.11	0.02	-4.72	-0.99
Junior college and above	By urban and rural income ratio	2.92	0.28	0.08	0.00	-2.84	-0.28
	By subsistence protection criteria	2.83	0.28	0.08	0.00	-2.75	-0.28

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

countryside than in the cities. According to the urban and rural income ratio, urban and rural elderly poverty depth was 3.9 and 2.3 times higher, respectively, in 2010 than in 2016. By the subsistence protection criteria, this multiple was 5.3 and 2.5 times higher, respectively (as shown in Table 7).

For a more detailed description of the elderly income poverty depth and distribution, Table 8 provide estimates on such dimensions as gender, age, living alone status, level of education, and marital status.

Table 7: Urban and Rural Poverty Depth in 2010 and 2016 by Different Poverty Criteria (%)

Basis of estimation	2010		2016		Difference	
	Urban	Rural	Urban	Rural	Urban	Rural
By urban and rural income ratio	53.00	61.80	13.40	26.70	-39.60	-35.10
By subsistence protection criteria	49.30	58.60	9.20	23.50	-40.10	-35.10
Difference	3.70	3.20	4.20	3.20		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 8: Gender-Specific Analysis of Urban and Rural Poverty Gap Indexes

Gender	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Male	By urban and rural income ratio	0.223	0.268	0.065	0.132	-0.158	-0.136
	By subsistence protection criteria	0.206	0.251	0.045	0.115	-0.162	-0.136
Female	By urban and rural income ratio	0.307	0.350	0.070	0.136	-0.237	-0.214
	By subsistence protection criteria	0.286	0.335	0.048	0.120	-0.238	-0.215
Difference	By urban and rural income ratio	-0.084	-0.082	-0.005	-0.004		
	By subsistence protection criteria	-0.080	-0.084	-0.003	-0.005		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 9: Age-Specific Analysis of Urban and Rural Poverty Gap Indexes

Age	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
60~65 years	By urban and rural income ratio	0.197	0.267	0.054	0.105	-0.143	-0.162
	By subsistence protection criteria	0.182	0.252	0.036	0.092	-0.146	-0.160
66~70 years	By urban and rural income ratio	0.111	0.175	0.034	0.076	-0.078	-0.099
	By subsistence protection criteria	0.104	0.166	0.023	0.067	-0.081	-0.099
71~75 years	By urban and rural income ratio	0.103	0.133	0.023	0.049	-0.080	-0.084
	By subsistence protection criteria	0.096	0.127	0.016	0.043	-0.080	-0.084
Above 75 years	By urban and rural income ratio	0.118	0.136	0.024	0.037	-0.094	-0.099
	By subsistence protection criteria	0.111	0.129	0.018	0.033	-0.093	-0.096

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 10: Analysis of Urban and Rural Poverty Gap Indexes for Living Alone Status

Living alone status	Basis of Estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Living with others	By urban and rural income ratio	0.499	0.587	0.121	0.246	-0.378	-0.342
	By subsistence protection criteria	0.465	0.558	0.083	0.216	-0.383	-0.342
Living alone	By urban and rural income ratio	0.031	0.031	0.013	0.022	-0.018	-0.009
	By subsistence protection criteria	0.027	0.028	0.010	0.019	-0.018	-0.009
Difference	By urban and rural income ratio	0.469	0.557	0.108	0.224		
	By subsistence protection criteria	0.438	0.530	0.073	0.197		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Gender-wise, urban and rural male income poverty depth was three times and two times higher, respectively, in 2010 than in 2016. Urban poverty depth varied more significantly. Income poverty depth for urban and rural elderly women was higher in 2010, but reached more or less the same level as their male peers in 2016. Urban and rural elderly income poverty gap indexes corresponding to various age brackets are correlated with income poverty criteria. As far as the subsistence protection criteria are concerned, poverty depth eased the most for the age group of 60-65 years, followed by the age group of 66-75 years (Table 9).

For elderly persons living alone, their poverty gap index difference between 2010 and 2016 was modest, whether they lived in cities or the countryside. For elderly persons living with others, urban and rural difference is more significant partly due to the complexity of household structures, and their level of poverty also eased more significantly, as shown in Table 10.

Judging by the comparison result of the level of education and urban and rural poverty gap index, most of the deeply poor elderly persons in the countryside were uneducated, whose level of poverty also improved the most. This finding is consistent with the above-mentioned result of poverty incidence analysis mainly due to policy impact, as shown in Table 11.

5.1.3 Squared poverty gap index

The income squared poverty gap index for urban and rural elderly persons reflects the following conditions: (i) Income gap is smaller among urban poor elderly persons than among their rural peers; (ii) under the two income poverty criteria, the difference in the squared poverty gap index is smaller; (iii) compared with 2010, the income gap between urban and rural elderly persons narrowed in 2016 (as shown in Table 12).

Gender-wise, the following aspects require attention: (i) Income gap was greater among rural elderly men than among their female peers, as reflected in a higher squared poverty gap index for elderly men as shown in Table 13; (ii) unlike in the countryside, income gap was greater among poor elderly women in cities; (iii) income gap was generally greater in the countryside than in cities; (iv) income gaps improved in 2016 from 2010.

Judging by the age distribution, the income gap is the widest for poor elderly persons aged between 60 and 65, especially those in the countryside. Seniors in this age group are still capable of work, but vary greatly in their choice of work. Those with employable skills and willing to work are more likely to

Table 11: Analysis of Urban and Rural Poverty Gap Indexes by the Level of Education

Level of Education	Basis of Estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Uneducated	By urban and rural income ratio	0.264	0.459	0.110	0.235	-0.154	-0.224
	By subsistence protection criteria	0.243	0.436	0.075	0.207	-0.168	-0.229
Primary school	By urban and rural income ratio	0.109	0.111	0.016	0.025	-0.093	-0.085
	By subsistence protection criteria	0.100	0.104	0.011	0.022	-0.089	-0.082
Junior middle school	By urban and rural income ratio	0.083	0.038	0.007	0.007	-0.077	-0.031
	By subsistence protection criteria	0.079	0.036	0.005	0.006	-0.075	-0.030
High school	By urban and rural income ratio	0.046	0.008	0.001	0.000	-0.045	-0.008
	By subsistence protection criteria	0.045	0.008	0.001	0.000	-0.044	-0.007
Junior college and above	By urban and rural income ratio	0.027	0.002	0.001	0.000	-0.026	-0.002
	By subsistence protection criteria	0.026	0.002	0.000	0.000	-0.025	-0.002

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 12: Squared Poverty Gap Index for Urban and Rural Elderly Persons in 2010 and 2016

Poverty gap index	2010		2016		Difference	
	Urban	Rural	Urban	Rural	Urban	Rural
By urban and rural income ratio	0.484	0.564	0.089	0.214	-0.394	-0.350
By subsistence protection criteria	0.452	0.520	0.062	0.171	-0.390	-0.349
Difference	0.031	0.044	0.027	0.043		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 13: Gender-Specific Analysis of Urban and Rural Poverty Gap Indexes

Gender	Basis of Estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Male	By urban and rural income ratio	0.203	0.240	0.043	0.105	-0.160	-0.135
	By subsistence protection criteria	0.189	0.218	0.030	0.083	-0.159	-0.135
Female	By urban and rural income ratio	0.281	0.324	0.046	0.088	-0.235	-0.235
	By subsistence protection criteria	0.263	0.302	0.032	0.088	-0.231	-0.214
Difference	By urban and rural income ratio	-0.078	-0.084	-0.003	0.016		
	By subsistence protection criteria	-0.074	-0.084	-0.002	0.005		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 14: Age-Specific Analysis of the Urban and Rural Poverty Gap Indexes

Age	Basis of Estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
60~65 years	By urban and rural income ratio	0.179	0.243	0.035	0.084	-0.144	-0.159
	By subsistence protection criteria	0.167	0.223	0.024	0.068	-0.143	-0.156
66~70 years	By urban and rural income ratio	0.102	0.160	0.022	0.061	-0.080	-0.099
	By subsistence protection criteria	0.095	0.147	0.015	0.049	-0.080	-0.098
71~75 years	By urban and rural income ratio	0.094	0.122	0.015	0.039	-0.079	-0.083
	By subsistence protection criteria	0.088	0.113	0.011	0.031	-0.077	-0.082
Above 75 years	By urban and rural income ratio	0.109	0.124	0.017	0.030	-0.092	-0.095
	By subsistence protection criteria	0.102	0.115	0.012	0.024	-0.090	-0.091

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Table 15: Urban and Rural Poverty Gap Indexes for Living Alone Status

Living alone status	Basis of Estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Living with others	By urban and rural income ratio	0.457	0.538	0.080	0.197	-0.377	-0.341
	By subsistence protection criteria	0.428	0.498	0.056	0.158	-0.372	-0.340
Living alone	By urban and rural income ratio	0.027	0.026	0.009	0.017	-0.018	-0.009
	By subsistence protection criteria	0.024	0.023	0.007	0.014	-0.018	-0.009
Difference	By urban and rural income ratio	0.430	0.512	0.071	0.180		
	By subsistence protection criteria	0.403	0.475	0.049	0.144		

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

earn higher incomes. Compared with their rural peers, urban poor elderly persons have a smaller income gap largely because of more job opportunities in cities.

Seniors living with others have more diverse income sources and thus wider income gaps compared with those living alone. From 2010 to 2016, however, their difference narrowed sharply, as shown in Table 15.

The income gap is greater among uneducated elderly persons compared with their educated peers, as shown in Table 16. Urban elderly persons are relatively better off. By 2016, the income gap was relatively small among seniors with various levels of education.

Table 16: Analysis of Urban and Rural Poverty Gap Indexes by the Level of Education

Level of education	Basis of estimation	2010		2016		Difference	
		Urban	Rural	Urban	Rural	Urban	Rural
Uneducated	By urban and rural income ratio	0.237	0.421	0.072	0.189	-0.165	-0.232
	By subsistence protection criteria	0.218	0.390	0.050	0.151	-0.169	-0.238
Primary school	By urban and rural income ratio	0.098	0.100	0.011	0.020	-0.087	-0.079
	By subsistence protection criteria	0.090	0.090	0.008	0.016	-0.082	-0.074
Junior middle school	By urban and rural income ratio	0.079	0.034	0.005	0.005	-0.074	-0.029
	By subsistence protection criteria	0.076	0.031	0.004	0.004	-0.072	-0.027
High school	By urban and rural income ratio	0.045	0.008	0.001	0.000	-0.044	-0.007
	By subsistence protection criteria	0.044	0.007	0.001	0.000	-0.043	-0.007
Junior college and above	By urban and rural income ratio	0.025	0.002	0.000	0.000	-0.025	-0.002
	By subsistence protection criteria	0.025	0.002	0.000	0.000	-0.024	-0.002

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

5.2 Measurement Result of Multidimensional Elderly Poverty by the “Two No Worries and Three Guarantees” Criteria

5.2.1 Single-dimensional poverty measurement and analysis

Before estimating the multidimensional poverty index, this paper has examined and compared the single-dimensional poverty incidence in 2010 and 2016 (Table 17), respectively. Judging by the results, the dimension that improved the most is healthcare, which contributed 66% to poverty reduction. Income and education reduced the poverty incidence by 35.3 and 34.4 percentage points, respectively. According to the results of the China Longitudinal Aging Social Survey (CLASS) in 2014, elderly persons in China were vulnerable to income poverty, with 55.76 million elderly persons in China living below the subsistence protection threshold, and 76.98 million to 89.59 million elderly persons were in relative poverty (Zhu and Fan, 2017). Access to housing and safe drinking water helped reduce poverty by 7%-9%.

In 2010 and 2016, poverty incidence was generally higher in the countryside than in cities. Yet in 2010, housing poverty incidence was higher in cities than in the countryside. Except for the housing dimension, all the other dimensions - not least basic healthcare protection - contributed more to poverty reduction in the countryside than in cities.

In 2013, the National School of Development (NSD) at Peking University released the China Health and Retirement Longitudinal Study (CHARLS). Based on consumption poverty criteria, i.e. 2,433 yuan and 3,200 yuan per person/year for the countryside and cities, respectively, the survey on elderly people's economic conditions found that 22.9% of elderly persons aged 60 years or above were below the poverty line, totalling 42.40 million people, and that the poverty incidence for urban elderly persons of the age group was 9.5%, which was far below the rural poverty incidence of 28.9%.¹⁰ Since this report adopts different

¹⁰ Source: <http://finance.haiwainet.cn/n/2013/0705/c352345-19013624.html>.

Table 17: Single-Dimensional Poverty Incidence in 2010 and 2016

Single-Dimensional Poverty	2010			2016			Difference		
	Single-Dimensional Poverty Incidence	Urban and Rural		Single-Dimensional Poverty Incidence	Urban and Rural		Single-Dimensional Poverty Incidence	Urban and Rural	
		Urban	Rural		Urban	Rural		Urban	Rural
Income	0.669	0.300	0.370	0.316	0.137	0.179	-0.353	-0.162	-0.191
Access to safe drinking water	0.033	0.003	0.030	0.003	0.000	0.003	-0.030	-0.003	-0.027
Housing	0.125	0.080	0.045	0.041	0.017	0.024	-0.084	-0.063	-0.022
Healthcare	0.726	0.236	0.490	0.067	0.034	0.033	-0.659	-0.202	-0.458
Education	0.562	0.203	0.359	0.218	0.105	0.113	-0.344	-0.098	-0.246

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

poverty criteria from the survey results released by Peking University, our poverty incidence estimates are somewhat different, but the trend and urban-rural gap are generally consistent.

5.2.2 Dynamic comparison of multidimensional poverty by “two no worries and three guarantees”

Figure 1 depicts the relationship between three multidimensional poverty index and various deprived dimensions in 2010 and 2016. In 2016, most surveyed elderly persons were deprived of fewer than two dimensions, down from three dimensions in 2010. That is to say, compared with 2010, China faced fewer poverty reduction pressures to meet the “two no worries and three guarantees” target in 2016. The difference between the multidimensional poverty indexes between the two years is as much as 0.334. When deprivation occurred on one to three dimensions, the reduction of multidimensional poverty all exceeded 0.2. However, deprivation on all five dimensions at the same time almost never occurred in both years.

Comparison of poverty incidence on various deprived dimensions, the average share of deprivation and multinational poverty index is shown in Table 18. Both poverty incidence and the average share of deprivation have decreased on various deprived dimensions. However, the reduction of the multidimensional poverty index is mainly attributable to a decrease in poverty incidence, and the average share of deprivation, i.e. poverty depth, decreased by a smaller margin.

When the deprived dimension K is 1, the poverty incidence was 92.2% in 2010 and 52.1% in 2016, and the average share of deprivation was 45.9% and 24.8%, respectively. When K increases, however, poverty incidence fell sharply from 11.5% in 2016, down from 71.5% in 2010. With no more than three deprived dimensions, poverty was broad and deep in 2010. In 2016, however, most of the poor were poor only on one dimension.

5.2.3 Decomposition of multidimensional poverty index: significant differences across urban and rural areas, provinces and age groups

The urban-rural decomposition of the multidimensional poverty index is shown in Table 20. First,

Table 18: Comparison of Multidimensional Poverty on Various Deprived Dimensions

	2010			2016			Difference		
	Poverty incidence (H)	Average deprived dimensions (A)	Multidimensional poverty index (M0)	Poverty incidence (H)	Average deprived dimensions (A)	Multidimensional poverty index (M0)	Poverty incidence (H)	Average deprived dimensions (A)	Multidimensional poverty index (M0)
K=0	0.479	—	—	0.078	—	—	0.401	—	—
K=1	0.521	0.248	0.129	0.922	0.459	0.423	-0.401	-0.211	-0.294
K=2	0.115	0.415	0.048	0.715	0.534	0.382	-0.599	-0.119	-0.334
K=3	0.008	0.606	0.005	0.418	0.629	0.263	-0.410	-0.023	-0.258
K=4	0.000	0.800	0.000	0.059	0.805	0.047	-0.059	-0.005	-0.047
K=5	0.000	—	—	0.002	1.000	0.002	-0.002	-1.000	-0.002

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Note: K is the number of deprived dimensions.

Table 19: Comparison of Urban and Rural Multidimensional Poverty at Various Deprived Dimensions

Urban and rural decomposition Urban		2010		2016		Difference	
		Rural	Urban	Rural	Urban	Rural	
K=1	Poverty incidence (H)	0.401	0.521	0.236	0.285	-0.166	-0.235
	Average deprived dimensions (A)	0.409	0.497	0.250	0.246	-0.160	-0.251
	Multidimensional poverty index (M0)	0.164	0.259	0.059	0.070	-0.106	-0.189
K=2	Poverty incidence (H)	0.269	0.445	0.054	0.061	-0.215	-0.384
	Average deprived dimensions (A)	0.512	0.547	0.415	0.414	-0.096	-0.133
	Multidimensional poverty index (M0)	0.138	0.244	0.023	0.025	-0.115	-0.218
K=3	Poverty incidence (H)	0.133	0.285	0.004	0.004	-0.129	-0.281
	Average deprived dimensions (A)	0.627	0.630	0.600	0.613	-0.027	-0.017
	Multidimensional poverty index (M0)	0.083	0.180	0.003	0.002	-0.081	-0.177
K=4	Poverty incidence (H)	0.018	0.041	0.000	0.000	-0.018	-0.041
	Average deprived dimensions (A)	0.800	0.808	—	0.800	—	-0.008
	Multidimensional poverty index (M0)	0.014	0.033	—	0.000	—	-0.033
K=5	Poverty incidence (H)	0.000	0.002	0.000	0.000	0.000	-0.002
	Average deprived dimensions (A)	—	1.000	—	—	—	—
	Multidimensional poverty index (M0)	—	0.002	—	—	—	—

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Note: K is the number of deprived dimensions.

poverty incidence decreased sharply in both cities and the countryside. With $K=2$, for instance, poverty incidence fell by 21.5 and 38.4 percentage points in cities and the countryside, respectively. Second, the depth of poverty decreased more in the countryside than in cities. With $K=2$, for instance, the depth of poverty fell by 9.6 and 13.3 percentage points in cities and the countryside, respectively. Lastly, there is certain uniqueness in the difference of urban and rural poverty incidence and depth of poverty. In 2010, China's urban poverty incidence and depth were both smaller in cities than in the countryside. By 2016, however, there was a convergence in the depth of poverty across cities and the countryside while poverty incidence was smaller in cities than in the countryside.

Multidimensional poverty differences between 2010 and 2016 for various provinces are shown in Table 20. When $K=1$, the differences of multidimensional poverty index are ranked in ascending order. With $K=2$, for instance, both poverty incidence and the depth of poverty decreased sharply for Henan, Gansu, Guangdong and Shanghai while Guizhou and Yunnan saw smaller reductions in their poverty incidence but greater reductions, i.e. by close to 20 percentage points, in the depth of poverty.

According to the multidimensional poverty index decomposed by age in 2010, poverty incidence was smaller for those aged below 60 years than for those aged 60 years or above, but the depth of poverty was greater for those aged 60 years or above. By 2016, there was some difference in the poverty incidence for both groups, but the depth of poverty was generally consistent. For those aged below 60 years, poverty incidence fell by over 16 percentage points when $K \leq 3$, and the decrease in the depth of poverty diminished with the increase of deprived dimensions. For the elderly group aged below 60 years, their poverty incidence was high but fell sharply in 2016 from 2010. However, their depth of poverty narrowed by a smaller margin. In other words, poverty reduction for the age group below 60 years was reflected mainly in the reduction of poverty incidence. Those aged 60 years or above saw sharp decreases in both their poverty incidence and depth of poverty.

Contributions to multidimensional poverty in 2010 measured by multidimensions are shown in Figure 1. In the multidimensional poverty system with “two no worries and three guarantees” requirements, healthcare, income and education ranked high in terms of their contributions in 2010, and housing and access to safe drinking water contributed the least, indicating the modest depth of poverty on these dimensions.

Contributions to multidimensional poverty in 2016 are shown in Figure 2. Income and education contributed the most, and healthcare contributed about 10% (when $K=1$). Access to safe drinking water and housing faced smaller poverty reduction burdens.

Compared with 2010, healthcare, housing and access to safe drinking water ceased to be key determinants of multidimensional poverty in 2016. According to the China Health and Retirement Longitudinal Study (CHARLS) released by the National School of Development (NSD) at Peking University, medical insurance coverage was relatively low for poor elderly persons and those living alone no matter in the countryside or cities. Despite high medical insurance coverage for the general population, elderly persons who were weak and needed more assistance received less support. Hence, policymakers should strive to increase the effective supply of health services for older persons.

The above analysis shows that under the urban and rural poverty thresholds converted from the urban and rural income ratio and the national urban subsistence protection criteria, elderly poverty incidence was 30.6% in 2016. Compared with the nationwide poverty incidence of 5.7%, poverty was more widespread among the elderly, especially those living in the countryside. Poverty incidence was higher for elderly women than for their male peers, and higher by more than 20 percentage points for uneducated elderly persons than for their educated peers.

Judging by poverty reflected by the poverty gap index and the income gap among the poor reflected by the squared poverty gap index, the depth of poverty and income gap among elderly persons in the countryside were twice as high as in cities. Also, there is a big difference between the urban and rural

Table 20: Comparison of Multidimensional Poverty Index in 2010 and 2016 Decomposed by Age

Decomposition by age Below 60		2010		2016		Difference	
		60 or above	Below 60	60 or above	Below 60	60 or above	
K=1	Poverty incidence (H)	0.872	0.922	0.495	0.521	-0.378	-0.401
	Average deprived dimensions (A)	0.356	0.459	0.252	0.248	-0.105	-0.211
	Multidimensional poverty index (M0)	0.311	0.423	0.124	0.129	-0.186	-0.294
K=2	Poverty incidence (H)	0.487	0.715	0.115	0.115	-0.372	-0.599
	Average deprived dimensions (A)	0.480	0.534	0.421	0.415	-0.059	-0.119
	Multidimensional poverty index (M0)	0.234	0.382	0.049	0.048	-0.185	-0.334
K=3	Poverty incidence (H)	0.174	0.418	0.012	0.008	-0.162	-0.410
	Average deprived dimensions (A)	0.624	0.629	0.605	0.606	-0.020	-0.023
	Multidimensional poverty index (M0)	0.109	0.263	0.007	0.005	-0.101	-0.258
K=4	Poverty incidence (H)	0.021	0.059	0.000	0.000	-0.020	-0.059
	Average deprived dimensions (A)	0.806	0.805	0.800	0.800	-0.006	-0.005
	Multidimensional poverty index (M0)	0.017	0.047	0.000	0.000	-0.016	-0.047

Source: Calculated based on 2010 and 2016 data from the China Family Panel Studies (CFPS).

Note: K is the number of deprived dimensions.

poverty gap indexes and the squared poverty gap index measured by gender, age, living alone status and level of education. Notably, the depth of poverty among older persons aged 60-65 years varied by close to three times between cities and the countryside (by subsistence protection criteria). The urban and rural difference was more significant for elderly persons living with others, but smaller for elderly persons living alone. Judging by the income gaps of poor elderly persons reflected by the squared poverty gap index, the income gap was wider among rural male poor elderly persons than among their female peers. In cities where jobs are plentiful and incomes higher, the income gap was smaller even among uneducated elderly persons compared with their rural peers.

Calculated with the multidimensional poverty model, the multidimensional elderly poverty index suggests that under the current “two no worries and three guarantees” criteria, urban and rural elderly multidimensional poverty indexes are only about half the income poverty incidence. With two or more deprived dimensions, the level of multidimensional elderly poverty is even lower. Overall, the level of elderly multidimensional poverty is smaller in cities than in the countryside, but the difference in the average share of deprivations, i.e. poverty intensity, is relatively small. Despite the modest overall level of multidimensional poverty under the “two no worries and three guarantees” criteria, a few provinces such as Gansu and Henan rank high in terms of the provincial multidimensional poverty index. Poverty incidence is high among elderly persons living with others, but their average share of deprivations is smaller compared with that of elderly persons living alone. Despite a higher poverty incidence, elderly persons living with others have a lower poverty intensity compared with their peers who lived alone. The “two no worries,” especially the income dimension, contributed more to poverty. Among the “three guarantees,” healthcare and education are the weakest links.

6. Conclusions and Policy Advice

With 2010 and 2016 data from the China Family Panel Studies (CFPS), this paper investigated income and multidimensional poverty facing the Chinese elderly. Our study found that compared with non-elderly persons aged below 60, elderly persons in China faced a smaller poverty incidence but deeper poverty in 2010. However, by 2016 the level of poverty for the two groups converged. Compared with 2010, the poverty incidence and the average share of deprivation both fell sharply. Average poverty incidence and the average share of deprivation decreased by 30 and 10 percentage points, respectively. Rural elderly persons saw a larger reduction in poverty around 10 percentage points compared to their urban peers. Anti-poverty work achieved greater results for the rural elderly. Poverty indicators fell sharply for impoverished provincial-level regions like Guizhou, Yunnan, and Guangxi between 2010 and 2016. In 2010, there was a significant difference in the contributions of various dimensions to multidimensional poverty between elderly and non-elderly persons. However, by 2016, the difference in the contributions of various dimensions to multidimensional poverty converged with smaller welfare gaps between the two groups.

Elderly support, healthcare, education, and income contributed the most to multidimensional poverty reduction for the elderly between 2010 and 2016. The countryside experienced far greater single-dimensional and multidimensional poverty reduction than did cities. Multidimensional poverty for the elderly is positively correlated with the level of economic development in each province. In more prosperous provinces, both poverty incidence and intensity fell sharply. Income and residential energy remained key determinants of multidimensional elderly poverty.

In the countryside, income and multidimensional poverty remain priorities for poverty reduction, a more daunting task than in cities. As far as income poverty is concerned, rural elderly poverty incidence exceeded overall rural poverty incidence by close to 25 percentage points. Income poverty incidence was higher among female and uneducated elderly persons, and the income gap was greater among male rural elderly persons. In cities, the income gap was smaller even among uneducated elderly persons compared with their rural peers.

Our estimate of the multidimensional elderly poverty index via the “two no worries and three guarantees” criteria found that multidimensional poverty was far less intense than income poverty. The intensity of multidimensional poverty was only around half that of income poverty. After decomposition by gender, age, level of education and province, we found significant differences in urban and rural multidimensional poverty index categories. In poor provinces like Gansu and Henan, elderly persons living with others were more widely poor but not as deeply poor as those living alone. “Two no worries” contributed more to multidimensional poverty reduction than the “three guarantees,” especially on income and residential energy dimensions. Among the “three guarantees” criteria, health status contributed more than 20% of the multidimensional elderly poverty.

The above research findings highlight the importance of a targeted response to elderly poverty. As far as specific regions and groups are concerned, we should focus on the rural elderly as a key target group for poverty reduction. In regions with deep multidimensional poverty like Gansu and Henan, we should focus on rural elderly women and uneducated elderly as key target groups. Attention should also be paid to the urban elderly, especially those who are uneducated. For those aged between 60 and 70 and still capable of work, we may offer them technical training and job opportunities. With respect to income, we should raise allowances for the oldest old, and improve housing protection to prevent elderly persons from getting into poverty after exhausting their life’s savings to assist their children’s homeownership. With respect to healthcare, we should enhance the identification and prevention of elderly diseases while maintaining current health protection.

For elderly persons and especially those in poverty, we should help them participate in social

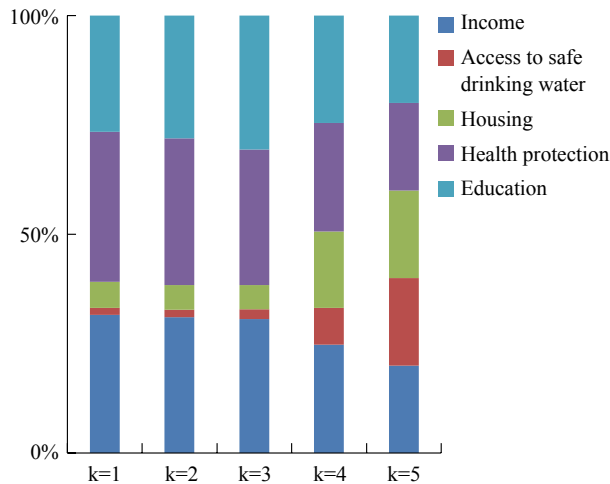


Figure 1: Contributions of Various Dimensions to Multidimensional Poverty in 2010

Source: Calculated based on 2010 data from the China Family Panel Studies (CFPS).

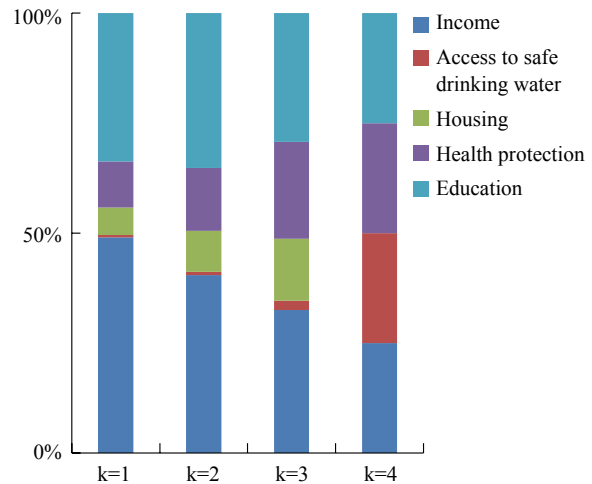



Figure 2: Contributions of Various Dimensions to Multidimensional Poverty in 2016

Source: Calculated with 2016 data from the China Family Panel Studies (CFPS).

activities and community development as well as help them keep in touch with their relatives, friends, and neighbors. Social participation will fulfill their value and dispel their sense of loneliness. We should establish community elderly activity centers, especially in rural areas, which are helpful to the psychological health of elderly persons. We should allow elderly persons to perform voluntary services in exchange for shopping coupons and healthcare credits. Communities may train elderly persons to use smartphones and other electronic devices, helping them adapt to new technology and situations.

Finally, we suggest establishing a complaint hotline to report discrimination against the elderly, encouraging them to fight discrimination and live in dignity. 

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