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Comparing the Extent and Levels of Child Poverty by the Income and Multidimensional Deprivation Approach in China

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Abstract Based on the newly published China Family Panel Studies Survey dataset in 2014, this paper estimated and compared the child poverty situations in China by the unidimensional income poverty approach and the multidimensional poverty approach. The Minimum Living Security Standard (MLSS) poverty line produced by the provincial government separately in the urban and rural areas was used to estimate child poverty rate by the income approach. While under the multidimensional deprivation approach, five dimensions with in total twenty deprivation indicators that could reflect the actual living standards were selected to measure the extent of multidimensional poverty among Chinese children. These five dimensions include the dimension of child health, child nutritional status, the dimension of education, child care and protection as well as children's access to basic facilities at the household level that are vital for children's survival and development. The results show, there is almost no significant difference in the child income poverty rate between rural and urban areas, whereas the multidimensional poverty rate of rural and urban children has significant disparities as measured using the multidimensional deprivation approach, no matter their performance in the single deprivation indicator or the aggregated deprivation index. The estimated results at the provincial level also indicate that the income approach could not accurately measure the extent and levels of child poverty. The results using the multidimensional poverty measures show that the disparities among children in China existed in a variety

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of areas including nutritional status, the early educational levels, the extent of care and protection from parents and caregivers, the social protection levels and the deprivation in access to basic facilities at the household level. This indicates that, there're multiple vulnerabilities and disadvantages faced by poor children in China beyond the household income, which will severely affected children's development of capabilities. To achieve the goal of minimizing the gaps between poor and non-poor children and helping poor children out of poverty, the government should consider measuring child poverty using the multidimensional deprivation approach and regularly monitoring the extent and levels of child poverty as well as the progress in child poverty reduction. In addition, a comprehensive strategy of social assistance and security should be implemented to help address multiple disadvantages faced by the poor children.

Keywords Income poverty · Multidimensional deprivation · Regional disparities · Minimum living security scheme · Child poverty

1 Introduction

The Chinese government has promulgated a series of child-focused policies in recent years, which shows the protection and realization of children's basic rights being recognized as increasingly more important areas by the policy-makers. In 2014, the State Council Office promulgated the Child Developmental Plans for the National Poor Regions from 2014 to 2020 with the policy targeting on 40 million children in contiguous areas with severe poverty (State Council 2014). The major goal of this policy is to promote the development levels of children living in the specified poor regions of China to the national average before 2020. Specifically, it mainly focused on reducing the child mortality rate, the underweight and stunting rate and improving the compulsory educational rate among children. In 2016, the Guidelines on strengthening the protection for the vulnerable children issued by the State Council of People's Republic of China firstly included the official definition of vulnerable children (State Council 2016a). These vulnerable children include children facing difficulties in living, accessing healthcare and education due to household poverty, children having difficulties in being recovered, being cared and being socially integrated due to disabilities, and children facing threats or harms to their personal safety due to the lack of family guardian or improper care and as a result suffering from abuse, abandon, accidental injury and unlawful infringement. In the same year, the State Council promulgated the Notices on strengthening the care and protection for the left-behind children in rural areas of China (State Council 2016b). It targeted children being left-behind by parents who worked in urban areas and thus lacking enough care and protection from parents or caregivers.

These child-focused policies indicate the scope and areas of child protection in China have been expanded which not only attempt to satisfy children's basic needs for survival and living but also the needs for developmental and being protected from harm or neglect. These aspects are all important for realizing children's basic rights in survival, development, participation and protection as ratified in the UNCRC, which states that every child have the right to have a standard of living adequate for the children's physical, mental, spiritual, moral and social development, and adequate protection and care shall be provided for children as it is necessary for their

development and well-being (UNCRC 1989). Recognized the various domains related to children's survival and development, it would be important for capturing these multidimensionality by rigorous selection and development of multidimensional indicators and dimensions for measuring the extent and levels of child poverty. It is also interesting to compare the extent and levels of child poverty by the multidimensional poverty measure and the conventional income or monetary measure.

At present, the government still adopts the conventional monetary approach for measuring and identifying the poor population. There are two notorious poverty lines, one is the rural poverty line designed only for rural areas of China, and the Minimum Living Security Scheme (MLSS, also known as Dibao scheme) poverty line designed for both rural and urban areas of China. In this paper, the MLSS poverty line is going to be used in comparisons with the child poverty outcomes by the multidimensional approach as the analysis is not confined solely to rural China. This paper is going to answer the following research questions: (1) What is the extent and level of child poverty by the conventional income poverty approach in China? (2) What is the difference in the extent of child poverty in China if measured by the multidimensional approach? (3) If the differences existed between two measures, how can it be explained and which poverty measure shall then be utilized for measuring child poverty in future?

2 Literature

The conventional measure of child poverty normally depends on the income poverty line to define poor children. Children are identified as poor if the household income are lower than the designed poverty lines (Olinto et al. 2013; Oxley et al. 2001; World Bank 2017). One well-known poverty line used for measuring child poverty around the world is the absolute poverty line designed by the World Bank. According to the newly updated 1.9 dollars a day poverty line, it is estimated that 19.5% of children under eighteen years old are in poverty and this rate is almost twice as the adult poverty rate (UNICEF 2016; Newhouse et al. 2016). For the developed countries, the poverty line is usually designed by setting a certain percentage of the median equivalized household income of the society members (Bradshaw et al. 2012; Bradshaw and Richardson 2008).

However, the income approach has received criticisms in that it fails to capture the other facilities and services that are vital for child survival and development. Poverty experienced by children is different from those of the adults' (Barrientos and DeJong 2006; Boyden et al. 2012; Bradbury and Jantti 2001; Gordon and Nandy 2012; HM Government 2014; Lu and Wei 2002; Roelen and Notten 2011; Singh and Sarkar 2014). As argued by Saunders, child poverty differs fundamentally from adult poverty not only in how it is experienced, and the extent to which those affected can be regarded as being responsible for their plight, but also in terms of its longer-term effects (Saunders 2015). The equal access to education, health, housing and social services are important for realizing children's basic rights and to achieve their full potentials for future development. The fulfillment of these facilities and services not only rely on the financial resources at the household level, but also are determined by the external provisions of public services and goods.

Therefore, the measurement of child poverty should take into consideration of these facilities and services which call for a multidimensional poverty measurement approach, which has been discussed and documented in previous studies (Hjelm et al.

2016; Chzhen et al. 2016, 2014; de Milliano and Plavgo 2014; de Neubourg et al. 2012 Gordon et al. 2003; Roelen and Gassmann 2008, 2009, Roelen et al. 2010; Notten and Roelen 2011; UNICEF 2007, 2011, 2013). In addition, the validity of the monetary income poverty approach has been challenged as many people not living below the income poverty line are still suffering from multiple deprivations, as documented in previous studies (Dercon 2012; Gordon et al. 2000, 2003; Minujin 2009; Nolan and Whelan 2010). Specifically, the actual living standard of children is more dependent on the provisions of goods and services which are not solely determined by the amount of household financial resources, but the distribution strategies within the family, parental choices and decisions as well as the macro child-relevant policies and the situations of accessing the external facilities such as the healthcare and schools, etc. Therefore, this calls for a multidimensional approach for analyzing child poverty status.

The application of multidimensional approach for measuring poverty has a long history record. Earlier in 1968, Sweden has conducted the Swedish Level of Living Survey and developed nine dimensions for poverty measurement including health and access to health care, employment and working conditions, economic resources, education and skills, family and social integration, housing, diet and nutrition, recreation and culture, and political resources (World Bank 2017).

In the United Kingdom, Peter Townsend has pioneered the relative deprivation approach for measuring poverty, which included multiple indicators covering diet, clothing, housing, health, education and so on (Townsend 1979). For child poverty measures, Gordon et al. (2003) has developed seven dimensions for measuring child poverty in the developing countries based on children's basic rights including food, safe drinking water, sanitation facilities, health, shelter, education and information. Afterwards, based on the concept of capabilities proposed by Sen, the Multidimensional Poverty Index (MPI) measurement approach was proposed and applied for child poverty measurement by the Oxford Poverty Human Initiative (OPHI) Centre (Alkire and Santos 2010; Alkire and Foster 2011; Alkire et al. 2015). In addition to calculate the headcount ratio of children experiencing multiple deprivations and poverty, the MPI methodology also recognized the importance of incorporation of the average number (sum of weighted) of deprivations the poor children suffering from into the poverty estimations and thus, a final adjusted multidimensional poverty rate will be estimated. The MPI methodology has been applied for child poverty estimations, for example, Roche (2009) utilized the Multiple Cluster Indicator Survey (MICS) data to estimate child poverty in Bangladesh (Roche 2009). Based on the Bangladesh Demographic Health Survey (BDHS) data from 1997 to 2007, Alkire and Roche (2011) measured the incidence and breadth of multidimensional poverty among children in Bangladesh as well but the measurement were specific to children under five-years old. The following multidimensional overlapping deprivation analysis, which is known as MODA methodology proposed by UNICEF scholars, was a combination of previous Bristol methodology and the Oxford MPI approach (de Milliano and Plavgo 2014; de Neubourg et al. 2012, 2013; Ferrone and Chzhen, 2016; Hjelm et al. 2016). In the construction of dimensions and indicators, it follows the Bristol methodology to choose the dimensions and indicators that are vital for child survival and development, while it also refers at the same time the estimation approaches of the MPI methodology by not only measuring the headcount ratio of child poverty but also the average deprivation intensity experienced by the poor children. These poverty measures all attempted to capture the multidimensionality of poverty experienced by children.

Compared with the large number of studies on child poverty in the international society for different country contexts, there are still very few studies on child poverty in the context of China. A growing number of articles in the context of China mainly focused on the discussion of the difficulties faced by the vulnerable children by different child groups such as the left-behind children or the migrated children with few studies have been conducted for exploring the scale and extent of poor children and how these poor children located in modern Chinese society by a rigorous poverty measurement approach. Even by the unidimensional income poverty measures, there is still the lack of data on children (Qi and Wu 2014). For example, the National Bureau Statistics (NBS) of China as well as the Ministry of Civil Affairs of China (MCA) estimated the number of people and households for the whole population living below the Minimum Living Security Scheme (MLSS) poverty line every year but without specific figures on children. It leaves it unknown about the extent and levels of child poverty in China by the MLSS poverty line. Put it forward, it is still not known the differences in child poverty status if measured by the income poverty measures and the multidimensional poverty measures. The lack of data and knowledge about child poverty makes it difficult for developing effective and efficient anti-poverty programs or policies for children. The Chinese government is now making its commitment of eradicating poverty before 2020 and as introduced in the beginning, several child-focused policies have also been promulgated by the State Council of China, with the political goal of eradicating child poverty and promoting better child development. In this general background, this paper then aimed at filling in the existing knowledge gap by addressing the following research questions: (1) What is the extent and level of child poverty in China if measured by the income poverty approach? (2) What is the extent and level of child poverty in China if measured by the multidimensional poverty approach? (3) How is it different in child poverty levels if measured using the income and multidimensional poverty approach?

3 Data and Methods

3.1 Data

This study aims to estimate the extent and levels of child poverty by two different approaches, i.e. the income and multidimensional poverty approach. The dataset of China Family Panel Studies (CFPS) surveyed in 2014 is used in this paper for two reasons. Firstly, CFPS focuses on the economic and non-economic wellbeing status of the Chinese population. It includes specific questionnaires for children, adults, the household and the community. And also, it covers information on children and families in multiple domains including household economic status, living conditions, community environment, health and education and so on, which is suitable for measuring child poverty using both poverty approaches. Secondly, this dataset surveys 25 provinces in China. It stratifies the sample in three stages: county, community and household, and selects random samples according to the probability proportion to size (PPS) method. The CFPS dataset covers 94.5% of the whole Chinese population and thus is a national representative dataset. The child poverty results estimated using the CFPS could then be generalized to the whole society, and thus the accuracy and reliability of the child poverty estimations analyzed based on this dataset could be guaranteed.

3.2 Measurement

CFPS 2014 starts its survey from July 2014, so this study adopts the Minimum Living Security Line in the third and fourth season in 2014 and utilizes the MLSS poverty line in 2014 for identifying poor children living in income poverty. The sources of the MLSS poverty line by the urban and rural areas of China are from the Ministry of Civil Affairs. The Social Assistance Act issued by Ministry of Civil Affairs (MCA) regulates that those whose per capita household income lower than the local designed MLSS poverty line is eligible for receiving social assistance from local government. A child is considered as being in income poverty if their per capita household income is lower than the MLSS poverty line. The following figure shows the MLSS poverty line by urban and rural areas of China for different provinces covered by the CFPS sample.

It is known from Fig. 1 that the urban MLSS poverty line is higher than the rural MLSS poverty line in general, while the urban-rural MLSS poverty line gap is smaller for the Eastern developed provinces and municipalities such as Shanghai, Beijing, Zhejiang and Jiangsu provinces. It is also known from the provincial trend that the Eastern provinces have higher poverty lines than the Western and Middle provinces, indicating that higher income level is required for maintaining a minimum living standard in the developed Eastern regions of China. According to the newly issued Social Assistance Policy by the national government (MCA, 2014), families with per capita income lower than the local minimum living security line are eligible for receiving the government social assistance allowances. Therefore, children are defined as the income poor children if their per capita income is lower than the MLSS poverty line.

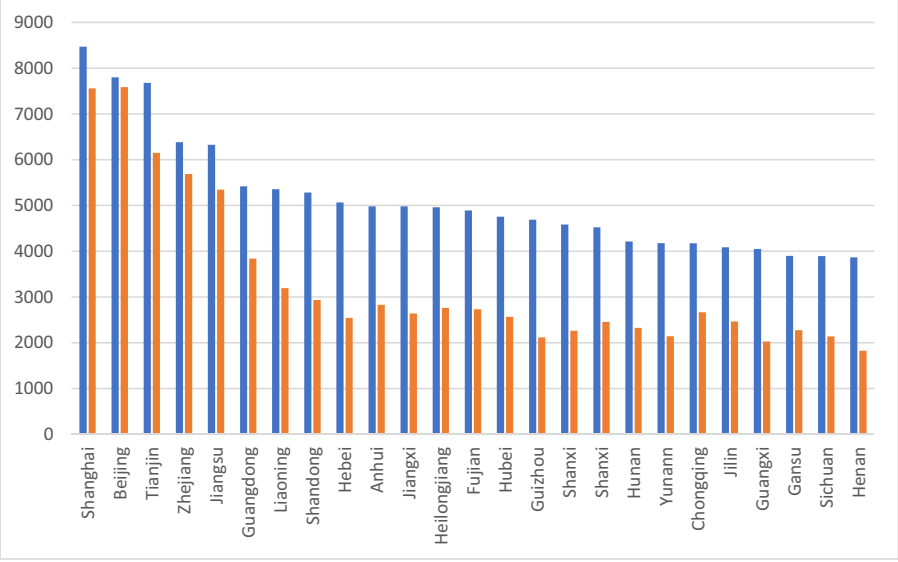

Fig. 1 MLSS Poverty lines at provincial level by urban and rural areas of China (Year, 2014; X-axis: Provinces; Y-axis: RMB). Source: Data Source: MCA(Ministry of Civil Affairs): http://www.mca.gov.cn/article/sj/

For the multidimensional poverty measure, this paper follows a rights-based approach for selecting the dimensions and indicators vital for child survival and development. In addition to making references to the international consensus, this paper also refers to the child-focused policies and contexts in China. For child health, it is necessary for children to have medical care including going to the hospital or buying medicine when children get serious illness (Gordon et al. 2003), and thus how to deal with severe illness was included as one deprivation indicator. Also, being able to access to healthcare facilities and medical insurance is necessary for promoting children's health (UNICEF 2012). For the dimension of nutrition, two indicators were selected including underweight and stunting, which were two widely used indicators for measuring children's nutritional deficiencies (WHO and UNICEF 2000). For child care and protection, it is known that the lack of adequate care from parents or caregivers have been found to significantly affect children's development in all aspects from cognitive to psychological development (Nguyen 2016; Wen and Lin 2012). Meanwhile, due to the unequal development of China's economy in different regions and areas, many children were being left-behind in rural areas by parents who seek job opportunities in urban cities of China. Long-term separation with parents will bring harms and negative consequences for child development (Chen et al. 2009). Therefore, the care and protection receiving from parents and caregivers have been incorporated in the analytical framework. For child education, it is necessary for children to receive pre-school education and nine-years of compulsory education, as ratified in China's Child Development Outlines (State Council 2011). Also, the distance and time to school has been considered as two important indicators to reflect the accessibility of schools for children (Gordon et al. 2003; UNICEF 2012). Therefore, four indicators were selected to reflect child deprivation in the dimension of education. For household facilities, previous works have found the importance of accessing to clean drinking water and sanitary toilet for reducing child mortality and morbidity (WHO and UNICEF 2013). Accessing to clean cooking fuel, electricity and having a proper shelter have also been found to closely associate with child health (UN-Habitat 2009). Therefore, five deprivation indicators have been selected to represent the quality of household facilities.

In total, five deprivation dimensions including health, nutrition, care and protection, education, and household facility with twenty deprivation indicators have been constructed to represent a minimum living condition that all child should have, and the lack of these items or necessities represent a deprivation of basic living standards. All of these indicators are used to measure the poverty status among Chinese children. Table 1 lists the dimension, indicators and the deprivation or poverty thresholds.

4 Results and Discussions

4.1 Validity Test of the Multidimensional Deprivation Indicators

Table 2 displays the validity test results for the multidimensional deprivation indicators described above. Validity is a key requirement that each deprivation indicator or item selected has to fulfil to be an eligible indicator for the final deprivation index. As argued by Guio et al. (2012), validity tests aim to check whether an individual deprivation

Table 1 Child multidimensional deprivation indicators and thresholds

	Deprivation threshold
Child health	
1. Illness treatment	1 = not go to hospital or buy medicine when children get serious illness
2. Health condition	1 = sick last month
3. Medical insurance	1 = no social or commercial medical insurance
4. Healthcare facility	1 = no healthcare center in village or community
Child nutrition	
1. Underweight	1 = child weight 2 SD lower than WHO weight reference
2. Stunting	1 = child height 2 SD lower than WHO weight reference
Child care and protection	
1. Care at day time	1 = no care at daytime including from any caregiver
2. Care at night time	1 = no care at night time including from any caregiver
3. Separation with father	1 = not living with father last year for more than six months
4. Separation with mother	1 = not living with mother last year for more than six months
5. Hukou status	1 = no Hukou
Child education	
1. Compulsory education	1 = not in school from 6 to 16 years old
2. Kindergarten	1 = not in kindergarten from 2 to 6 years old
3. Distance to school	1 = more than 5 km from home to school
4. Time to school	1 = longer than 1 h from home to school
Household facility	
1. Water source	1 = no clean drinking water
2. Sanitation facility	1 = no flush toilet at home or in village or community
3. Cooking fuel	1 = no clean cooking fuel
4. Electricity	1 = no electricity or cut frequently
5. Housing condition	1 = child older than 12 living with parents in the same room

indicator exhibits statistically significant relative risk ratios with a set of independent variables known to be correlated with the latent construct of deprivation. In many previous works such as Townsend (1979) and also Mack and Lansley (1985) have used the correlation between income and deprivation to select the indicators. For self-reported health status, earlier works have shown that people living in poverty also tend to have worse health status (Gordon et al. 1999; Leon and Walt 2001). Thus, in the work of measuring poverty using a set of multidimensional deprivation indicators in the European countries, Guio et al. (2012) have testified the validity of deprivation indicators using the external criteria including household income and self-reported health status. Following previous works, it is known that the deprivation indicators or items we have constructed should at least have significant associations with one of these external indicators, and thus, the indicators we've constructed could be said to well reflect and measure the concept of poverty, rather than any other concept. In order to test whether the selected indicators may truly reflect the poverty status of individuals, it requires to find another exogenous measurement of poverty and to examine their relationships. This

Table 2 Validity test of the multidimensional deprivation indicators

Deprivation indicator	N	Odds ratio 1	Odds ratio 2
1. Illness treatment	7883	1.08(0.36)	1.25(0.71)
2. Health condition	7884	1.01(0.71)	0.93(0.66)
3. Medical insurance	7488	0.84(0.00)***	0.80(0.22)
4. Healthcare facility	7129	0.96(0.15)	0.66(0.14)
5. Underweight	5071	0.79(0.00)***	1.12(0.87)
6. Stunting	7215	0.76(0.00)***	0.74(0.1)
7. Care at day time	7880	0.97(0.35)	4.84(0.00)***
8. Care at night time	7879	0.96(0.18)	4.90(0.00)***
9. Separation with father	7883	0.91(0.00)***	1.37(0.23)
10. Separation with mother	7885	0.89(0.00)***	1.16(0.61)
11. Hukou status	7890	0.82(0.00)***	n/a
12. Compulsory education	7883	0.76(0.00)***	4.2(0.00)***
13. Kindergarten	7883	0.85(0.00)***	n/a
14. Distance to school	7562	1.13(0.01)***	1.22(0.54)
15. Time to school	7893	0.77(0.00)***	1.71(0.36)
16. Water source	7878	0.78(0.00)***	0.78(0.29)
17. Sanitation facility	7657	0.59(0.00)***	1.06(0.69)
18. Cooking fuel	7893	0.58(0.00)***	1.13(0.38)
19. Electricity	7893	0.71(0.00)***	1.01(0.98)
20. Housing condition	7893	0.77(0.00)***	1.37(0.05)**

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

study adopts two exogenous measurement: family income and child self-report health status, and assumes that lower family income may lead to a higher probability of child multidimensional poverty, and more likely to be multidimensionally poor may then result in poorer health status. Either assumption holds, testifying the validity of the selected multidimensional deprivation indicators that can reflect the poverty status of Chinese children. This study uses Logistic regression model to carry out these tests.

According to the regression results, 14 out of 20 selected indicators are significantly related to household income and their relationships satisfy the above assumption. For example, for child health indicators, household income is significantly correlated to medical insurance, and higher income gives lower probability of deprivation in medical insurance (coefficient smaller than 1). For child nutrition indicators, stunting and underweight are both related to family income, and higher income leads to lower stunting and underweight rates. For child education indicators, higher income increases children's enrollment in kindergarten and primary school. The deprivation indicators of the household facilities are also testified to be significantly correlated with family income, and higher income significantly improves children's basic living conditions such as clean drinking water, sanitation facility and cooking fuel.

In addition, there are 4 out of 20 selected indicators significantly correlated to child self-report health status and their relationships satisfy the assumption. For example, children without care at day time have a higher likelihood of being unhealthy by 4.8

times, and similarly 4.9 times for children without care at night time, which show that caregiving significantly affects children's self-report health. However, these two indicators are not related to family income, which manifests that income does not completely determine children's life quality, and there are other non-material factors influence their wellbeing like parental care. Moreover, schooling enrolment is also significantly correlated to self-report health, and without the compulsory education, children feel unhealthy 4.2 times more likely than those in school, which reflects that education not only helps accumulate knowledge and skill, but also improve children's mental and physical health status. Similarly, living in poor household condition levels down children's self-evaluation on their health as well, by 1.37 times more probable to be unhealthy.

4.2 Comparison of Child Poverty Status by the Income and Multidimensional Poverty Index

Overall, there are totally 16 out of 20 indicators passing the validity test, and the multidimensional deprivation index aggregated by these 16 indicators may thus reflect the children's living conditions and poverty rate in China. This section will answer the research question, i.e. what is the extent and level of child poverty by the multidimensional poverty measurement approach? And what is the extent and level of child poverty by the income approach? What is the difference in child poverty rate when measured using these two distinctive approaches?

Figure 2 displays the deprivation rates by each indicator that has passed the validity test. Besides, the last column shows the income poverty rate of children living below the MLSS poverty line, for comparison. Overall, there were 19.6% children in China living below the MLSS poverty line. The multidimensional deprivation indicators, on the other hand, show poverty and deprivation experienced by children in multiple aspects. In general, children were more deprived in dimensions of health, nutrition, and household facility. For instance, 26.2% of all surveyed children lacked medical insurance, 28.9% were stunted, 13% were without care and protection either at day time or night time, 55% did not have clean toilet, 43% families did not cook using clean fuel,

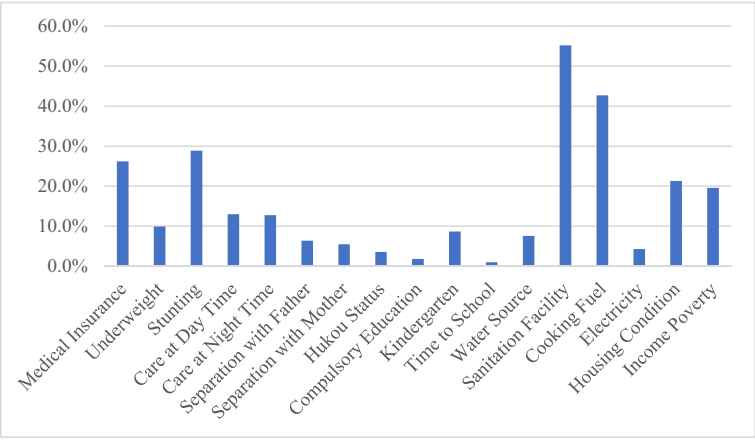

Fig. 2 Single-dimensional deprivation rate and income poverty rate

and 21% lived in crowded room. In addition, 6.4% and 5.5% children living separately with their father and mother, 8.7% did not go to kindergarten. The multidimensional deprivation results indicated that Chinese children still suffer from deprivations of basic facilities and services that hinder their healthy development, especially in the dimension of health, nutrition, protection, early development and family material condition. These deprivations and sufferings could not be captured solely using the unidimensional income poverty approach.

Furthermore, Table 3 compares the income poverty rate and the single-dimensional deprivation rate between rural and urban children, and the *P*-value indicates the t-test result between the two sample means. As can be seen from the table, the income poverty rate according to the MLSS poverty line set in 2014 between rural and urban areas were insignificantly different, 19.5% versus 20.1%. However, the child deprivation status between rural and urban samples provides controversial conclusions. First of all, the living condition of rural children was significantly worse than urban children, reflected in the 16 deprivation indicators, some of which show a distinct gap. For example, in the child nutrition dimension, underweight and stunting rates of rural children were 11.8% and 35.2%, both significantly higher than urban children with only 6.9% and 19.3% respectively. In child protection, rural children were also more likely to be separated with their parents and suffer from the lack of adequate care from any adults. In the education dimension, although the compulsory schooling enrolment rates were similarly high between rural and urban areas, there existed significant gap in terms of kindergarten enrolment. Roughly 9.8% of rural children were still deprived of early educational

Table 3 Comparing rural-urban child poverty by multidimensional deprivation indicator and income indicator

Deprivation indicator	National	Rural	Urban	P-value
Income Poverty rate	19.6%	19.5%	20.1%	0.54
Medical insurance	26.2%	28.7%	22.1%	0.000***
Underweight	9.9%	11.8%	6.9%	0.000***
Stunting	28.9%	35.2%	19.3%	0.000***
Care at day time	13.0%	13.5%	12.3%	0.11
Care at night time	12.8%	13.3%	11.9%	0.063*
Separation with father	6.4%	7.2%	5.0%	0.000***
Separation with mother	5.5%	6.5%	3.8%	0.000***
Hukou status	3.6%	4.2%	2.7%	0.000***
Compulsory education	1.8%	2.1%	1.4%	0.02**
Kindergarten	8.7%	9.8%	6.9%	0.000***
Time to school	1.0%	1.4%	0.4%	0.000***
Water source	7.6%	10.8%	2.2%	0.000***
Sanitation facility	55.2%	70.6%	30.9%	0.000***
Cooking fuel	42.7%	56.7%	19.9%	0.000***
Electricity	4.3%	5.5%	2.4%	0.000***
Housing condition	21.3%	21.6%	20.5%	0.25

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

opportunities, which was significantly higher than those of the urban peers. In the household facility dimension, the difference in material seemed more apparent that 10.8% of rural children could not access clean drinking water, 70.6% lacked flushed toilet, and 56.7% still used unclean cooking fuels, indicating a shocking high number of children lacking the access to basic facilities. Whereas in these indicators, child deprivation rate was much lower with 2.2%, 30.9% and 19.9% in urban China.

The multidimensional poverty analysis show that rural children were suffering from severe deprivations in multiple dimensions, and their living standards were much worse than children living in urban areas of China. The disparities manifest the deficiency in child nutrition, protection, preschool education, and infrastructure in rural China. However, the severe deprivations of basic facilities, services and resources could not be captured by the income approach.

In addition to the comparison in child poverty rate between rural and urban children by income and single deprivation indicators, a final multidimensional child poverty index is also calculated to reflect how children experienced multidimensional poverty simultaneously. Figure 3 also shows the aggregated multidimensional deprivation index ranging from 0 to 16, representing how many deprivations children suffered from simultaneously. It is obvious from this aggregate index that rural children suffered significantly more severe multidimensional deprivation. For instance, 79.7% of rural children experienced deprivation in at least 2 indicators, compared with 49.1% of the urban children. 57.1% of rural children suffered from three or more deprivations, whereas the poverty rate for urban children was only 25.9%. The disparity was also significant when the summarized poverty index was set at more than five or six deprivation indicators. The results show the significant disparity in the life quality of children between rural and urban China. Nevertheless, these rural-urban gaps were not reflected in the income poverty rates between the two areas, and the income measurement could not fully represent child life quality and poverty status. Hence, to ensure precise and effective assist to people in poverty, it requires precise identification of them using multidimensional deprivation approach.

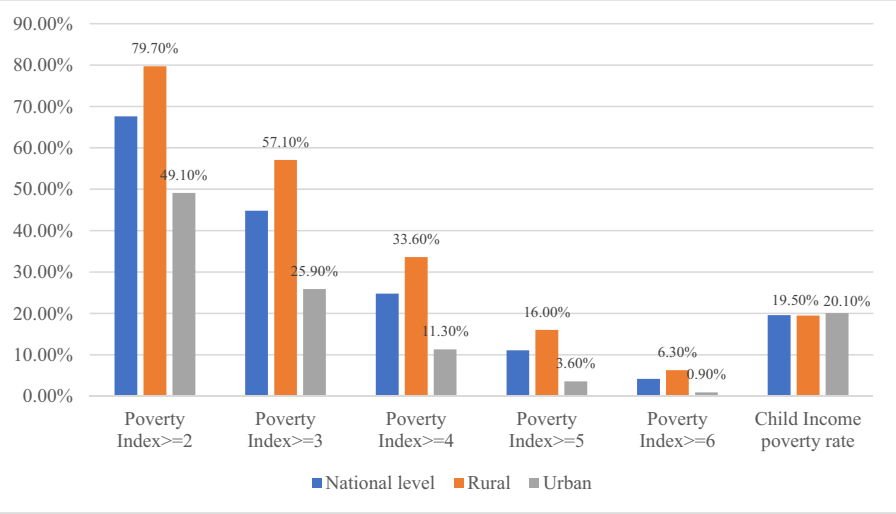

Fig. 3 Comparing child poverty by multidimensional deprivation approach and income approach

In addition to comparing the poverty status between rural and urban children in China by the income and multidimensional poverty approach, the analysis was also conducted to compare the regional disparities in children's living standards. The following Table 4 investigates the poverty rate using both approaches in each province of China. It shows the average deprivation status by different provinces and it could be seen from the results that on average, children suffered from more than two deprivations out of our constructed deprivation index. In poor and undeveloped provinces, the child multidimensional poverty rates were usually very high, and even higher than the corresponding income poverty rates. For example, children who suffered at least 4 different deprivation items accounted for 49.4% and 51.4% in Gansu and Sichuan, which indicates the worse living conditions in these two provinces, whereas their corresponding income poverty rates were only 21.1% and 37.1%. It indicates that

Table 4 Child poverty rate by multidimensional poverty and income poverty approach

Province	Average index	Index > =2	Index > =3	Index > =4	Income poverty
National	2.4	67.6%	44.8%	24.8%	19.6%
Beijing	1.1	28.1%	3.1%	3.1%	6.1%
Tianjin	1.2	31.8%	15.9%	4.6%	4.7%
Hebei	2.3	68.0%	40.8%	17.1%	21.6%
Shanxi	2.7	72.7%	51.0%	30.2%	27.1%
Liaoning	2.4	73.0%	46.4%	21.7%	12.1%
Jilin	2.5	68.9%	47.8%	27.8%	17.1%
Heilongjiang	2.1	62.3%	34.3%	20.6%	13.3%
Shanghai	0.9	25.0%	7.3%	0.8%	4.8%
Jiangsu	1.2	29.9%	13.2%	5.6%	11.4%
Zhejiang	1.5	48.5%	20.4%	7.8%	6.9%
Anhui	2.4	65.7%	43.8%	27.0%	20.2%
Fujian	1.9	58.5%	28.5%	13.1%	23.3%
Jiangxi	1.9	54.1%	29.0%	12.6%	17.3%
Shandong	2.0	62.0%	34.7%	12.8%	16.5%
Henan	2.2	64.3%	38.0%	18.0%	12.6%
Hubei	1.9	54.0%	31.0%	17.2%	9.5%
Hunan	1.9	55.4%	35.3%	17.4%	12.1%
Guangdong	2.1	60.5%	36.3%	18.3%	26.1%
Guangxi	2.5	69.0%	48.3%	28.5%	24.6%
Chongqing	2.0	60.3%	30.9%	14.7%	18.8%
Sichuan	3.6	83.4%	68.5%	51.4%	37.1%
Guizhou	3.1	79.3%	63.5%	40.3%	36.5%
Yunnan	2.9	83.7%	60.3%	31.9%	22.9%
Shaanxi	2.5	74.3%	45.6%	24.0%	14.2%
Gansu	3.5	91.8%	75.1%	49.4%	21.1%
P-Value	0.00***	0.00***	0.00***	0.00***	0.00***

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

many children were not living below the local MLSS poverty thresholds but still suffered from deprivations in multiple dimensions and had a poor standard of living. The income poverty approach underestimated the severe deprivations and poverty experienced by children in poor regions of China. In addition, similarly located in western China, Guizhou, Yunnan and Shaanxi also experienced higher multidimensional poverty rates, than those eastern provinces like Jiangsu and Zhejiang, which reflects the eastern-western development gap. The disparities of child poverty between western and eastern provinces were larger using the multidimensional poverty approach than those estimated using income measure. The income approach cannot describe the living conditions of Chinese children in multidimensional aspects, and even cannot reflect the regional disparities in child development.

Figure 4 shows the disparities in child poverty when measured using income and multidimensional poverty approach. A stricter cut-off, i.e. children who suffered at least deprivations in four or more deprivations were defined as living in multidimensional poverty for comparisons. Bars above the 0% reference line represent multidimensional deprivation rates were higher than income poverty rates in certain provinces. On average, a large amount of children experienced severe poverty measured using the multidimensional approach but were not identified as income poor children in many provinces such as Gansu, Shanxi and Yunnan. It indicates the inconsistency between the two measurement. In particular, this inconsistency and disparity in undeveloped western provinces was even larger, for example, 14.3% and 28.3% in Sichuan and Gansu, which manifests that these large proportion of children were not considered as poor children according to the MLSS poverty line, but they still experienced low living conditions and material deficiency in multiple ways, who should be incorporated into the social protection system.

Generally, the income poverty measurement may underestimate the severity of child poverty, but even according to the income poverty line, some of the poor families still cannot receive the MLSS allowance. Figure 5 further compares the income poverty rate and the actual allowance receiving rate by province. It is apparent that income poverty rates were higher than the allowance receiving rate in most provinces of China, only

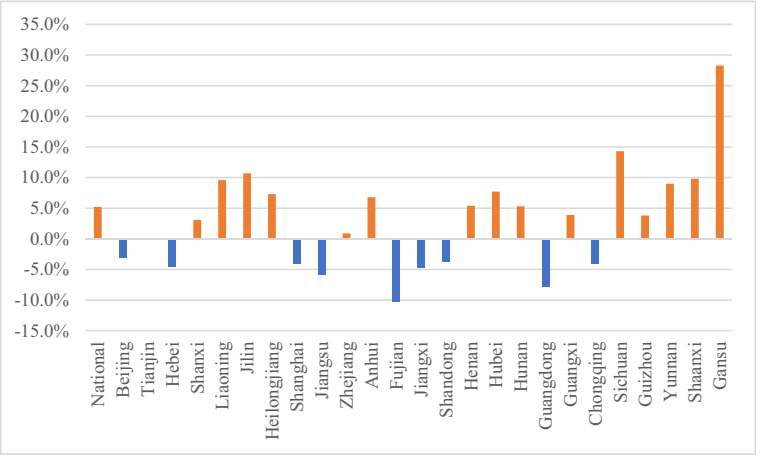

Fig. 4 The disparities in child poverty rate by income and multidimensional poverty approach

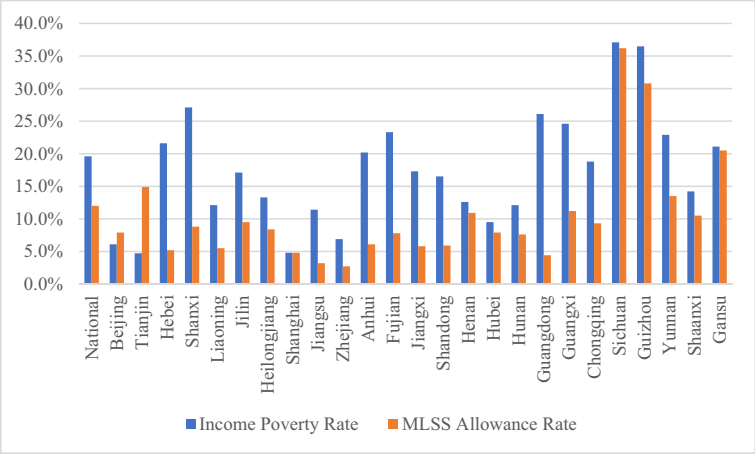

Fig. 5 Income poverty rate and MLSS allowance rate by province

except Beijing and Tianjin. There existed many children who should have received the MLSS allowance or other forms of social assistance in the other 23 provinces. On average, there were 19.6% children in China with their family income lower than the MLSS poverty line, but only 12% of them received the allowance, and 7.7% were not covered. Specifically in each province, children eligible but not receiving the allowance accounted for over 10% in provinces like Hebei, Shanxi, Anhui, Fujian, Jiangxi, Shandong, Guangdong and Guangxi, which reflects a large amount of uncovered children by the social protection system in most provinces of China, and the deficiency and unfulfillment of the social assistance scheme.

5 Conclusion

Based on the newly published China Family Panel Studies Survey dataset in 2014, this paper estimated and compared the child poverty situations in China by the unidimensional income poverty approach and the multidimensional poverty approach. Despite the income approach is easier to be applied for calculations, it does not capture the disadvantages that poor children experienced in a multidimensional way. The traditional uni-dimensional approach of utilizing solely income in child poverty measurement could not reflect children's accessibility to basic facilities and services that are vital for their survival and development. It is not known how children living below the income poverty line experience poverty or whether children's basic rights as ratified in the UNCRC (1989) are fulfilled or not. The United Nations convention set standards that all children have the rights to a minimum level of wellbeing including the right to water, nutrition, basic education, survival and to access infrastructure and services that are critical for children's development and future wellbeing.

It is known that children have a variety of needs which rely on not only household financial resources, but most importantly the accessibility of basic infrastructure and public services provided by the surrounding environment (Qi and Wu 2014, 2015a, b). Therefore, it would be necessary to look beyond the narrow focus on income,

consumption or expenditure poverty measures and focus on the effects of inadequate public service provisions for children (Gordon et al. 2003; Minujin 2012). Sen (1981) also argued that direct method is superior to the income method and only in the absence of direct information regarding the satisfaction of the specified needs can there be a case for bringing in the intermediary of income.'

Therefore, this paper aims to look beyond the traditional income measures and utilize the multidimensional deprivation approach for estimating and comparing child poverty results. The Minimum Living Security Standard (MLSS) poverty line produced by the provincial government separately in the urban and rural areas was used to estimate the child poverty rate by the income approach. The complexities of using multidimensional approach rely on the selection of appropriate deprivation indicators or items, which should follow many existing conventions and national policies or guidelines relating to children. Following the children's rights framework, five dimensions with in total twenty deprivation indicators that could reflect the actual living standards were selected to measure the extent of multidimensional poverty among Chinese children. These five dimensions include the dimension of child health, child nutritional status, the dimension of education, child care and protection as well as children's access to basic facilities at the household level that are vital for children's survival and development.

This paper has the following findings which provide important implications for policy-makers and practitioners to develop further effective anti-poverty policies or programs for children. Firstly, this paper found that child care receiving from parents and caregivers would be important for children's health, as checked through the validity test. The lack of care and the long-term separation with parents would all significantly affect children's self-reported health status. The analysis by the rural and urban children on the dimension of child care further discovered the severe deprivation of care from caregivers among children living in rural areas of China. Rural children were more severely deprived of enough care and being able to live with parents. This has important implications for the policy-makers to focus on the health and wellbeing status of children being left-behind by parents in rural areas of China.

Secondly, this paper found that the extent and levels of child poverty were more severe when measured using multidimensional poverty approach compared with the results using income approach, in rural and poor regions of China. The rural children suffer from severe deprivations of the developed deprivation items, the multidimensional child poverty rate among rural children was much more severe either in single deprivation items or the final aggregated child poverty index. A large proportion of rural children still lack the access to basic facilities and services, including adequate nutrition, access to kindergarten, sanitation facilities, clean cooking fuel, electricity and shelter. When compared child poverty rate using aggregated poverty index, it shows 79.7% of rural children suffer from two or more deprivations, 57.1% of rural children suffer from three or more deprivations, the rate decreased as the index values become bigger but there is significant disparity compared with urban children. Whereas, the income poverty rate has no significant difference between rural and urban children. The situation is similar in regional comparisons. Western children experience severe deprivations, with the single deprivation rate and multidimensional child poverty rate much higher than children living in Eastern regions of China. The Western-Eastern disparities in child poverty rate were also larger when measured by the multidimensional poverty approach compared with the income approach. The findings show the worse living

standard of children in poor regions of China, and their multidimensional poverty status were captured by the multidimensional poverty approach but were not being able to be captured by the income measures.

To better reflect children's living standards and how they experienced poverty, as well as more effective and efficient anti-poverty policies and programs to be developed in future, it would be important to incorporate the multidimensional poverty approach into the poverty analysis and monitor the poverty status among children in China more regularly. As introduced at the beginning, nowadays alleviation of poverty has been included in the political commitment, and the government has also made a series of child-focused polices. However, the lack of figures and data in China on child poverty makes it difficult to understand the key problems and challenges the poor children suffered from, and makes it hard to have effective policies and programs for targeting these poor children and helping to address the key problems. To achieve the goal of minimizing the gaps between poor and non-poor children and helping poor children out of poverty, a multidimensional poverty measurement approach is necessary. Meanwhile, comprehensive strategy of social assistance and security as well as effective programs should be developed and implemented to help address multiple disadvantages faced by children in poor areas of China.

Finally, this paper also recognized the limitations of this work. Firstly, this paper only utilizes one cross-sectional dataset for child poverty analysis and comparisons. It is one snap-shot of child poverty status in China, further works should be conducted to analyze the trends of child poverty in China over a longer time period. Longitudinal dataset should also be employed to track the changes of children's living standards. Secondly, this paper did not analyze the risk factors of child poverty, and also did not further analyze how child poverty has differed by parents-level or household-level characteristics. There might be different risk factors for driving income poor children and multidimensionally deprived children. The risk factor information would be also important for policy-making, in particular to better locate the poor households and children. Further works could be done to construct a risk-factor model to find out the risk and protective factors for children living in poverty.

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