

# Differences of Height, Weight and BMI between Urban and Rural Children Aged 2-4 Years in China

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## Abstract

**Objective:** To compare the height, weight and BMI of Chinese children aged 2-4 years between urban and rural areas, and to provide some references for the study of early childhood health. **Methods:** A total of 1361 rural and urban children (721 boys, 640 girls) aged 2-4 years who met the criteria of the China Family Panel Studies (CFPS) in 2018 were selected as subjects, to analyze and compare the physical development of children in rural and urban areas. **Results:** The height of urban children aged 2-4 years was higher than that of rural children ( $p < 0.05$ ), the weight of urban and rural children aged 2-4 years had no significant difference ( $p > 0.05$ ), and the BMI of rural children aged 2-4 years was higher than that of urban children. **Conclusions:** The physical development of children in China is different between urban and rural areas, so we should pay attention to the problem of obesity in rural children.

**Keywords:** Children, Height, Weight, BMI, Urban-rural Differences.

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## INTRODUCTION

Children's health has always been the focus of people's attention. Physical development is often used to judge a child's health [1], height, weight and BMI are the basic indexes to evaluate the physical development of human body. From previous research reports, we found that the height and weight of children of all ages have increased significantly in recent decades, especially the weight [2, 3]. This growth trend is influenced by congenital genetic factors and acquired factors such as nutrition, physical exercise, parenting, and socioeconomic status, but the influence of acquired factors is more critical [4].

Economic development has been unbalanced between rural and urban [5]. In terms of public infrastructure, health care, nutrition, etc., there is a large gap between rural and urban areas in my country, which is the reason for the obvious gap in children's growth and development. Previous studies have shown that the average height and weight of Chinese rural children are generally lower than urban children [6]. However, in recent years, studies have found that this difference has gradually narrowed, and some results have even reversed. In some areas, there is no significant

difference in the weight of urban and rural children, and even some rural children have exceeded the weight of urban children [7].

This study extracted the data of children aged 2-4 years from the Database of China Family Panel Studies (CFPS), compared the differences in height, weight and BMI of children aged 2-4 years between urban and rural areas, understood the status quo of height, weight and BMI of children in urban and rural areas, and analyzed the existing problems from multiple perspectives. And put forward solutions, so as to provide reference for children's physical health development.

## METHODS

The research data are from the newly released China Family Panel Studies (CFPS) 2018 national data. The survey was conducted by the China Center for Social Science Surveys at Peking University, and included 8,734 children in the 2018 database. In order to obtain the height and weight of children, BMI and other basic relevant information, 1361 children aged 2-4 were selected from the children's sample database in 2018 as the research objects, and variables were screened, including urban and rural classification,

children's age, height and weight, and BMI, while abnormal data were excluded. Data were exported to Excel software and finally transferred to SPSS21.0 for independent t-tests. The significance level was  $p < 0.05$ . All values will be presented as mean  $\pm$  SD unless otherwise stated.

## SUBJECTS

A total of 1361 rural and urban children (721 boys, 640 girls) were selected from CFPS2018 data, among them, their ages ranged from 2 to 4 years old: 293 boys (145 urban children, 248 rural children) and

258 girls (120 urban children, 128 rural children) are 2-year-old children, 207 boys (88 urban children, 119 rural children) and 204 girls (81 urban children, 123 rural children) are 3-year-old children, 221 boys (87 urban children, 134 rural children) and 178 girls (74 urban children, 104 rural children) are 4-year-old children. Urban children refer to those whose parents have non-agricultural household registration and live in urban areas. Rural children are those whose parents have agricultural hukou and live in rural areas. The basic situation is shown in Table 1.

**Table 1: Distribution of children in different age groups and regions**

Participant	2-year-old	3-year-old	4-year-old
Urban boy	145	88	87
Rural boy	148	119	134
Urban girl	120	81	74
Rural girl	138	123	104
<b>Total</b>	<b>551</b>	<b>411</b>	<b>399</b>

## RESULTS

The comparison results of height, weight and BMI between urban boys and rural boys aged 2-4 are shown in Table 2. There were significant differences in height and BMI between urban boys and rural boys of different ages. Specifically, among 2-year-old boys, the height of urban boys is significantly higher than that of rural boys ( $P < 0.05$ ), while the BMI was significantly lower than rural boys ( $P < 0.05$ ). among 3-year-old

boys, the height advantage of urban boys was more prominent than that of rural boys ( $P < 0.01$ ), and the BMI was significantly lower than that of rural boys ( $P < 0.05$ ); compared with rural boys of the same age, 4-year-old urban boys maintain an absolute advantage in height ( $P < 0.01$ ) and have a greater gap in BMI ( $P < 0.01$ ). However, no matter which age group; there was no significant difference in weight between urban boys and rural boys ( $P > 0.05$ ).

**Table 2: Comparison of indicators for boys aged 2-4 years between urban and rural areas**

	Age (year)	Urban	Rural	t	p
Height	2	86.32 $\pm$ 9.54	83.66 $\pm$ 12.43	2.053	0.041*
	3	93.82 $\pm$ 11.78	86.64 $\pm$ 14.70	3.773	0.000**
	4	101.61 $\pm$ 9.47	94.18 $\pm$ 17.10	3.700	0.000**
Weight	2	25.81 $\pm$ 4.18	25.92 $\pm$ 5.14	-0.213	0.831
	3	30.61 $\pm$ 5.30	29.61 $\pm$ 5.57	1.297	0.196
	4	35.58 $\pm$ 6.28	34.03 $\pm$ 7.13	1.610	0.109
BMI	2	17.99 $\pm$ 5.90	20.09 $\pm$ 9.63	-2.245	0.026*
	3	18.64 $\pm$ 9.85	21.75 $\pm$ 10.67	-2.142	0.033*
	4	17.41 $\pm$ 3.59	21.56 $\pm$ 12.03	-3.121	0.002**

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

The comparison results of height, weight and BMI between urban boys and rural girls aged 2-4 are shown in Table 3. We found there were significant differences in height and BMI between 2-year-old urban girls and rural girls, urban girls are taller and have a lower BMI ( $P < 0.05$ ); the urban-rural differences in height and BMI of 3-year-old girls are consistent with those of 2-year-old girls ( $P < 0.05$ );

among 4-year-old girls, the differences in height and weight between urban girls and rural girls are still significant ( $P < 0.01$ ), but the gap seems to be narrowing; however, in the comparison of body weight, we found that similar to the results of boys, there was no significant difference between urban girls and rural girls at all ages.

**Table 3: Comparison of indicators for girls aged 2-4 years between urban and rural areas**

Indicators	Age (year)	Urban	Rural	t	p
Height	2	86.33±10.14	82.10±12.85	2.899	0.004**
	3	92.94±11.38	88.44±12.42	2.616	0.010**
	4	100.11±9.87	96.11±14.87	2.020	0.045*
Weight	2	24.64±5.41	25.01±5.54	-0.547	0.585
	3	28.15±5.51	29.32±6.67	-1.308	0.192
	4	32.96±6.64	32.39±5.94	.599	0.550
BMI	2	17.12±5.84	20.38±11.67	-2.772	0.006**
	3	16.79±4.84	19.81±7.82	-3.100	0.002**
	4	16.59±3.46	18.87±7.76	-2.356	0.020*

P&lt;0.05, \*\* p&lt;0.01

## DISCUSSION

The results of this study show that the height of urban children is better than that of rural children, and the difference is significant ( $P < 0.05$ ), but there is no difference in body weight between urban and rural children ( $P > 0.05$ ), BMI of rural children is higher than that of urban children ( $P < 0.05$ ), and the results are not affected by age. It is obvious that children in towns and villages grow up at different rates.

Nutrition is the material basis for the growth and development of children and the guarantee for their healthy growth [8]. After the 1940s, the mode of family operation has undergone earth-shaking changes. Many families have changed from the natural form of self-sufficiency in agriculture to the social family form with strong external dependence, which has changed the way children are taken care of [9]. The way children are taken care of has a direct impact on their growth. Preschool children are more dependent on their parents for daily life and food, but many rural parents are forced to move to cities due to economic problems, and their children are raised by next-generation immediate family members [10]. However, due to the lack of nutritional knowledge of the elderly, children are prone to nutritional imbalance [11]. Some scholars have investigated left-behind children in rural China and found that their next-generation immediate relatives are more likely to spoil them, and more unhealthy food floods into rural areas, which elderly people cannot distinguish, resulting in unhealthy consumption of children and obesity of children [12]. The living conditions of urban children are better than those of rural children, although urban couples are also under employment pressure due to the surge in social pressures, and therefore often need to resort to social care, such as nurseries [9]. However, urban parents are more educated than rural parents, and they will give their children proper nutrition in vegetables, fruits, dairy products and eggs [13], so as to promote their children's all-round development. This may explain the differences in physical development between urban and rural children.

The problem of obesity among rural children urgently needs to be improved. The companionship of

parents is crucial to the growth of children, but due to various factors, the phenomenon of left-behind children in rural areas is inevitable. Therefore, we believe that first of all, the government should increase investment in rural areas, improve child care service institutions, build, rebuild and expand child care institutions in rural areas where resources are scarce, and make up for the shortage of family care. We will establish a sound system for parents to balance work and children, and provide basic financial security to primary caregivers. Secondly, special child health guidance groups should be set up in rural areas to regularly popularize nutrition knowledge for parents, organize children's physical examination collectively, and give policy and economic support for children's healthy growth.

## CONCLUSION

There are differences in children's physical development between urban and rural areas: 1) the height development of urban children is better than that of rural children; 2) There was no significant difference in body weight between urban and rural children; 3) The BMI of rural children is higher than that of urban children.

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## CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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