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Cover photo: Local CDC staff conducting interviews for nutrition survey at a primary school in Jiacha County in Tibet in September 2018 (photographer: Dongmei Yu, National Institue for Nutrition and Health, China CDC).

Announcements

Tracking New Challenges of Nutrition Transition and Developing Specific Strategies to Promote Healthy China

Gangqiang Ding[1,#]

With the rapid development of socioeconomy, urbanization and population aging, China has been experiencing the nutrition transition characterized as a double burden of undernutrition and over-nutrition (*1–2*). Actively responding to the challenges, the Chinese government has released a series of national nutrition and health policies during the past five years, such as the Healthy China 2030 Blueprint, Healthy China Initiative (2019–2030), and National Nutrition Plan (2017–2030), in the context of comprehensive implementation of the National Strategy for Healthy China (*3–5*).

The national nutrition survey has been implemented regularly to track dynamics of nutrition and health status in the Chinese population. Until now six rounds of national nutrition surveys had been conducted among Chinese residents in 1959, 1982, 1992, 2002, 2010–2013, and 2015–2017 (*6–11*). The surveys of 1959 and 1982 were completed by national nutrition project team in Chinese Academy of Medical Sciences, and the rest cycles were conducted by China CDC (Former Chinese Academy of Preventive Medicine). The nationally representative samples were selected using a multistage cluster random sampling method in the surveys. The fourth survey in 2002, renamed the China National Nutrition and Health Survey, combined with chronic diseases and nutrition for the first time (*8*). Given the rapid change of diet, nutrition, and other lifestyle factors in China, the nutrition survey was renamed to nutrition surveillance since 2010-2013 and are scheduled to be conducted every 3–5 years (*9*). Remarkably, the latest China Nutrition and Health Surveillance (2015–2017) has both national and provincial representativeness. All above surveys have provided solid data base of scientific evidence for policymaking in China.

China has been faced with a great challenge of the double burden of malnutrition over time. Stunting, underweight, micronutrient deficiency, overweight and obesity, and nutrition-related chronic diseases are still prevalent among urban and rural residents in China. Beginning with comprehensive introduction of the implementation scheme of the China Nutrition and Health Survey/Surveillance, this issue and awaiting issue will publish a series of articles covering topics from dietary intake, sugar-sweetened beverages, serum ferritin, vitamin A, folic acid, weight status, and related self-perception. These articles will give a multidimensional assessment of diet, nutrition, and health status mong school-aged students, women of childbearing age, pregnant women, the elderly and potential sociodemographic disparity.

Three papers will describe the consumption and features of energy, macronutrients, vitamins, and beverages among children and adolescents.The dietary intake of children can affect their life-long health.

Iron deficiency and vitamin A deficiency in childhood have the potential adverse short- and long-term impacts on their health. One article was about the prevalence of iron deficiency among Chinese children in 2016–2017, especially among girls aged 12–17 years. Another article discussed the prevalence of vitamin A marginal deficiency among rural children was higher than that among urban children in China, especially among younger children. For pregnant Chinese women, one article reported that there was still a certain proportion of women at risk of folic acid deficiency in 2015.

Underweight is an independent risk factor of their health and life quality among the elderly. One article will present trend of the underweight status among elderly people from 1992 to 2015. Precise self-perception of body weight status plays a key role in optimal weight control against underweight or overweight. Another study will show the percentage of self-perception of body weight accurately in Chinese women of childbearing age.

Findings from the aforementioned papers have important implications for policymaking, strategy development, and public health practice. Effective strategies should be actively implemented to cope with new challenges during rapid nutrition transition. It is vital to transfer each policy into action, develop better measures and practice for promoting balanced diets and healthy lifestyles, and enhancing nutrition awareness and technology. Joint efforts of governments, societies, schools, families, and individuals should be promoted to establish supportive environments for nutrition and health promotion.

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Preplanned Studies

Energy and Macronutrient Intake Among Children Aged 6–11 Years Old — China, 2016–2017

Lahong Ju[1]; Wei Piao[1]; Hongyun Fang[1]; Qiya Guo[1]; Shuya Cai[1]; Xiaoli Xu[1]; Shujuan Li[1]; Xue Cheng[1]; Dongmei Yu[1,#]; Liyun Zhao[1]

Summary

What is already known on this topic?

Low level energy and macronutrient intakes and dietary imbalances are still important issues and should be prioritized in children aged 6–11 years old in China.

What is added by this report?

Among children aged 6–11 years in China in 2016–2017, the average protein intake was 55.2 g/d in urban areas and was higher than the estimated 45.4 g/d in rural areas. The proportions of children whose protein intake were below the estimated average requirement (EAR) were about one-fifth in urban areas, and more than one-third in rural areas, respectively.

What are the implications for public health practice?

The undernutrition problem had changed into a nutritional imbalance problem among children aged 6–11 years in China. In addition to enriching the food supply and improving the dietary behavior, societies, schools, and families should make joint efforts to develop a feasible and appropriate dietary environment.

Proper intake of energy and macronutrients (including protein, fat, and carbohydrate) are vital factors for human nutrition and health, especially among children aged 6–11 years old. The fact that unhealthy diet is associated with non-communicable diseases (NCDs) and worsened quality of life has been recognized worldwide (*1*). Childhood is the key stage of growth over the whole lifetime and has higher nutrition requirements. Malnutrition consists of undernutrition and overnutrition. The latest data from the World Health Organization (WHO) showed that the prevalence of obesity among children and adolescents were 11.7%, and about 21.3% of children under the age of 5 were stunted (*2*). In 2010, the prevalence of malnutrition, including stunting, mild wasting, and moderate severe wasting in children aged 7–12 years were 13.29% and 12.55%, respectively (*3*). This study aimed to reveal the status of energy and macronutrient intake among children aged 6–11 years old in China using data from the China Nutrition and Health Surveillance conducted between 2016 and 2017.

Compared with Chinese Nutrition and Health Survey in 2002, a declining trend of the average energy intake was observed in 2010–2012, while the average fat intake was slightly increased with a narrowing gap between urban and rural areas. Carbohydrate intake decreased, and protein intake largely remained the same (*4*). No previous nationwide report about the intakes of energy and macronutrients among 6–11 years old children in China was published, and the intake levels of energy and macronutrients evaluated by dietary reference intakes (DRIs), including estimated average requirement (EAR) and recommended nutrient intake (RNI), were also rarely reported in this age group.

Data were obtained from the China Nutrition and Health Surveillance of Children and Lactating Mothers in 2016–2017. This study was a cross-sectional study, conducted in 31 provincial-level administrative divisions (PLADs). The survey used multistage stratified random sampling method and was nationally and provincially representative. The method of data collection included four parts: interviews to collect demographic information; physical examination to observe the indices of growth; laboratory tests to evaluate the health and dietary status among interviewees; and inquiring into the energy and nutritional intake. The information on energy and macronutrient intakes were drawn and assessed by 3 consecutive days of 24 h dietary recalls and weight records of edible oil, salt, and flavoring (*5*). The calculation of the energy was conducted by referring to China Food Composition (*6–7*). The protein intake of participants was evaluated using the criteria of EAR and RNI, and then were divided into <EAR, EAR–RNI, and ≥RNI groups (*8*). Study populations were allocated into different groups by sex and regions. SAS 9.4 (SAS Institute Inc., Cary, NC, USA) was used

to conduct all the analyses. The protocol of this study was evaluated and approved by the ethical committee China CDC (201614).

A total of 8,777 subjects were included for this report, including 4,145 in urban areas and 4,632 in rural areas. The number of males was 4,364, including 2,034 in urban areas and 2,330 in rural areas; the number of females was 4,413, including 2,111 in urban areas and 2,302 in rural areas.

Table 1 presented the data on energy and macronutrient intakes of two regions of the two sexes. The average intake of energy was 1,591.7±560.0 kcal/d, and the average intakes of protein, fat, and carbohydrate were 50.0±20.8 g/d, 69.6±37.5 g/d, and 196.3±81.6 g/d, respectively. All the intake of energy and macronutrients in urban area was higher than in rural area. Overall, the average protein intake in urban areas was approximately 10.0 g/d higher than in rural areas, and similar results were observed when grouped by regions and sexes. Although the carbohydrate intakes were higher in males than in females, which was similar to the results based on region.

The results of evaluating protein intake based on the value of EAR and RNI were illustrated in Table 2. Generally, the proportion of children whose protein intake were below the EAR criteria was about 19.5% in urban areas and more than 33.9% in rural areas. Protein intake of more than half of the total children were over the EAR criterion. Similar trends were observed in protein intake evaluated by RNI in the overall group of children aged 6–11 years old. All the proportions of protein intake that were below EAR in urban male and female groups remained around 20% and were higher in rural groups.

DISCUSSION

Energy and macronutrient intake are key indicators

TABLE 1. Energy and macronutrient intake among children aged 6–11 years old in China, 2016–2017.

Gender	Energy & macronutrients	Total	Urban	Rural
Male	Energy (kcal/d)	1,624.1±567.7	1,672.3±555.2	1,581.9±575.1
	Protein (g/d)	50.9±21.2	56.2±21.9	46.3±19.3
	Fat (g/d)	71.4±38.1	73.8±36.7	69.4±39.2
	Carbohydrate (g/d)	199.5±82.3	201.2±81.2	198±83.3
Female	Energy (kcal/d)	1,559.7±550.6	1,600.5±540.9	1,522.2±556.7
	Protein (g/d)	49.1±20.4	54.1±21.9	44.5±17.7
	Fat (g/d)	67.8±36.8	69.3±34.8	66.4±38.5
	Carbohydrate (g/d)	193.2±80.8	195.2±81.1	191.4±80.5
Both	Energy (kcal/d)	1,591.7±560.0	1,635.8±549.1	1,552.2±566.8
	Protein (g/d)	50.0±20.8	55.2±21.9	45.4±18.6
	Fat (g/d)	69.6±37.5	71.5±35.8	67.9±38.9
	Carbohydrate (g/d)	196.3±81.6	198.2±81.2	194.7±82.0

TABLE 2. Distributions of protein intakes among children aged 6–11 years old in China 2016–2017.

Gender	DRIs	Total (%)	Urban (%)	Rural (%)
Male	<EAR	26.9	19.8	33.2
	EAR–RNI	19.6	16.3	22.6
	≥RNI	53.4	64.0	44.3
Female	<EAR	27.3	19.1	34.7
	EAR–RNI	21.4	18.7	23.8
	≥RNI	51.4	62.2	41.5
Both	<EAR	27.1	19.5	33.9
	EAR–RNI	20.5	17.5	23.2
	≥RNI	52.4	63.0	42.9

Abbreviations: DRTs=dietary reference intakes; EAR=estimated average requirement; RNI=recommended nutrient intake.

that reflected the nutritional status of individuals and the overall population and are important to combatting undernutrition or malnutrition. Protein-energy malnutrition (PEM) has been a leading cause of child health problems, especially in developing countries. Assessing PEM is a vital procedure in nutrition surveillance.

In this study, higher intake of energy and macronutrients in urban populations as compared to rural populations were observed, and a disparity of protein intake between two area types was revealed. In general, the intake levels of energy and macronutrients were higher in urban populations than in rural population, and the intake levels were also higher in males than in females. Compared with the China Nutrition and Health Surveillance 2010–2013 (*4*), a large gap of protein intake between urban and rural 6–11 years old children still existed in the 2016–2017 surveillance. The discrepancy of carbohydrate intake between urban and rural areas nearly vanished in 2017, and the similar result was observed in analysis based on biological sex. Protein intakes of more than 30% of total children were under EAR, and no more than 50% of all children's protein intakes were over the RNI. Although the protein intake in urban children was better than in rural children, the overall intake was at a low level, which suggested an imbalance of macronutrients intake.

A previous study had shown that the prevalence of malnutrition had declined overall in recent years but had increased in some PLADs and became concentrated in undeveloped areas (*3*). To improve the nutritional status, food supply is an important factor. Another study suggested that the short supply of protein-rich food, such as eggs, soy products, and milk, was a serious challenge in rural China (*9*). The differences in energy and protein intake between urban and rural population drawn from this study might be a reasonable explanation.

Dietary behavior was also important to improving nutrition so that the dietary behaviors of vulnerable children could be changed by external influences. Therefore, the effects of government nutrition policies, environmental improvement, and nutrition education on improving dietary behavior and nutrition status had been recognized (*10*). The Nutrition Improvement Program for Rural Compulsory Education Students had been performed since November 2011; however, the problem of insufficient dietary habits for this population still needs to be solved (*9*). Enhancing school health education was emphasized in "Healthy China 2030" (*11*).

In general, low intake levels of energy and macronutrients in children aged 6–11 years in China were an important issue to be addressed. Dietary imbalance was another problem that should be prioritized. Communities, schools, and families should make joint efforts to develop a feasible and appropriate dietary environment for the target population.

This study was subject to at least two limitations. First, children aged 6–11 years old in this survey were a special group and information had to be collected, with difficulty, from the participants themselves or the family. Most of the data were collected from their schools or other units, which could, therefore, influence the randomness of the sampling to be not as ideal. Second, the profiles of fat and carbohydrate evaluated by the DRIs were not conducted because there were no recommended values.

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Preplanned Studies

Weight Status and Self-Perception of Weight Among Women of Childbearing Age — China, 2015

Hongyun Fang[1]; Qiya Guo[1]; Lahong Ju[1]; Shujuan Li[1]; Xiaoli Xu[1]; Wei Piao[1]; Dongmei Yu[1]; Liyun Zhao[1,#]

Summary

What is already known about this topic?

Both lean and obese women carry a risk for adverse pregnancy outcomes. Correct self-perception of body weight status is necessary for optimal weight control.

What is added by this report?

Data from the Nutrition and Chronic Disease Surveillance of Chinese Residents in 2015 were used in this study. The weight status and self-perception of weight among women of childbearing age in China were analyzed to provide basic data for improving the nutritional health of women of childbearing age.

What are the implications for public health practice?

Around 45% of women of childbearing age misperceive their body weight status. Future actions to improve body weight perception in women of childbearing age are necessary to increase the impact of public health campaigns focusing on a healthy body weight.

In the United Nations population statistics, women of childbearing age were defined as being between 15–49 years old. According to the data of the Sixth Census in 2010, the total number of women who were aged 15–49 years in China was about 380 million. Childbearing is important and it is thus important to identify factors that may influence the ability to give birth to children. Beyond age, several lifestyle-related factors, such as excess body weight, obesity, underweight, smoking, intense sporting activity, alcohol consumption, drug addiction, or abuse of other substances, have an adverse influence on female fertility (*1–3*). Accuracy of body weight perception is an individual's perception of their body weight in comparison with actual body weight, and a correct self-perception of body weight status is necessary for optimal weight control. In this report, we aimed to analyze the weight status and self-perception of weight among women of childbearing age in China. The data were obtained from the China National Chronic Diseases and Nutrition Surveillance of Adults (2015). The proportion of normal weight and underweight in women of childbearing age were 54.3% and 5.7% respectively, and the incidence of normal weight and underweight was the highest in the group aged 18–24 years; the rate of overweight and obesity were 28.3% and 11.7%, respectively, and the proportion of overweight and obesity was highest in the group aged 35–49 years. Only 55.6% of women of childbearing age perceived their body weight correctly. Correct evaluation of one's own weight is necessary for taking weight control measures for healthy weight management. Actions should be taken to improve the cognitive level of weight of women of childbearing age to guide them to correctly manage their own weight.

China National Chronic Diseases and Nutrition Surveillance of Adults was a descriptive and cross-sectional study conducted in 2015 (*4*). Demographic information, perception of body weight, anthropometric measures [weight, height, and body mass index (BMI)] were assessed. Trained investigators using standardized protocols measured height and weight using standardized equipment. Height was measured with a height meter (TZG type) with a minimum scale of 0.1 cm; weight was measured with an electronic scale (Tanita HD-390) with a minimum scale of 0.1 kg. A total of 43,077 women of childbearing age were included in this study, including 17,782 urban women and 25,295 rural women. Each participant was asked to rate her own body weight category as underweight, normal weight, overweight, or obese before anthropometric measurement. We calculated BMI from measured weight and height, and the women were categorized into 4 groups according to their BMI as follows (according to the Criteria of Weight for Adults of the health industry standard of China, WS/T 428–2013):

Underweight: BMI <18.5 kg/m^2

Normal: 18.5≤ BMI <24.0 kg/m^2

Overweight: 24≤ BMI <28.0 kg/m^2

Obese: BMI ≥28.0 kg/m^2

Weighted coefficients accommodated the sampling scheme for unequal probabilities of sample selection and the post-stratification weights, which harmonized the sample structure of the surveillance with that of the Sixth National Population Census in 2010 (5). Prevalence by region (urban and rural), and age were estimated. SAS software (version 9.4, SAS Institute Inc., Cary, USA) was applied for statistical analysis.

General characteristics of the sample are shown in Table 1. We investigated women of childbearing age from urban (41.3%) and rural (58.7%) areas in China and considered 3 age groups: 18–24 years (7.4%), 25–34 years (26.7%) and 35–49 years (65.9%). The mean BMI of Chinese childbearing age women was 23.6 kg/m^2 (23.3 kg/m^2 in urban areas and 23.8 kg/m^2 in rural areas) and increased with the age. Based on objective body weight status, 5.7% were classified as underweight, 54.3% were normal weight, 28.3% were overweight, and 11.7% were obese. The prevalence of underweight decreased with age and was 12.5% among women 18–24 years of age. The prevalence of overweight increased proportionally with increasing age as the groups aged 18–24, 25–34, and 35–49 had rates of 17.1%, 22.9%, and 36.3%, respectively. Similarly, the obese prevalence of women also increased with age, and the prevalence of obese women aged 18–24, 25–34, and 35–49 years were 7.6%, 10.2%, and 14.3%. Within each age group, women residing in rural areas were more likely to be overweight and obese than those in urban areas.

Table 2 shows the consistency of BMI and body weight perception of Chinese women at childbearing age in 2015. Among normal weight women, 28.1% underestimated or overestimated their weight, 8.6% thought they were low weight and 19.5% thought they were overweight or obese. Among underweight women, 55.7% perceived their body weight heavier than their actual body weight, in which 2.1% perceived themselves as overweight or obese. Among overweight and obese women, 42.5% perceived their body weight lighter than their actual body weight, in which 1.9% perceived themselves as underweight.

Table 3 provides the association of BMI and body weight perception. Both permutations were divided into 3 groups: consistency, underestimation, and overestimation; 55.6% women of childbearing age accurately perceived their weight status, 15.8% underestimated their weight status, and 28.6% overestimated their weight status. Women in urban areas were less likely to overestimate their weight than those in rural areas. Women aged 35–49 years were the most likely to overestimate their weight (37.2%), while young women aged 18–24 years were more likely than other ages to underestimate their weight (24.7%).

DISCUSSION

Weight status and BMI are important indicators reflecting the physical health status of women of childbearing age. In our study, the proportion of underweight, normal weight, overweight and obese among Chinese women of childbearing age in 2015 were 5.7%, 54.3%, 28.3%, and 11.7%, respectively. Young women aged 18–24 years had a higher incidence of underweight (12.5%), especially in urban young women (15.6%), while the incidence of overweight and obese increased with age. Nearly half of women of childbearing age in China were abnormal

TABLE 1. Descriptive characteristics and body mass index (BMI) category of Chinese women of childbearing age, 2015.

Area type	Age (years)	N (%)	BMI (kg/m^2, Mean, SE)	BMI category (%, 95%CI)			
				Underweight	Normal	Overweight	Obese
Urban	18–24	1,288 (7.2)	21.9 (0.13)	15.6 (12.8, 18.4)	64.0 (60.3, 67.6)	13.5 (10.1, 16.8)	7.0 (4.8, 9.1)
	25–34	5,130 (28.9)	22.9 (0.11)	7.6 (6.4, 8.9)	61.7 (59.4, 64.1)	21.0 (18.9, 23.2)	9.6 (8.0, 11.2)
	35–49	11,364 (63.9)	24.3 (0.06)	1.7 (1.3, 2.0)	50.3 (48.5, 52.1)	34.9 (33.2, 36.7)	13.1 (11.9, 14.3)
	Subtotal	17,782 (41.3)	23.3 (0.07)	6.5 (5.7, 7.4)	56.7 (55.2, 58.2)	26.1 (24.7, 27.5)	10.7 (9.8, 11.6)
Rural	18–24	1,894 (7.5)	22.7 (0.16)	8.9 (7.1, 10.6)	61.3 (57.9, 64.7)	21.4 (18.0, 24.8)	8.4 (6.2, 10.6)
	25–34	6,358 (25.1)	23.3 (0.09)	6.7 (5.7, 7.6)	56.7 (54.9, 58.6)	25.5 (23.8, 27.1)	11.1 (9.7, 12.5)
	35–49	17,043 (67.4)	24.5 (0.05)	1.9 (1.6, 2.3)	44.9 (43.5, 46.2)	37.7 (36.5, 38.9)	15.5 (14.3, 16.7)
	Subtotal	25,295 (58.7)	23.8 (0.06)	4.7 (4.2, 5.2)	51.5 (50.3, 52.7)	31.0 (29.9, 32.1)	12.8 (11.9, 13.7)
Total	18–24	3,182 (7.4)	22.3 (0.11)	12.5 (10.7, 14.3)	62.7 (60.2, 65.3)	17.1 (14.6, 19.7)	7.6 (6.1, 9.2)
	25–34	11,488 (26.7)	23.0 (0.08)	7.2 (6.4, 8.0)	59.6 (58.0, 61.2)	22.9 (21.5, 24.4)	10.2 (9.2, 11.3)
	35–49	28,407 (65.9)	24.4 (0.04)	1.8 (1.6, 2.0)	47.7 (46.6, 48.8)	36.3 (35.2, 37.3)	14.3 (13.4, 15.1)
	Subtotal	43,077 (100.0)	23.6 (0.05)	5.7 (5.2, 6.2)	54.3 (53.3, 55.3)	28.3 (27.4, 29.3)	11.7 (11.0, 12.3)

TABLE 2. Consistency analysis of body mass index (BMI) and body weight perception of Chinese women of childbearing age, 2015.

BMI category	Age (years)	Body weight perception category (%, 95%CI)		
		Underweight (%, 95%CI)	Normal (%, 95%CI)	Overweight/obese (%, 95%CI)
Underweight	18–24	40.8 (29.9, 51.7)	57.1 (46.3, 67.9)	2.1 (0.7, 3.5)
	25–34	47.4 (42.8, 52.1)	49.8 (45.0, 54.5)	2.8 (0.9, 4.7)
	35–49	48.0 (41.3, 54.7)	49.6 (42.7, 56.4)	2.4 (0.4, 4.4)
	Subtotal	44.3 (38.5, 50.2)	53.3 (47.6, 59.0)	2.4 (1.3, 3.4)
Normal	18–24	5.9 (4.1, 7.7)	69.5 (66.2, 72.9)	24.6 (21.3, 27.9)
	25–34	6.5 (5.7, 7.4)	71.5 (69.5, 73.4)	22.0 (20.1, 23.9)
	35–49	11.5 (10.3, 12.7)	73.5 (71.9, 75.2)	14.9 (13.7, 16.1)
	Subtotal	8.6 (7.8, 9.3)	71.9 (70.5, 73.2)	19.5 (18.3, 20.8)
Overweight/Obese	18–24	1.4 (0.4, 2.5)	35.2 (29.7, 40.8)	63.3 (57.7, 69.0)
	25–34	1.2 (0.8, 1.7)	34.8 (32.1, 37.5)	64.0 (61.3, 66.7)
	35–49	2.3 (1.9, 2.7)	44.0 (42.1, 45.9)	53.7 (51.8, 55.7)
	Subtotal	1.9 (1.6, 2.3)	40.6 (38.9, 42.4)	57.4 (55.7, 59.2)

TABLE 3. Consistency of body mass index (BMI) and body weight perception by age and residence among Chinese women of childbearing age, 2015.

Item	Consistent estimation (%, 95%CI)	Underestimation (%, 95%CI)	Overestimation (%, 95%CI)
Age (years)			
18–24	58.0 (55.4, 60.7)	24.7 (22.4, 27.0)	17.3 (15.2, 19.4)
25–34	59.1 (57.6, 60.6)	18.9 (17.3, 20.4)	22.0 (20.6, 23.5)
35–49	52.5 (51.3, 53.8)	10.2 (9.5, 10.9)	37.2 (36.0, 38.5)
Area type			
Urban	57.4 (56.1, 58.7)	18.4 (17.2, 19.6)	24.2 (22.6, 25.8)
Rural	53.5 (52.3, 54.7)	12.8 (11.9, 13.7)	33.7 (32.6, 34.9)
Total	55.6 (54.7, 56.5)	15.8 (15.0, 16.6)	28.6 (27.5, 29.7)

weight — i.e., they were underweight, overweight, or obese. Previous studies have shown that underweight, overweight, and obese may reduce fertility (*1–3*). Therefore, medical institutions and health education departments should take targeted measures to help women of childbearing age with abnormal weight improve their weight management.The accuracy of body weight perception refers to an individual's perception of their body weight (normal weight, underweight, overweight, or obese) compared with their actual body weight. Self-perception of body weight is influenced by many factors such as BMI, sex, age, race, ethnicity, and socioeconomic status (*6–8*). Previous studies suggested that women tended to overestimate their weight status and men were more likely to underestimate (*7–8*). However, there have been limited studies on the accuracy of body weight perception in women of childbearing age. The results of this study added to the literature by assessing the concept of accuracy of body weight perception in Chinese women of childbearing age based on nationally representative sample for the first time.

In our study, there was a significant difference between BMI and body weight perception in Chinese women of childbearing age. However, women with different BMIs have different self-perception tendencies. The current results showed that among normal weight women of childbearing age, 71.9% could correctly judge their body weight while 19.5% overestimated their weight and 8.6% underestimated. However, 55.7% of underweight women of childbearing age overestimated their body weight, and 42.5% of overweight and obese women of childbearing age underestimated their body weight. This result is similar to a previous study among US adults that obese and overweight persons tend to underestimate their body weight (*9*). The rate of false self-perception of body weight was high in women with abnormal BMI.

In China, around 45% of Chinese women of childbearing age did not accurately rate their body weight status. Young women tended to underestimate their weight, while older women tended to overestimate their weight. This may be related to self-esteem or self-acceptance. Compared with other age groups, young women were less willing to admit that they were overweight, while older women were more receptive to the problem of becoming overweight. The rate of incorrectly perceiving weight (45%) in our study was higher than Chinese American adults (32%) (*10*). The accuracy of weight perception might be different in different ethnic and cultural backgrounds. A previous study reported that white women, even if they were of normal weight, were more likely to think they were overweight (*6*). Compared with Europeans, obese women in South Asia tend to underestimate themselves as normal weight (*11*).

The findings in this study are subject to at least two limitations. First, the method of self-assessment of body weight was used in this study, and the subjects rated their weight as underweight, normal, overweight and obese. This report didn't provide pictures of different body types for the respondents to choose. There are some differences in body shape judgment of underweight, normal, overweight and obese. Second, this is a cross-sectional study, this research couldn't track the impact of weight cognition on individual weight control and other health outcomes.

Both lean and obese women carry a risk for adverse pregnancy outcomes. Preventing abnormal body weight may improve women's reproductive health and save a portion of medical expenses for related treatment in China. Correct self-perception of body weight indicates that people have a correct understanding of their current weight status, which is necessary for weight control and prevention of weight related diseases. Our study showed a low agreement between self-perception of body weight status and objectively measured body weight status in women of childbearing age in China. Future actions to improve body weight perception in women of childbearing age are necessary.

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Preplanned Studies

Serum Vitamin A Nutritional Status of Children and Adolescents Aged 6−17 Years — China, 2016−2017

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Summary

What is already known on this topic?

Vitamin A deficiency (VAD) in children is still a global public health problem, which needs continuous monitoring and timely intervention.

What is added by this report?

Using surveillance data from China Nutrition and Health Surveillance of Children and Lactating Mothers in 2016–2017, the prevalence of VAD and marginal deficiency was 0.96% and 14.71%, respectively. The vitamin A nutritional status of children and adolescents from urban areas and those aged 12–17 years were better than those from rural areas and aged 6–11 years.

What are the implications for public health practice?

Marginal VAD was a major form of VAD in Chinese children. The monitoring of vitamin A status in key populations should be continuously strengthened, and the public should be encouraged to consume foods rich in vitamin A or vitamin A supplements.

Vitamin A deficiency (VAD) has an important impact on the health of children and adolescents during the time of growth and development. VAD may damage the functioning of visual rod cells, reduce the ability of dark adaptation, and subsequently affect the visual function of children. Eye diseases, secondary to xerophthalmia caused by severe VAD in children, is a major cause of blindness in children worldwide, resulting in irreversible visual impairment in children. Various studies (*1–2*) have indicated that VAD, as an independent risk factor for respiratory diseases, may lead to the weakening of immune function in children, as well as recurrent respiratory infections and asthma. Furthermore, VAD may also cause anemia, dysplasia, and other diseases.

It is reported that there are still 190 million preschool children in the world with VAD (*3*). At present, there are about 228 million children with VAD in the world, which causes about 3 million children to die every year, and 10 million children suffer from eye diseases (*4*). Since 2002, serum retinol concentration has been used for the first time to evaluate the vitamin A nutritional status of children aged 3–12 years in China Nutrition and Health Survey. The serum retinol concentration was determined using high performance liquid chromatography (HPLC). In accordance with the National Health Standard (method for VAD screening) from the National Health Commission of the People's Republic of China (*5*): serum retinol concentration <0.2 mg/L (0.70 μmol/L) is VAD, and 0.2 mg/L (0.70 μmol/L)≤ serum retinol concentration <0.3 mg/L (1.05 μmol/L) is marginal VAD.

This study was a cross-sectional study. Data were obtained from the China Nutrition and Health Surveillance of Children and Lactating Mothers in 2016–2017. It was conducted using multistage stratified random sampling method, including 31 provinces, autonomous regions and municipalities in the mainland of China, 150 monitoring sites, and 280 children and adolescents aged 6–17 years from each monitoring site with a sex ratio of 1∶1 (*6*). According to the 2018 China Health Statistics Yearbook, the regions are divided into eastern, central, and western regions. The protocol of this study was evaluated and approved by the ethical committee of China CDC (201614).

The study population was divided into different groups by gender, age, and regions. Data analyses used data from China's Sixth National Census in 2010 with complex weights used in the calculation of rates for sampling. Values were presented as median (25th and 75th percentile) and percentages with their 95% confidence intervals (CIs) for continuous and categorical variables, respectively. Kruskal-Wallis one-way analysis of variance (ANOVA) was used to compare continuous data (such as serum retinol levels) among multiple groups. Rao-Scott chi-square analysis was used to compare categorical data (such as deficiency rates) between different groups. Statistical significance was defined as *P*<0.05. SAS 9.4 (SAS Institute Inc., Cary, NC, USA) was used to conduct all the analyses.

In total, 63,310 subjects were included for this report, including 31,617 male and 31,693 female with a gender ratio of 1.00. The number of urban and rural subjects were 29,532 and 33,778, respectively. The number of subjects aged 6–11 years and 12–17 years were 35,242 and 28,068, respectively.

Among 63,310 children and adolescents aged 6–17 years, the median of serum vitamin A was 1.35 μmol/L. The median of serum vitamin A in male and female were 1.35 μmol/L and 1.36 μmol/L, respectively. Although the median for female was higher than that of male, the difference was not significant. The median of serum retinol in individuals in urban areas (1.40 μmol/L) was significantly higher than that of those in rural areas (1.31 μmol/L). The median of serum retinol was 1.36 μmol/L, 1.27 μmol/L, and 1.40 μmol/L in the eastern, central, and western regions, respectively. The western region was significantly higher than the other two regions. The 6–11 age group was significantly lower than the 12–17 age group. (Table 1)

The results of VAD and marginal VAD in children and adolescents aged 6–17 years were illustrated in Table 2. The prevalence of VAD in children and adolescents aged 6–17 years was 0.96%, and the marginal VAD was 14.71%. There was no difference in the prevalence of marginal VAD between male and female, but the prevalence of VAD of male was higher than that of female (χ^2=3.895, *P*=0.048). The prevalence of VAD among rural children and adolescents was higher than that of urban areas (χ^2=20.615, *P*<0.0001). The prevalence of VAD was the lowest in the western region (χ^2=43.649, *P*<0.0001). Similar phenomena were also found in the marginal deficiency group. The prevalence of marginal VAD of 6–11 year-old children was significantly higher than that of 12–17 year-old adolescents, which were 21.14% and 8.82%, respectively (χ^2=585.378, *P*<0.0001). VAD was also higher in the 6–11 age group than in the 12–17 age group.

DISCUSSION

The current results showed that the nutritional status of vitamin A in children and adolescents aged 6 to 17 years in China has been improving significantly. The results of the China Nutrition and Health Surveillance (2010–2012) showed that the serum VAD rate and marginal deficiency rate of children and adolescents aged 6 to 17 in China were 6.4% and 18.7% (*7*), respectively. The VAD rate and marginal VAD rate of children and adolescents aged 6 to 17 years in China were 0.96% and 14.71%, respectively, from 2016 to 2017.

The results of our study suggest that the level of vitamin A increases with age from 2016 to 2017 in Chinese children, while the rate of VAD and marginal VAD decreases with age, which align with previous studies (*7–10*). Compared with children and adolescents aged 12 to 17 years, children and adolescents aged 6 to 11 years are more likely to suffer from VAD, which may be related to differences in eating habits and absorption. For example, children in the lower age group generally have bad eating habits such as picky eating and snacking, while children in high age groups have a more diversified dietary structure (*11*). This may also be due to other reasons such as use of one single cut-off point for all age groups and not considering potentially physiologically lower vitamin A levels in younger children (*12–13*).

Our study also discovered that the nutritional status of vitamin A in urban children aged 6 to 17 years in China was better than that in rural areas. This may be connected with the popularization of nutrition knowledge and the level of regional economic development. A previous study (*14*) had shown that the incidence of VAD was lower in urban areas with relatively high economic levels. In addition, our study found no significant difference in vitamin A level between male and female, suggesting that the correlation between vitamin A level and gender was not strong, which was consistent with the results of previous studies (*12*).

Although the nutritional status of vitamin A has been significantly improved in children and adolescents aged 6 to 17 years in China, the proportion of marginal VAD was still more than 20% in children aged 6 to 11 years. Moreover, although the overall level of vitamin A of children and adolescents aged 6 to 17 years in rural areas had improved in recent years, it was still significantly lower than that of children and adolescents aged 6 to 17 years in urban areas. Therefore, children and adolescents aged 6 to 11 years in rural areas will still be the target areas and groups for vitamin A prevention and control in China in the future.

This study was subject to some limitations. First, the current study was that the dietary intake, dietary supplement intake, and other information of the respondents were not included. Second, the vitamin A grouping variables included in this study are still very

TABLE 1. Analysis of serum vitamin A levels in children and adolescents aged 6–17 years in China from 2016 to 2017.

Variable	N (%)	Serum vitamin A (μmol/L)		χ^2	*P*
		P_{50}	P_{25}–P_{75}		
Gender				0.758	0.384
Male	31,617 (49.94)	1.35	1.12–1.61		
Female	31,693 (50.06)	1.36	1.14–1.61		
Area type				536.950	<0.0001
Urban	29,532 (46.65)	1.40	1.17–1.65		
Rural	33,778 (53.35)	1.31	1.10–1.58		
Region				976.740	<0.0001
East	20,963 (33.11)	1.36	1.14–1.60		
Middle	19,971 (31.55)	1.27	1.08–1.54		
West	22,376 (35.34)	1.40	1.19–1.68		
Age group (years)				3,312.530	<0.0001
6–11	35,242 (55.67)	1.26	1.09–1.50		
12–17	28,068 (44.33)	1.47	1.23–1.72		
Total	63,310 (100.00)	1.35	1.12–1.61		

TABLE 2. Nutritional status of vitamin A in children and adolescents aged 6–17 years in China from 2016 to 2017.

Variable	Marginal deficiency		χ^2	*P*	Deficiency		χ^2	*P*
	N	Rate (%, 95%CI)			N	Rate (%, 95%CI)		
Gender			0.432	0.510			3.895	0.048
Male	4,890	14.87 (14.16, 15.57)			358	1.07 (0.89, 1.27)		
Female	4,603	14.53 (13.83, 15.23)			285	0.82 (0.65, 0.99)		
Area type			201.260	<0.0001			20.615	<0.0001
Urban	3,525	10.91 (10.28, 11.54)			240	0.64 (0.49, 0.80)		
Rural	5,968	18.14 (17.38, 18.89)			403	1.24 (1.04, 1.44)		
Region			124.935	<0.0001			43.649	<0.0001
East	3,068	13.95 (13.05, 14.84)			259	1.27 (1.00, 1.53)		
Middle	4,020	19.14 (18.28, 20.00)			285	1.17 (0.95, 1.39)		
West	2,405	12.02 (11.25, 12.80)			99	0.40 (0.06, 0.52)		
Age group (years)			585.378	<0.0001			72.702	<0.0001
6–11	6,956	21.14 (20.32, 21.97)			491	1.51 (1.26, 1.74)		
12–17	2,537	8.82 (8.26, 9.38)			152	0.46 (0.35, 0.57)		
Total	9,493	14.71 (14.21, 15.21)			643	0.96 (0.83, 1.09)		

limited, which is not conducive to the clear analysis of the correlation between vitamin A nutritional status and potential influencing. Therefore, in future studies, the relevant information affecting the nutritional status of vitamin A in children and adolescents should be added.

In conclusion, the results of our study indicated that the overall nutrition status of vitamin A had been significantly improved in Chinese children aged 6 to 17 years, however, marginal VAD still remains an issue. Future interventions for VAD in children and adolescents should focus on younger age groups and children and adolescents with marginal VAD in rural areas.

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Recollections

China Nutrition and Health Surveys (1982–2017)

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The status of nutrition and health among residents is one of the important indicators reflecting the developing level in a country or a region. China's government initiated the first China National Nutrition Survey in 1959. The Second National Nutrition Survey and the Third National Nutrition Survey were then conducted in 1982 and 1992, respectively (*1–2*). The China National Nutrition and Health Survey (2002) combined the nutrition and chronic diseases survey and became the fourth survey (*3*). The Chinese government changed the time interval between each survey from every 10 years to 3–5 years and the fifth cycle was China Nutrition and Health Surveillance (2010–2013) (*4*). From 2010, the surveillance became a continuous program that changed the content of the survey with emerging needs in China. All the above surveys were cross-sectional, nationally representative surveys in China. The sixth round, China Nutrition and Health Surveillance (2015–2017), was the latest cross-sectional survey and was nationally and provincially representative. The Chinese government financed it and it was led by the National Health Commission (NHC). The survey cycles of 1959 and 1982 were completed by national nutrition project team in Chinese Academy of Medical Sciences, and the rest rounds were conducted by China CDC (Former Chinese Academy of Preventive Medicine)(*5*). The protocols were designed to collect data and assess the nutrition and health status among all ages of the population in China.

OBJECTIVE

The objective of the six China Nutrition and Health Surveys (1982–2017) was to collect information for residents of all ages regarding their food and nutrition intake, growth, medical conditions, lifestyle, and related risk factors. The second objective was to assess the current situation, describe the trends of the nutritional and health status in the Chinese population (including food and nutrient intake, malnutrition, medical conditions, etc.), and explore the risk factors related to the nutrition and health. The third objective was to train CDC staff and provide a scientific basis for the evidence-based policymaking, design health programs and services, and expand the health knowledge for people of all ages in China.

SAMPLING DESIGN AND SAMPLE SIZE

The Second National Nutrition Survey (1982): Subjects of all ages were selected using double-order stratified cluster random method. There were 238,124 participants in 178 survey sites (*6*).

The Third National Nutrition Survey (1992): The survey conducted a multistage stratified random cluster process and selected 100,201 subjects of all ages from 213 survey sites (*2*).

China National Nutrition and Health Survey (2002): This cycle took a multistage cluster sampling method. A total of 247,464 participants from 132 survey sites were selected (*3*).

China Nutrition and Health Surveillance (2010–2013): The project team finished a nationally representative round from 2010 to 2013. The target population was ≥6 years old and pregnant women in 2010–2012. There were 212,658 participants selected from 150 sites using cluster random sampling method with multistage stratification and probability proportionate to size (PPS). Sample participants were 0–5-year-old children and lactating women in 2013. A total of 36,878 participants from 55 sites were selected using multistage stratification cluster sampling design (*4,7*).

China Nutrition and Health Surveillance (2015–2017): This round included the China Adult Chronic Disease and Nutrition Surveillance (2015) and China Nutrition and Health Surveillance of Children and Lactating Women (2016–2017).

1) China Adult Chronic Disease and Nutrition Surveillance (2015)

The participants of 2015 survey were adults ≥18 years old and pregnant women. A total of 302 survey sites (counties/districts/Xinjiang Production and

Construction Corps) were selected based on 605 monitoring sites of Disease Surveillance points system from 31 provincial-level administrative divisions (PLADs) in the mainland of China using stratified, multistage, and random sampling design. The sampling method in the survey sites were as follows:

Stage 1: Three townships/sub-districts/corps were randomly selected in each survey site using systematic sampling by population size.

Stage 2: Two administrative villages/neighborhood committees/companies were randomly selected in each township/sub-district/corps using systematic sampling by population size.

Stage 3: In each administrative village/neighborhood committee/company, every 60 households were divided into a group. One group was randomly selected using the simple random sampling method from several villager/resident groups.

Stage 4: Finally, 45 households were selected in each villager/resident group using simple random sampling method, 20 households were dietary households and 25 households were non-dietary households.

In each survey site, there were no less than 270 households and 612 regular inhabitants (adults ≥18 years old). A total of 30 pregnant women were also selected from the county maternal and child health hospital, and there were 10 each in the early, middle, and late pregnancy. The replacements must finish in the same villager/resident group and select similar households or participants. The replacement rate was no more than 35%.

2) China Nutrition and Health Surveillance of Children and Lactating Women (2016–2017)

The participants of 2016–2017 were children and adolescents aged 0–17 years and lactating women. They were selected from 31 PLADs using multistage, stratified-random sampling. Different age group had different sampling designs.

All the administration counties/county-level cities/districts in China were categorized into 4 strata (large cities, medium and small cities, general rural counties, and poor rural counties) based on the population size and the definition of urban or rural from National Bureau of Statistics of the People's Republic of China (*6*). A total of 275 survey sites (counties/county-level cities/districts) were selected as national and provincial representative survey sites in 2016–2017. The 275 sites included 31 large cities, 101 medium and small cities, 97 general rural counties, and 46 poor rural counties. Two townships/sub-districts were randomly selected in each survey site and two villages/neighborhood committees were randomly selected in each township/street district.

In 2016–2017 survey, there were at least 280 children aged 0–5 years in each survey site, 40 children in each age group (0–5, 6–11, 12–23, 24–35, 36–47, 48–59, and 60–71 months) with equal numbers of males and females. At least 280 children and adolescents were aged 6–17 years in each survey site. There were 28 students in each grade (1–6 grades in elementary school, 1–2 grades in junior high schools and 1–2 grades in senior high school) with equal numbers of males and females. Lactating women were defined as the mother of children <2 years. A total of 100 mothers were sampled. The replacements were conducted in the same village/neighborhood committee and selected similar households, schools, or participants. The replacement rate was no more than 35%.

DATA COLLECTION AND CONTENT

The Second National Nutrition Survey (1982): The data collection method included dietary interview, blood and urine test, and medical examination (*5*,*8*).

The Third National Nutrition Survey (1992): The survey collected the data by dietary interview, hemoglobin test, and medical examination (*1*,*8*).

China National Nutrition and Health Survey (2002): The methods to obtain the information included interview, dietary, lab test, and body measurement (*3*,*8*).

China Nutrition and Health Surveillance (2010–2013): The data collection used interviews, dietary interview, lab test, and body measurement (*4*,*7*).

China Nutrition and Health Surveillance (2015–2017): The 2015–2017 survey collected the used interviews, anthropometric measurements, dietary survey, and laboratory tests.

The interviews included household or individual questions such as for information related to demographics, economics, smoking, alcohol consumption, physical activities, health-related question, family disease history, health insurance, early development and milestones (infant), etc. Questionnaires designed by the China CDC project team were used and completed by strictly trained field workers in face-to-face interviews in households or at local fixed sites.

The anthropometric measurements were conducted by trained local CDC staff and consisted of weight, height, length, head circumference, waist circumference, and blood pressure. All equipment was selected by the national project team. Body weight was measured using electric scale (TANITA, HD-390) with accuracy up to 0.01 kg. Length of children under 2 years was measured using infant scale with accuracy up to 0.1 cm. Height was measured using a stadiometer with accuracy up to 0.1 cm. The head measuring tape checked children's head circumference. The soft tape was used to measure waist circumference. Blood pressure measurements used Omron HBP 1300 electronic sphygmomanometer. The equipment was calibrated before physical examination in the local fixed site or when the equipment was moved.

Three dietary survey methods were used in 2015–2017. 1) 3 consecutive days food weight record (2 weekdays and 1 weekend day): interviewers weighed and recorded the amounts of edible oils, salt, sauce, and other flavorings in the household before and after the 3-day survey. 2) 3 consecutive days 24-hour dietary recall (2 weekdays and 1 weekend day): interviewers collected food intake information for 3 days for individuals during a 24-hour period, including breakfast, lunch, dinner, soft beverages, wine, snacks, dietary supplements, other foods that consumed in or away the home except edible oils, water or energy-free water, soups, and flavorings. 3) Food Frequency Questionnaire (FFQ): an FFQ interview was conducted by interviewers using a foods list to collect the consumption frequency and amount in the past 12 months. Parts of participants finished the three days' food weight record and 24-hour dietary recall, and all participants finished FFQ. The dietary survey was personally conducted in households or at local fixed sites.

Laboratory sample collecting and tests were administered by highly trained medical personnel. In 2015, all adults were drew 8 mL of fasting venous blood and test blood biochemical and nutritional indicators (blood glucose, blood lipids, vitamin A, vitamin D, serum ferritin, etc.). In 2016–2017, fingertip blood was collected in children aged 0–5 years to detect hemoglobin; 30 children aged 3–5 years (4 mL sample), all children and adolescents aged 6–17 years (6 mL sample), and lactating women (6 mL sample) in each survey site had fasting venous blood drawn and were tested for biochemical and nutritional indicators. Hemoglobin concentration was tested using Hemocue in the field. Some participants had 24-hour urine or random urine tests collected to detect urine sodium and iodine, etc.

The protocols of China Adult Chronic Disease and Nutrition Surveillance (2015) and China Nutrition and Health Surveillance of Children and Lactating Women (2016–2017) were approved by the Ethical Committee of China CDC. Ethical approval numbers were 201519 and 201614, respectively. The participants were included in the survey only after they signed informed consent forms.

QUALITY CONTROL

The national project team paid attention to the quality control of China Nutrition and Health Surveillance (2015–2017). There were 3 quality control groups: China CDC, provincial-level CDCs, and county/district-level CDCs. The project team used unique manuals, unique work training, and unique devices and reagents. There was a series of protocols targeting the interview, body measurement, lab tests, and dietary interviews to ensure the quality control.

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Notifiable Infectious Diseases Reports

Reported Cases and Deaths of National Notifiable Infectious Diseases — China, January, 2021

Diseases	Cases	Deaths
Plague	0	0
Cholera	0	0
SARS-CoV	0	0
Acquired immune deficiency syndrome	3,260	1,250
Hepatitis	120,035	54
Hepatitis A	960	0
Hepatitis B	98,257	44
Hepatitis C	18,258	9
Hepatitis D	20	0
Hepatitis E	1,838	1
Other hepatitis	702	0
Poliomyelitis	0	0
Human infection with H5N1 virus	0	0
Measles	59	0
Epidemic hemorrhagic fever	562	3
Rabies*	15	25
Japanese encephalitis	4	0
Dengue	5	0
Anthrax	16	0
Dysentery	2,633	0
Tuberculosis	64,813	137
Typhoid fever and paratyphoid fever	362	0
Meningococcal meningitis	10	1
Pertussis	205	0
Diphtheria	0	0
Neonatal tetanus	3	0
Scarlet fever	2,502	0
Brucellosis	3,175	0
Gonorrhea	10,284	0
Syphilis	40,079	1
Leptospirosis	14	0
Schistosomiasis	4	0
Malaria	68	0
Human infection with H7N9 virus	0	0
COVID-19†	2,493	2
Influenza	20,232	1
Mumps	7,078	0

Continued

Diseases	Cases	Deaths
Rubella	127	0
Acute hemorrhagic conjunctivitis	2,305	0
Leprosy	31	0
Typhus	45	0
Kala azar	21	0
Echinococcosis	378	0
Filariasis	0	0
Infectious diarrhea[§]	177,114	1
Hand, foot, and mouth disease	63,209	1
Total	**521,141**	**1,476**

[*] Of the 25 reported death cases of rabies, there were 8 reported in January, the other were reported previously.
[†] The data were extracted from the website of the National Health Commission of the People's Republic of China.
[§] Infectious diarrhea excludes cholera, dysentery, typhoid fever and paratyphoid fever.
The number of cases and cause-specific deaths referred to data recorded in National Notifiable Disease Reporting System (NNDRS) in China, which includes both clinically-diagnosed cases and laboratory-confirmed cases. Only reported cases of the 31 provincial-level administrative divisions in the mainland of China are included in the table, whereas data of Hong Kong Special Administrative Region, Macau Special Administrative Region, and Taiwan, China are not included. Monthly statistics were calculated without annual verification, which is usually conducted in February of the next year for de-duplication and verification of reported cases in annual statistics. Therefore, 12-month cases could not be added together directly to calculate the cumulative cases because the individual information might be verified via NNDRS according to information verification or field investigations by local CDCs.

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