

## Preplanned Studies

## Beverage Consumption of Children and Adolescents Aged 6–17 Years — China, 2016–2017

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### Summary

#### What is already known on this topic?

Beverage consumption has become a problematic dietary behavior in children and adolescents. Excessive drinking of beverages, especially sugary beverages, can increase the risk of chronic diseases such as obesity, dental cavities, and diabetes.

#### What is added by this report?

This report revealed the beverage consumption rate was higher in males, in urban areas, and adolescents aged 12–17 years. The top three beverages by consumption rate were carbonated beverages (33.2%), milk-containing beverages (25.0%), and non-100% fruit and vegetable beverages (23.5%). Children and adolescents in China consumed beverages at a primary frequency rate of 1–3 times/week. Among children and adolescents aged 6–17 years who consumed beverages, the average amount was 193.8 g/d, and was higher in males (210.6 g/d), those in urban areas (204.7 g/d), and adolescents aged 12–17 years (259.0 g/d).

#### What are the implications for public health practice?

Children and adolescents are key periods of life to develop healthy dietary behaviors for individuals. The consumption of beverages by Chinese children and adolescents has shown to increase year over year. Parents, schools, and governments need to prioritize promoting health consumption of beverages.

In recent years, beverage consumption has become more and more popular among children and teenagers in China (1). For beverages available in the Chinese market, more than half are sugary beverages (2). According to previous studies, excessive consumption of sugary beverages can increase the risk of chronic diseases such as dental cavities and obesity among children and adolescents (3). The *Guideline: Sugars Intake for Adults and Children* issued by the World Health Organization (WHO) in 2015 claimed that it was important to reduce the intake of free sugars

throughout the life cycle (4). The *Ending Childhood Obesity* report also released by the WHO in 2016 emphasized that comprehensive measures should be applied to promote healthy food intake for children and adolescents and to reduce the intake of sugary beverages (5). This study analyzed the status and features on beverage consumption of Chinese children and adolescents aged 6–17 years and provided scientific support to policymaking.

The data of this study were obtained from the China Nutrition and Health Surveillance of Children and Lactating Mothers in 2016–2017. This study was a cross-sectional study, covering 31 provincial-level administrative divisions (PLADs) including 275 surveillance points in China (6). The survey used multistage stratified random sampling method for nationally and provincially representativeness. Data collection included four parts: interviews to collect demographic information; dietary questionnaires to assess food intake; physical examinations to observe the indicators of growth; and laboratory tests for health conditions. The information on the consumption of beverages was obtained by Food Frequency Questionnaire (FFQ), based on the consumption frequency and consumption of nine types of beverages in the past month. The 9 types of beverages in this study include 100% fruit and vegetable juices, non-100% fruit and vegetable beverages, carbonated beverages, tea beverages, milk-containing beverages, plant protein and cereal beverages, functional beverages, coffee, and other sugary beverages. The samples were grouped by age, sex, and regions. SAS (version 9.4, SAS Institute Inc., Cary, NC, USA) was used to process the quantitative analyses. The protocol of this study was evaluated and approved by the ethical committee China CDC (201614).

A total of 73,427 samples were involved for this report, including 36,701 males (50%) and 36,726 females (50%); and 34,981 (47.6%) in urban areas and 38,446 (52.4%) in rural areas. All subjects were divided into the 6–11 year-old group (44.1%) and

12–17 year-old group (55.9%). The number of children aged 6–11 years was 41,023, including 19,583 (47.7%) in urban areas and 21,440 (52.3%) in rural areas. The number of adolescents aged 12–17 years was 32,404, including 15,398 (47.5%) in urban areas and 17,006 (52.5%) in rural areas.

Table 1 showed that the total beverage consumption rate was 66.2% among children and adolescents aged 6–17 years from 2016 to 2017. The consumption rate was 68.3% for males and 64.1% for females; 71.3% in urban areas and 61.6% in rural areas; and 61.6% for children aged 6–11 years and 72.0% for adolescents aged 12–17 years. The top 3 beverages by consumption rate were carbonated beverages (33.2%), milk-containing beverages (25.0%), and non-100% fruit and vegetable beverages (23.5%). For carbonated beverages, tea beverages, and functional beverages, the consumption rate for males was higher than that for females; for the other six kinds of beverages, the consumption rate for females was higher than that for males.

In Table 2, the frequencies of beverage consumption were divided into:  $\geq 1$  time/day, 4–6 times/week, 1–3 times/week, and  $< 1$  time/week. The percentages among children and adolescents aged 6–17 years were 23.3%, 16.0%, 44.4%, and 16.4%, respectively. The top beverage consumption frequency was 1–3 times per week. The percentage of  $\geq 1$  time/day and 4–6 times/week was at a higher rate in males than in females and higher in urban areas and in adolescents aged 12–17 years. The percentages of 1–3 times/week and  $< 1$  times/week were at a higher rate in females

than in males and higher in rural areas and in children aged 6–11 years. Children aged 6–11 years who consumed functional beverages, coffee, and other sugary beverages had a higher rate of consumption behavior at frequency of  $< 1$  time/week, while other groups were involved in a higher frequency of 1–3 times/week. The top 3 beverages presented by frequency of  $\geq 1$  time/day were 100% fruit and vegetable juice (13.3%), milk-containing beverages (13.0%), and vegetable protein and cereal beverages (10.2%).

Table 3 indicated that among the children and adolescents aged 6–17 years who consumed beverages, the average amount of consumption was 193.8 g/d, which was higher in males (210.6 g/d), urban areas (204.7 g/d), and adolescents aged 12–17 years (259.0 g/d). The top 3 beverages for consumers were tea beverages (100.9 g/d), carbonated beverages (91.6 g/d), and 100% fruit and vegetable juice (81.5 g/d). For children aged 6–11 years old, the top 3 beverages were milk beverages (67.4 g/d), 100% fruit and vegetable juice (66.2 g/d), and tea beverages (65.1 g/d). For the 12–17 year-old group, the top 3 beverages were tea beverages (128.7 g/d), carbonated beverages (122.3 g/d), and 100% fruit and vegetable juice (98.7 g/d).

## DISCUSSION

Sugary beverages will often contain added sugar at levels of 8%–10%, and some are even of 13% (7). The sugar in the beverages can be quickly digested and

TABLE 1. Consumption rate of different types of beverages among children and teenagers aged 6–17 years — China, 2016–2017 (%).

Beverage categories	6–11 years old					12–17 years old					6–17 years old				
	Male	Female	Urban	Rural	Subtotal	Male	Female	Urban	Rural	Subtotal	Male	Female	Urban	Rural	Total
100% fruit and vegetable juice	12.9	13.9	21.8	5.8	13.4	12.6	13.6	19.7	7.2	13.1	12.8	13.8	20.9	6.4	13.3
Not 100% fruit and vegetable beverages	21.8	21.6	26.9	16.9	21.7	25.6	26.0	29.6	22.4	25.8	23.5	23.5	28.1	19.3	23.5
Carbonate beverages	31.7	24.7	29.7	26.8	28.2	46.8	32.4	41.1	38.3	39.6	38.4	28.1	34.7	31.9	33.2
Tea beverages	16.9	14.5	18.4	13.3	15.7	33.2	27.0	34.7	26.1	30.1	24.1	20.0	25.6	18.9	22.1
Milk-containing beverages	24.3	26.1	28.9	21.8	25.2	21.0	28.6	25.3	24.3	24.8	22.8	27.2	27.3	22.9	25.0
Vegetable protein and cereal beverages	16.3	16.8	20.1	13.3	16.5	15.4	17.8	19.1	14.3	16.6	15.9	17.2	19.7	13.7	16.6
Functional beverages	8.6	6.0	9.7	5.0	7.3	18.3	9.9	17.0	11.5	14.1	12.9	7.7	12.9	7.9	10.3
Coffee	1.8	1.9	2.3	1.4	1.9	10.0	11.0	14.8	6.7	10.5	5.5	5.9	7.8	3.7	5.7
Other sugary beverages	5.1	5.0	6.3	4.0	5.1	7.7	9.4	9.5	7.7	8.5	6.3	7.0	7.7	5.6	6.6
Total beverages	63.4	59.8	67.5	56.2	61.6	74.5	69.6	76.1	68.4	72.0	68.3	64.1	71.3	61.6	66.2

TABLE 2. The distribution of beverage consumption frequency in consumers aged 6–17 years — China, 2016–2017 (%).

Beverage categories	Drinking frequency	6–11 years old					12–17 years old					6–17 years old				
		Male	Female	Urban	Rural	Subtotal	Male	Female	Urban	Rural	Subtotal	Male	Female	Urban	Rural	Total
100% fruit and vegetable juice	≥1 time/day	11.4	11.9	11.8	11.2	11.7	15.5	15.2	16.4	12.8	15.3	13.2	13.3	13.7	12.0	13.3
	4–6 times/week	3.6	3.1	3.5	2.8	3.4	4.6	3.2	3.8	4.2	3.9	4.1	3.2	3.6	3.5	3.6
	1–3 times/week	53.9	52.1	52.8	53.3	52.9	54.0	53.1	52.8	55.3	53.5	53.9	52.5	52.8	54.3	53.2
	<1 time/week	31.1	32.9	31.9	32.6	32.0	25.9	28.5	27.0	27.7	27.2	28.8	31.0	29.9	30.2	29.9
Not 100% fruit and vegetable beverages	≥1 time/day	5.7	5.4	6.0	4.9	5.5	9.9	8.8	9.6	9.1	9.4	7.7	7.1	7.6	7.1	7.4
	4–6 times/week	1.6	1.6	1.6	1.6	1.6	4.8	3.6	4.5	3.8	4.2	3.2	2.5	2.9	2.7	2.8
	1–3 times/week	52.7	51.2	51.9	52.0	52.0	59.6	58.7	58.7	59.7	59.1	56.0	54.8	55.1	55.9	55.4
	<1 time/week	40.0	41.8	40.6	41.4	40.9	25.7	29.0	27.2	27.5	27.3	33.1	35.6	34.4	34.3	34.3
Carbonate beverages	≥1 time/day	5.1	4.8	4.4	5.6	5.0	10.4	8.1	9.4	9.5	9.4	8.0	6.5	7.0	7.7	7.3
	4–6 times/week	2.2	1.3	1.7	2.0	1.8	5.7	3.1	4.8	4.5	4.6	4.1	2.2	3.3	3.3	3.3
	1–3 times/week	53.0	51.1	51.0	53.4	52.2	62.2	58.6	60.1	61.4	60.8	58.0	54.9	55.7	57.7	56.7
	<1 time/week	39.6	42.7	43.0	39.0	41.0	21.8	30.2	25.7	24.7	25.2	30.0	36.4	34.0	31.4	32.7
Tea beverages	≥1 time/day	5.5	6.0	5.8	5.6	5.7	11.2	9.7	10.5	10.5	10.5	9.0	8.2	8.6	8.6	8.6
	4–6 times/week	1.8	1.3	1.4	1.7	1.5	4.7	3.3	4.5	3.7	4.1	3.6	2.5	3.2	2.9	3.1
	1–3 times/week	50.5	50.3	49.0	52.2	50.4	61.6	55.9	58.0	60.4	59.1	57.3	53.6	54.4	57.2	55.6
	<1 time/week	42.2	42.5	43.7	40.5	42.3	22.4	31.1	27.0	25.5	26.3	30.1	35.7	33.7	31.4	32.7
Milk-containing beverages	≥1 time/day	12.1	11.4	10.7	13.0	11.8	15.4	14.0	14.2	15.0	14.6	13.4	12.6	12.1	13.9	13.0
	4–6 times/week	5.0	4.7	4.2	5.6	4.8	6.5	5.6	6.0	5.9	6.0	5.6	5.1	4.9	5.7	5.3
	1–3 times/week	55.3	55.6	54.3	56.9	55.5	57.0	57.7	57.0	57.8	57.4	56.0	56.6	55.4	57.3	56.3
	<1 time/week	27.6	28.3	30.8	24.5	28.0	21.2	22.7	22.8	21.4	22.1	25.0	25.7	27.5	23.0	25.4
Vegetable protein and cereal beverages	≥1 time/day	8.2	9.1	8.0	9.5	8.7	11.8	12.4	12.7	11.3	12.1	9.7	10.6	10.0	10.4	10.2
	4–6 times/week	3.3	3.0	3.1	3.1	3.1	5.0	4.0	4.3	4.6	4.5	4.0	3.4	3.6	3.8	3.7
	1–3 times/week	49.8	49.8	49.2	50.6	49.8	54.5	54.4	54.1	54.9	54.4	51.8	51.9	51.3	52.6	51.8
	<1 time/week	38.6	38.2	39.7	36.7	38.4	28.8	29.3	28.9	29.2	29.1	34.4	34.2	35.1	33.3	34.3
Functional beverages	≥1 time/day	4.6	5.0	4.7	4.8	4.8	7.5	7.0	7.8	6.8	7.4	6.5	6.1	6.5	6.1	6.3
	4–6 times/week	1.1	1.0	0.9	1.4	1.1	3.1	1.4	2.5	2.6	2.5	2.4	1.2	1.8	2.2	2.0
	1–3 times/week	42.6	38.9	41.5	40.2	41.1	56.0	50.4	53.3	55.0	54.0	51.0	45.4	48.3	49.8	48.9
	<1 time/week	51.7	55.1	52.8	53.6	53.1	33.4	41.2	36.5	35.5	36.1	40.2	47.2	43.4	42.0	42.8
Coffee	≥1 time/day	8.5	5.0	7.4	5.7	6.7	9.6	9.7	9.8	9.5	9.7	9.4	8.9	9.4	8.7	9.1
	4–6 times/week	2.1	1.1	1.8	1.3	1.6	5.8	5.6	6.0	5.0	5.7	5.1	4.8	5.3	4.3	4.9
	1–3 times/week	33.1	36.9	33.6	37.1	35.0	51.8	47.3	50.0	48.4	49.5	48.3	45.5	47.3	46.0	46.8
	<1 time/week	56.3	57.1	57.2	55.9	56.7	32.8	37.4	34.3	37.1	35.2	37.2	40.9	38.1	41.0	39.1
Other sugary beverages	≥1 time/day	7.3	5.0	4.8	8.2	6.2	10.6	9.9	9.3	11.2	10.2	9.1	7.9	7.3	10.0	8.5
	4–6 times/week	2.2	1.6	1.5	2.6	1.9	4.3	3.0	3.6	3.7	3.6	3.4	2.5	2.6	3.2	2.9
	1–3 times/week	43.4	44.4	40.4	48.8	43.9	56.0	52.9	52.5	56.3	54.3	50.2	49.5	47.0	53.4	49.8
	<1 time/week	47.1	48.9	53.3	40.4	48.0	29.0	34.2	34.6	28.8	31.9	37.3	40.2	43.1	33.4	38.8
Total beverages	≥1 time/day	18.1	17.9	19.7	16.1	18.0	30.8	27.3	31.9	26.4	29.1	24.2	22.4	25.4	21.1	23.3
	4–6 times/week	14.1	13.6	15.4	12.1	13.8	18.9	17.6	18.9	17.7	18.3	16.4	15.5	17.0	14.9	16.0
	1–3 times/week	47.9	47.9	45.9	50.1	47.9	39.3	41.9	38.2	42.9	40.5	43.7	45.0	42.3	46.5	44.4
	<1 time/week	20.0	20.7	19.0	21.8	20.3	11.0	13.2	11.1	13.0	12.0	15.7	17.1	15.3	17.5	16.4

TABLE 3. Daily consumption of beverages of consumers aged 6–17 years — China, 2016–2017 (g/d).

Age groups	Beverage categories	The number of consumer	Male		Female		Urban		Rural		Total	
			Mean	P <sub>50</sub>	Mean	P <sub>50</sub>	Mean	P <sub>50</sub>	Mean	P <sub>50</sub>	Mean	P <sub>50</sub>
6–11 years old	100% fruit and vegetable juice	5,512	67.1	29.6	65.3	28.6	66.7	28.6	64.4	28.6	66.2	28.6
	Not 100% fruit and vegetable beverages	8,897	58.5	28.6	54.1	28.6	56.4	28.6	56.3	28.6	56.3	28.6
	Carbonate beverages	11,561	65.2	32.9	57.4	28.6	56.0	28.6	67.6	34.3	61.8	32.9
	Tea beverages	6,444	67.0	32.9	62.8	32.9	59.6	28.6	72.0	35.7	65.1	32.9
	Milk-containing beverages	10,323	68.4	35.7	66.5	35.7	62.3	29.6	73.6	41.1	67.4	35.7
	Vegetable protein and cereal beverages	6,786	57.8	28.6	58.2	28.6	56.5	28.6	60.1	31.4	58.0	28.6
	Functional beverages	2,981	54.0	24.6	47.2	19.7	48.1	21.4	56.6	23.7	51.2	21.4
	Coffee	757	33.3	9.9	27.9	9.2	32.0	9.9	28.4	8.2	30.6	9.9
	Other sugary beverages	2,085	51.5	21.4	40.4	16.4	38.9	16.4	56.1	28.6	46.0	19.7
	Total beverages	25,280	138.3	71.4	128.6	71.4	140.5	71.4	126.0	71.4	133.6	71.4
12–17 years old	100% fruit and vegetable juice	4,251	104.1	52.6	98.7	42.9	103.5	42.9	95.8	42.9	101.3	42.9
	Not 100% fruit and vegetable beverages	8,362	109.7	65.7	89.0	42.9	99.8	57.1	98.7	57.1	99.3	57.1
	Carbonate beverages	12,842	130.9	71.4	100.5	57.1	114.6	71.4	122.3	71.4	118.5	71.4
	Tea beverages	9,767	139.4	71.4	106.0	57.1	121.0	71.4	128.7	71.4	124.5	71.4
	Milk-containing beverages	8,023	92.3	57.1	84.1	45.7	86.9	48.6	88.2	57.1	87.6	51.4
	Vegetable protein and cereal beverages	5,376	81.5	42.9	80.5	35.7	82.3	35.7	79.3	41.1	81.0	35.8
	Functional beverages	4,563	99.7	50.0	76.1	35.7	93.5	42.9	88.7	49.3	91.5	43.4
	Coffee	3,411	64.4	28.6	58.3	28.6	63.1	28.6	57.5	28.6	61.2	28.6
	Other sugary beverages	2,765	95.1	42.9	77.6	35.7	82.2	35.7	89.2	42.9	85.5	36.1
	Total beverages	23,342	287.9	157.1	227.9	121.4	277.2	149.5	240.7	135.7	259.0	142.9
6–17 years old	100% fruit and vegetable juice	9,763	83.3	38.8	79.8	32.9	82.0	35.7	79.9	34.3	81.5	35.7
	Not 100% fruit and vegetable beverages	17,259	83.2	42.9	71.1	35.7	76.5	35.7	78.1	35.7	77.2	35.7
	Carbonate beverages	24,403	100.7	54.2	79.2	35.7	86.5	42.9	96.7	49.3	91.6	42.9
	Tea beverages	16,211	111.2	57.1	88.4	42.9	96.3	49.3	106.6	57.1	100.9	50.0
	Milk-containing beverages	18,346	78.1	42.9	74.6	35.7	72.3	35.7	80.4	42.9	76.2	40.0
	Vegetable protein and cereal beverages	12,162	68.0	34.3	68.3	32.9	67.5	31.4	69.0	35.7	68.2	34.3
	Functional beverages	7,544	82.7	35.9	63.6	29.1	74.4	32.9	77.3	35.7	75.6	35.7
	Coffee	4,168	58.6	28.6	52.9	21.4	57.9	28.6	51.4	21.4	55.7	26.3
	Other sugary beverages	4,850	75.1	32.9	62.5	28.6	62.4	28.6	76.1	35.7	68.5	28.6
	Total beverages	48,622	210.6	107.1	175.9	85.7	204.7	101.4	182.3	88.6	193.8	98.6

absorbed and increases the risk of overweight and obesity, dental cavities, and type 2 diabetes by promoting fat storage. This study showed the data of the consumption rate and characteristics of beverages for children and adolescents in China. The results revealed the consumption rate was relatively high, especially in males, in urban areas, and in adolescents aged 12–17 years. These results were basically consistent with relevant domestic studies (8–9), which

could be concerned by public health administrators. Carbonated beverages were the beverage with the highest consumption rate for children and adolescents. Carbonated beverages were primarily soft beverages in China and were the primary representative of sugary beverages (10). The results of dietary surveys in many countries showed that the high intake of added sugar in children and adolescents was mainly due to the intake of sugary beverages (11–12), especially

carbonated beverages (10). As for the choice of beverage types, males prefer carbonated beverages, tea beverages, and functional beverages, while females prefer milk-containing beverages, vegetable protein and cereal beverages, and 100% fruit and vegetable juice. A possible explanation can be that males might prefer beverages based on taste and feelings of being refreshed, while females may be more focused on the nutrition of beverages (13).

This study showed that children and adolescents consumed beverages at a primary frequency rate of 1–3 times/week. The top beverages in daily consumption were 100% fruit and vegetable juices, milk-containing beverages, and vegetable protein and cereal beverages. Beverages can hardly function as essential foods for life, and it is difficult to replace vegetables, fruits, milk, soy products, and cereals in supplying demanded nutrition for human beings (7).

The WHO comments that the intake of free sugar should be controlled to a rate lower than 10% of the total energy intake and that rates lower than 5% are even more beneficial for health (5). The *Dietary Guidelines for Chinese Residents (2016)* suggested that the daily adding of sugar should not exceed 50 g, preferably lower than 25 g (7). According to the database of added sugar food ingredient at US Department of Agriculture, on average, each 100 g of sugary beverages contains about 9 g of added sugar (14). By drinking an average of 193.8 g of sugary beverages per day, the free sugar intake reaches 17.4 g, which is close to the suggested value in the dietary guidelines with added sugars from other foods excluded. Although the current daily average consumption of sugary beverages by children and adolescents in China was lower than many other countries (15–16), more attention still should be paid to the consumption among the target populations.

The *Dietary Guidelines for Chinese Residents (2016)* suggested that children and adolescents should minimize consumption of sugary beverages (7). In 2019, the *Healthy Oral Action Plan (2019–2025)* issued by the National Health Commission emphasizes the combination of healthy campus program to support sugar control by joint work of regulating high-sugar beverage sales at junior high schools and elementary schools and management programs of sugar beverages controlling supply at cafeterias. Further involvement in education and managerial work of sugary beverage consumption can play an important role in administrating public health for children and adolescents in China.

The research was subjected to some limitations. First, the detailed sugar rate of beverages is difficult to isolate due to a combination of factors. Second, the samples did not cover the highest grades of children and adolescents in elementary schools, junior high schools, and senior high schools due to sampling design in this research, which could influence the randomness of the sampling to be not as ideal.

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