

Recollections

China Nutrition and Health Surveys (1982–2017)

Dongmei Yu¹; Liyun Zhao^{1,*}; Jian Zhang¹; Zhenyu Yang¹; Lichen Yang¹; Jian Huang¹; Hongyun Fang¹; Qiya Guo¹; Xiaoli Xu¹; Lahong Ju¹; Gangqiang Ding¹

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.

Acknowledgments: Project teams from China CDC, provincial-level CDCs, and county/district-level CDCs, local school staff, and all participants.

Conflicts of interest: No conflicts of interest were declared.

doi: 10.46234/ccdcw2021.058

Corresponding author: Liyun Zhao, zhaoly@ninh.chinacdc.cn.

¹ National Institute for Nutrition and Health, Chinese Center for Disease Control and Prevention, Beijing, China.

Submitted: February 18, 2021; Accepted: February 25, 2021

REFERENCES

- Ge KY, Zhai FY, Yan HC. The third national nutrition survey. *J Hyg Res* 1996;25(S1): 3–15. <https://www.ixueshu.com/document/c7c50ff0aa56f70bbfdd6c0c4aa6f01e318947a18e7f9386.html>. (In Chinese).
- Ge KY. The dietary and nutritional status of Chinese population. Beijing: People's Medical Publishing House. 1996. (In Chinese).
- Li LM, Rao KQ, Kong LZ, Yao CH, Xiang HD, Zhai FY, et al. A description on the Chinese national nutrition and health survey in 2002. *Chin J Epidemiol* 2005;26(7):478–84. <http://dx.doi.org/10.3760/j.issn:0254-6450.2005.07.004>. (In Chinese).
- Chang JL, Wang Y. Comprehensive report on China nutrition and health surveillance (2010–2013). Beijing: Peking University Medical Press. 2016. (In Chinese).
- Yu DM, Zhao LY, Zhao WH. Status and trends in consumption of grains and dietary fiber among Chinese adults (1982–2015). *Nutr Rev* 2020;78(S1):43–53. <http://dx.doi.org/10.1093/nutrit/nuz075>.
- Guo QY, Yu DM, Yu D, Wang X, Xu XL, Fang MH, et al. Comparative study on China national and health survey/surveillance in 1959, 1982, 1992, 2002 and 2010–2013. *J Hyg Res* 2016;45(4): 542–7. <http://d.wanfangdata.com.cn/periodical/wsj201604006>. (In Chinese).
- Yu DM, Zhao LY, Yang ZY, Chang SY, Yu WT, Fang HY, et al. Comparison of undernutrition prevalence of children under 5 years in China between 2002 and 2013. *Biomed Environ Sci* 2016;29(3):165–76. <http://dx.doi.org/10.3967/bes2016.021>.
- He Y, Zhao WH, Zhang J, Zhao LY, Yang ZY, Huo JS, et al. Data resource profile: China national nutrition surveys. *Int J Epidemiol* 2019; 48(2):368–f. <http://dx.doi.org/10.1093/ije/dyy289>.