

Original Article

Trends in eating behaviours among Chinese children (1991–1997)

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This study examined the trends in snacking behaviours and eating food-prepared-outside-the-home (FPOH) by Chinese children and adolescents using data from the China Health and Nutrition Survey. The sample consisted of 3223 subjects aged 6-18 in 1991 and 2836 in 1997. Three days of 24hr recall dietary data and per capita income (deflated to 1989) was used. The percentage of Chinese children having snacking behaviours was significantly differentiated according to the income level while percentage of eating FPOH increased in middle and high income groups. Snacking contributed about 8% of the energy intake (EI) for snackers, compared with over 15% from FPOH for those who ate FPOH. Fruit was a major component of snacking: snacks based on fruit intake almost doubled over the study period as did snacks based on soft drink consumption. Animal source food consumption was a key component of FPOH and its intake also increased.

Key Words: Food trends, snacking, food-prepared-outside-the-home, take away foods, children, adolescents, China.

Introduction

The theory of 'nutrition transition' is based on the premise that the change in nutritional status relates to a complex interaction of changes between socio-economic factors, patterns of health, patterns of diet and physical activities.¹ Explaining these changing relationships requires a series of studies focusing on the pathway from the social economic change to the transition in individual diet patterns; studying the trends in diet behaviours according to the important social environmental factors is an approach to investigate this pathway. The rapid nutrition transition occurring with recent economic development and urbanization in China provides an excellent chance to investigate this mechanism since the study of eating behaviour trends is rare, both in developing and developed countries.

Studying the diet behaviours in developing countries - like China - will be very helpful in understanding how the economic development stage and specific social background impacts the behaviour changes compared with western countries. In these countries, the epidemic of obesity is a serious problem, and the emerging bio-behaviour factors that are potential contributors to obesity (and have been investigated in recent epidemiological studies) are: dietary variety; food type (liquid vs. solid); portion size; palatability; snacking; eating in restaurants or other away-from-home locations.² Recent studies have also observed that snackers (defined later) generally ate more energy than non-snackers and the increased energy intake of adolescents and young adults is mainly attributed to the increased energy intake (EI) from snacking.^{3,4} Energy intake from food prepared outside the home (FPOH) increased from 24 to 35% for American children and adolescents.⁴ However, a recent study shows that the behaviour of Chinese children is generally different - they are

less active and less obese.⁵ Snacking contributes minimal energy intake (0.9%) to the Chinese population compared with 23% in the United States.^{3,5} No studies have investigated energy intake from FPOH for Chinese children and adolescents.

The purpose of this paper is to investigate the trends in food consumption behaviours in Chinese children and adolescents, focusing on snacking and eating FPOH. Two questions were addressed: 1) How does family income influence the trends of eating snacks and FPOH? 2) Is it true that snacking or eating FPOH equates to extra energy intake in the specific Chinese cultural background and economic development stage?

Method

This study was conducted in accordance with the internationally agreed ethical principles for the conduct of medical research. It was approved by both the UNC SPH Human Subjects review and that for the Institute of Nutrition and Food Safety, Chinese Center for Disease Control and Prevention.

Data set

The data were derived from the China Health and Nutrition Survey (CHNS) 1991, 1997. The details about study design and data collection for CHNS are described elsewhere.⁶ A total of 3223 subjects were selected from 1991 and 2836

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from 1997, all aged 6–18 y.

Dietary data

Three continuous days of 24-h recall questionnaires, supplemented with weighed and measured household food consumption records, were used to measure food intake for the participants of CHNS. The details of the dietary data collection are available elsewhere.⁶

Definition of snackers and classification of food preparation location

Snacker

A snacker is the person that consumed any snack during the three continuously investigated days. Food was determined to be a 'snack' by questions asked about eating times (between or during meals) in the 24-h recall questionnaire, and were categorized as morning snacks, afternoon snacks and evening snacks.

Food preparation location

Although there is a significantly increasing trend for the children in the United States and Europe to eat outside the home, the percentage of Chinese children eating outside the home was very small. Assuming that *buying* FPOH is the pre-stage of *eating* outside the home, associated with economic development, the food preparation locations were classified into two categories (again using questions about the food preparation locations in the 24-h recall questionnaire): in home and outside the home. '*In home*' meant either at a person's own home or at relatives' or friends' homes; '*outside the home*' meant at schools, restaurants, food stands, festivals, celebrations, or at other locations. Any children who consumed any food that was prepared outside the home during the three continuous investigated days were defined as consumers of FPOH.

Subjects were classified by age and deflated per capita family income

Age groups

In order to analyze the diet data, our selected subjects were classified into two age groups, 6–11 y and 12–18 y, since the total energy and food intake increase with age.

Per capita family income

The family income level is an important social and economic factor that determines the resource distribution, including food, among the population in a low-income country.¹ In order to assess the impact of family income level on the children or the adolescents' dietary behaviours, the subjects were classified into three sub-categories after being classified by age: (a) low-income, (b) medium-income and (c) high-income, according to the tertiles of per capita family income in years 1991 and 1997 (deflated to 1989).

Food group theme

To represent the food structure consumed by the subjects, the food items consumed were grouped into 12 major food groups: grains; coarse grains; legume nuts and seeds; vegetables; fruits; meat eggs and fish; milk and milk products; plant oils; candy or high sugar products; soft drinks; other drinks; and other food groups.

Only the top six most frequently consumed food groups are presented in this paper. Considering that some food preparation methods are not healthy, the food groups of grains and meat eggs and fish are further classified into two respective subgroups: deep fried and not deep fried; the food group of vegetables is further classified into salted and not salted; and the food group of fruits is further classified into fresh, preserved or canned. The classification of subgroups was based on the questions, in the 24-h recall questionnaire, about the food preparation methods.

Statistic methods

The analyses of variance between groups (ANOVA) statistic were used to compare the food group quantities consumed by different income groups in the same year. Chi-square tests were used to test the differences in the frequency of consumption. The t-test was chosen for comparing the food group consumption between years 1991 and 1997 (among the subjects in the same age and income groups).

Results

The nutrient intake of the subjects from the 1991 and 1997 CHNS are listed in Table 1. Generally, the Chinese children and adolescents tended to eat more energy dense foods, similar to western children, and the trends were influenced by the family income level. In 1997, the children consumed more fat than in 1991. The consumption of carbohydrates, protein and vitamin C decreased; there was a greater decrease in carbohydrates than for protein or vitamin C. The subjects from high-income families tended to eat more fat and proteins but less carbohydrates and vitamin C than the subjects from the low-income families.

Consumption of snacks or food prepared outside the home (FPOH) were influenced by the family income level

Those who tended to eat snacks or FPOH were influenced by the family income level and the effects of income on snacking or eating FPOH were different (Table 2).

Snack consumption

The subjects from the high-income families in both age groups ate more snacks in both years. However, in 1997, the snacking behaviour tended to differentiate further among the income groups, although the total percentage of the subjects for all income groups who snacked in 1997 did not change much from 1991. This differentiation resulted from the fact that in 1991, the difference in the percentage of the subjects that snacked (between the high income-group and the low-income group) was 6.3% for the group aged 6–11 y and 4.5% for the group aged 12–18 y; however, in 1997, the differences increased to 17.3% and 10.9%, respectively. This is attributed to the decreased percentage of the subjects who snacked in the low-income group and the increased percentage of the subjects who snacked in the high-income group.

FPOH

The total percentage of the subjects among all income groups eating FPOH increased only 3.1% among the group aged 6–11 y and 6.1% among the group aged 12–18 y, respectively, from 1991 to 1997.

Table 1. The nutrient intake status of Chinese children and adolescents (age 6–18 y) in China Health and Nutrition Survey (CHNS) 1991, 1997, stratified by age groups and per capita family income levels.

| Age and income group | Sample size | Total energy intake | | Carbohydrate | | | Fat | | | Protein | | | Vitamin C | |
|----------------------|-------------|---------------------|-----|----------------------|-------|------------------------------|---------------------|---------------------|---------------------|---------------------|------|-------------------------|-------------------|-------|
| | | Mean (Kcal/day) | SD | Mean (g/day) | SD | Energy from carbohydrate (%) | Mean (g/day) | SD | Energy from fat (%) | Mean (g/day) | SD | Energy from protein (%) | Mean (mg/day) | SD |
| <i>1991</i> | | | | | | | | | | | | | | |
| Age 6-11 y | | | | | | | | | | | | | | |
| Low-income | 420 | 1733 | 505 | 323.3 | 101.3 | 74.6 | 34.4 | 23.3 | 17.9 | 51.0 | 16.8 | 11.8 | 83.3 | 63.5 |
| Medium-income | 500 | 1846 ^b | 518 | 315.5 | 97.8 | 68.4 | 46.8 ^b | 27.2 | 22.8 | 57.1 ^b | 18.8 | 12.4 | 77.9 | 54.0 |
| High-income | 579 | 1915 ^b | 529 | 303.7 ^b | 89.9 | 63.4 | 55.7 ^b | 27.6 | 26.2 | 61.2 ^b | 21.2 | 12.8 | 77.4 | 51.3 |
| Total | 1499 | 1841 | 524 | 313.1 | 96.1 | 63.5 | 46.9 | 27.7 | 23.1 | 57.0 | 19.7 | 12.0 | 79.2 | 55.9 |
| Age 12-18 y | | | | | | | | | | | | | | |
| Low-income | 620 | 2398 | 705 | 450.8 | 141.2 | 75.1 | 46.4 | 26.6 | 17.4 | 71.2 | 23.9 | 11.8 | 101.3 | 68.9 |
| Medium-income | 616 | 2365 | 747 | 409.0 ^b | 130.8 | 69.2 | 57.9 ^b | 34.8 | 22.0 | 71.1 | 25.0 | 12.0 | 96.4 | 58.0 |
| High-income | 488 | 2316 ^b | 592 | 386.7 ^b | 108.6 | 67.7 | 62.5 ^b | 30.4 | 24.3 | 73.4 | 22.7 | 12.6 | 89.6 ^a | 56.1 |
| Total | 1724 | 2363 | 691 | 417.7 | 131.5 | 70.4 | 55.1 | 31.5 | 18.0 | 71.8 | 24.0 | 12.0 | 96.2 | 61.8 |
| <i>1997</i> | | | | | | | | | | | | | | |
| Age 6-11 y | | | | | | | | | | | | | | |
| Low-income | 640 | 1639 ^a | 533 | 280.8 ^a | 98.3 | 68.3 | 41.0 ^a | 23.5 | 22.5 | 49.6 | 19.9 | 12.1 | 71.5 ^a | 48.7 |
| Medium-income | 478 | 1751 ^{a,b} | 541 | 272.4 ^a | 86.0 | 62.1 | 53.2 ^{a,b} | 32.9 | 27.2 | 55.4 ^b | 20.5 | 12.7 | 76.5 | 104.6 |
| High-income | 327 | 1796 ^{a,b} | 557 | 242.0 ^a | 86.4 | 53.9 | 67.1 ^{a,b} | 32.1 | 33.6 | 60.9 ^b | 21.3 | 13.6 | 68.5 ^a | 44.1 |
| Total | 1445 | 1711 ^a | 545 | 269.3 ^a | 92.9 | 61.8 | 50.1 ^a | 30.7 | 25.4 | 54.1 ^a | 20.9 | 12.8 | 72.5 ^a | 71.5 |
| Age 12-18 y | | | | | | | | | | | | | | |
| Low-income | 553 | 2113 ^a | 621 | 375.1 ^a | 117.9 | 71.0 | 50.2 | 26.9 ^a | 21.3 | 63.4 ^a | 21.9 | 11.9 | 87.7 ^a | 56.9 |
| Medium-income | 486 | 2145 ^a | 651 | 345.5 ^{a,b} | 116.6 | 64.5 | 61.1 | 34.4 ^{a,b} | 25.6 | 67.8 ^{a,b} | 23.1 | 12.6 | 89.5 ^a | 56.3 |
| High income- | 352 | 2255 ^a | 646 | 323.3 ^{a,b} | 95.7 | 57.3 | 77.9 | 40.2 ^{a,b} | 31.1 | 74.5 ^b | 26.0 | 13.2 | 89.1 | 55.9 |
| Total | 1391 | 2160 ^a | 640 | 351.6 ^a | 114.1 | 66.4 | 61.0 ^a | 35.1 ^a | 21.5 | 67.8 ^a | 23.8 | 12.1 | 88.7 ^a | 56.4 |

^a P values < 0.05 of the t tests for the consumption values between two years among the subjects in the same age and income groups. ^b P values < 0.05 of the ANOVA tests for the consumption values among the subjects from different income groups with low-income group as the reference in the same age group and same year.

Table 2. The percentage of subjects who ate snacks or food prepared outside the home (FPOH) among the children and adolescents age 6–18 y in China Health and Nutrition Survey (CHNS) 1991, 1997, stratified by age group and per capita family income levels.

| Age and income group | 1991 | | 1997 | |
|--|-----------------|-------------------|------|---------------------|
| | <i>Snacking</i> | | | |
| | N | % | N | % |
| <i>Age 6-11 y</i> | | | | |
| Low-income | 420 | 11.0 | 640 | 6.9 ^b |
| Medium-income | 500 | 17.6 ^a | 478 | 10.9 ^{a,b} |
| High-income | 579 | 17.3 ^a | 327 | 24.2 ^{a,b} |
| Total | 1499 | 15.6 | 1445 | 12.1 ^b |
| <i>Age 12-18 y</i> | | | | |
| Low-income | 620 | 8.2 | 553 | 6.7 |
| Medium-income | 616 | 7.3 | 486 | 10.7 ^{a,b} |
| High-income | 488 | 12.7 ^a | 352 | 17.6 ^{a,b} |
| Total | 1724 | 9.2 | 1391 | 10.9 |
| <i>Food prepared outside the home (FPOH)</i> | | | | |
| | N | % | N | % |
| <i>Age 6-11 y</i> | | | | |
| Low-income | 420 | 18.3 | 640 | 20.6 |
| Medium-income | 500 | 33.8 | 478 | 40.6 ^{a,b} |
| High-income | 579 | 41.6 ^a | 327 | 57.5 ^{a,b} |
| Total | 1499 | 32.5 | 1445 | 35.6 |
| <i>Age 12-18 y</i> | | | | |
| Low-income | 620 | 21.9 | 553 | 21.5 |
| Medium-income | 616 | 30.8 ^a | 486 | 41.4 ^{a,b} |
| High-income | 488 | 44.5 ^a | 352 | 57.7 ^{a,b} |
| Total | 1724 | 31.5 | 1391 | 37.6 ^b |

^aP values <0.05 from Chi-square tests comparing the percentage of the subjects from high or medium income group with those from low income group in the same age group and same year. ^bP values <0.05 from Chi-square tests comparing the percentage of the subjects between two years from the same age and income level groups.

The number of the subjects in the lower-income group who ate FPOH did not decrease, compared to those who snacked, while the subjects in the high-income group who ate FPOH increased 15.9% and 13.2%, respectively, for groups aged 6–11 y and 12–18 y.

The trends in energy intake from snacks and food prepared outside the home

Energy from snacks

Snacks were not an important energy source for those who snacked. The energy from snacks for the high-income group in 1991 was generally less than that for the low-income group, and this difference increased further by 1997 (Table 3). Snacks only amounted to approximately 8% of the total energy for all age group subjects in both years. The percentage of energy from snacks for the subjects aged 6–11 y, from the low-income group increased from 11.2 to 11.8% between 1991 and 1997, while it decreased from 7.9 to 7.0% for those from the high-income groups. The same trends also occurred in the group aged 12–18 y.

Energy from FPOH

Compared with snacks, FPOH contributed an important energy source, accounting for almost 20% of the total energy. The energy from FPOH for the high-income

group was generally more than that for the lower income group. There was a slightly increasing trend to exaggerate this difference from 1991 to 1997.

Energy intake for snackers vs. nonsnackers

There was a striking trend (from 1991 to 1997) regarding the total energy intake for the children and adolescents who ate snacks; their energy intake was much larger than that of those who did not, and was associated with the income level. The extra energy intake for the subjects who ate snacks compared with those who did not (age group 6–11 y) was about 0.2% in 1991, but increased to 7.6% in 1997. It was 1.1% and 13.4%, respectively, in 1991 and 1997 for the children aged 12–18y. At the same time (from 1991 to 1997), the extra energy intake comparing snackers with nonsnackers in the high-income group for the children aged 6–11 y increased from 4.3 to 9.3%, while it was unchanged in the low-income group. For the children, aged 12–18 y, it increased from 2.0 to 15.2% in the high-income group, while it only increased from 3.0 to 4.5% in the low-income group.

Energy for those eating FPOH vs. those not eating FPOH

Compared with the trends of snacks, the trends in the difference for the total energy intake between those who ate FPOH, and those who did not, was not so clear. The subjects who ate FPOH generally consumed less total energy than those who did not, in the 12–18 y age groups, but was slightly more in the 6–11 y age groups.

Snacks

The foods most frequently consumed as snacks in 1991 were fruits, grains, and vegetables. For the snackers, aged 6–11 y, 65.8% ate fruits as snacks, 35.5% ate grains, and 10.3% ate vegetables. It was 56.3%, 39.9%, and 12.7%, respectively, for the snackers aged 12–18 y. The foods most frequently consumed as snacks in 1997 were almost the same as those in 1991; however, the percentage of the subjects who ate grains for snacks, aged 6–11y, decreased to 28.6%, while those choosing meat, eggs, and fish as snacks increased from 7.3 to 17.1%. The same trend occurred among snackers, aged 12–18 y.

Fruit was a typical food consumed as a snack. The consumption of fruit among the snackers aged 6–11 y was 126.7g per person in 1991 and 213.4g per person in 1997. It was 135.0 and 205.7g for the snackers aged 12–18y, respectively, in 1991 and 1997. The consumption of grains as snacks decreased, while the consumption of meat, eggs, and fish increased for both age groups. There was a trend that deep-fried prepared grains and salted vegetables as snacks increased. Soft drinks emerged as a snack in 1997, although the number of snackers who consumed them was low (less than 10%), and the absolute value consumed per person was still minimal in the 1997 survey.

FPOH

The foods most frequently consumed as FPOH were grains; meat, eggs, and fish; fruits; and vegetables. Grains were at the top of the food groups most consumed as

Table 3. The energy intake from snack and food prepared outside the home (FPOH) for children and adolescents age 6–18 y, stratified by age and per capita family income level in China Health and Nutrition Survey (CHNS) 1991, 1997

| Age and income group | 1991 | | | | Extra energy intake of consumers than nonconsumers (%) | Energy from snack or food prepared outside home (%) | 1997 | | | | Extra energy intake of consumers than nonconsumers (%) | Energy from snack or food prepared outside home (%) |
|--|---------------------|-----|------------------------|-----|--|---|---------------------|-----|------------------------|-----|--|---|
| | Total Energy Intake | | Consumers ^b | | | | Total Energy Intake | | Consumers ^b | | | |
| | Mean | SD | Mean | SD | | | Mean | SD | Mean | SD | | |
| Snack | | | | | | | | | | | | |
| Age 6-11 y | | | | | | | | | | | | |
| Low income | 1732 | 513 | 1740 | 448 | 0.5 | 11.2 | 1638 | 534 | 1647 | 527 | 0.5 | 11.8 |
| Medium income | 1866 | 520 | 1753 | 500 | -6.0 | 8.5 | 1741 | 536 | 1834 | 582 | 5.3 | 9.2 |
| High income | 1901 | 534 | 1982 | 602 | 4.3 | 7.9 | 1756 | 535 | 1919 ^a | 610 | 9.3 | 7.0 |
| Total | 1839 | 528 | 1843 | 503 | 0.2 | 8.7 | 1696 | 537 | 1825 | 589 | 7.6 | 8.7 |
| Age 12-18 y | | | | | | | | | | | | |
| Low income | 2393 | 707 | 2454 | 686 | 3.0 | 7.5 | 2107 | 628 | 2201 ^a | 514 | 4.5 | 10.8 |
| Medium income | 2366 | 757 | 2353 | 605 | -0.5 | 9.2 | 2111 | 628 | 2426 ^a | 769 | 15.0 | 6.6 |
| High income | 2310 | 582 | 2357 | 660 | 2.0 | 6.9 | 2196 | 623 | 2530 ^a | 684 | 15.2 | 6.6 |
| Total | 2361 | 695 | 2387 | 651 | 1.1 | 7.7 | 2129 | 627 | 2414 ^a | 687 | 13.4 | 7.5 |
| Food prepared outside the home (FPOH) | | | | | | | | | | | | |
| Age 6-11 y | | | | | | | | | | | | |
| Low income | 1835 | 526 | 1676 ^a | 410 | -8.7 | 14.9 | 1696 | 532 | 1663 | 574 | -1.9 | 16.8 |
| Medium income | 1894 | 530 | 1941 | 524 | 2.5 | 17.9 | 1782 | 540 | 1799 | 545 | 1.0 | 16.5 |
| High income | 1956 | 543 | 1965 | 526 | 0.5 | 15.7 | 1712 | 467 | 1892 ^a | 594 | 10.5 | 19.8 |
| Total | 1895 | 535 | 1911 | 518 | 0.8 | 16.3 | 1725 | 526 | 1798 ^a | 577 | 4.0 | 17.9 |
| Age 12-18 y | | | | | | | | | | | | |
| Low income | 2529 | 720 | 2424 | 682 | -4.2 | 17.6 | 2228 | 613 | 2120 ^a | 666 | -4.8 | 18.8 |
| Medium income | 2447 | 725 | 2433 | 703 | -0.6 | 18.8 | 2225 | 675 | 2172 | 614 | -2.4 | 19.2 |
| High income | 2440 | 633 | 2358 | 561 | -3.4 | 19.2 | 2374 | 625 | 2231 ^a | 631 | -6.0 | 24.0 |
| Total | 2479 | 704 | 2401 ^a | 644 | -3.1 | 18.6 | 2252 | 638 | 2183 ^a | 633 | -3.1 | 21.0 |

^a *P* values < 0.05 for ANOVA tests between consumers and nonconsumers from the same income group and in the same year. ^b 'Consumers': for snacks, it means the children who ate snacks; for FPOH, it means children who ate it.

Trends in eating behaviours among Chinese Children

Table 4. The top six food groups most frequently consumed as snacks or food prepared outside the home (FPOH) for the children and adolescents in China Health and Nutrition Survey (CHNS) 1991, 1997 stratified by age

| Food groups | Snackers | | | | | | Children who consumed FPOH | | | | | |
|--------------------------|-------------------------|---------------------|--|-------------------------|---------------------|---|----------------------------|---------------------|---|-------------------------|---------------------|--|
| | 1991 | | | 1997 | | | 1991 | | | 1997 | | |
| | People who consumed (%) | Amount consumed (g) | Amount from deep fried, salted or preserved ^a (%) | People who consumed (%) | Amount consumed (g) | Amount from deep fried, salted or preserved (%) | People who consumed (%) | Amount consumed (g) | Amount from deep fried, salted or preserved (%) | People who consumed (%) | Amount consumed (g) | Amount from deep fried, salted, or preserved (%) |
| Children age 6–11 y old | | | | | | | | | | | | |
| <i>N</i> | <i>N</i> =234 | | | <i>N</i> =175 | | | <i>N</i> =487 | | | <i>N</i> =514 | | |
| Grains | 35.5 | 32.2 | 11.2 | 28.6 | 21.1 ^c | 15.6 | 80.9 | 94.9 | 26.3 | 81.3 | 96.5 | 21.3 |
| Legume, nuts and seeds | 8.1 | 6.4 | 0.0 | 10.3 | 6.7 | 1.5 | 14.6 | 11.2 | 7.1 | 19.8 ^b | 13.0 | 2.3 |
| Vegetables | 10.3 | 7.4 | 2.7 | 15.4 | 16.1 | 8.1 | 15.2 | 9.5 | 8.4 | 21.6 ^b | 14.7 | 24.5 |
| Fruits | 65.8 | 126.7 | 0.0 | 65.7 | 213.4 ^c | 0.0 | 24.6 | 43.2 | 0.0 | 12.8 ^b | 22.6 ^c | 0.0 |
| Meat, eggs, fish | 7.3 | 3.9 | 0.0 | 17.1 ^b | 8.3 ^c | 3.6 | 27.9 | 16.0 | 6.9 | 37.5 ^b | 20.1 | 9.4 |
| Soft drinks | 6.4 | 5.3 | - | 7.4 | 16 ^c | - | 2.9 | 2.1 | - | 3.5 | 6.9 ^c | - |
| Children age 12–18 y old | | | | | | | | | | | | |
| <i>N</i> | <i>N</i> =158 | | | <i>N</i> =151 | | | <i>N</i> =543 | | | <i>N</i> =523 | | |
| Grains | 39.9 | 53.3 | 3.2 | 32.5 | 37.9 | 2.9 | 82.3 | 137.1 | 23.9 | 80.3 | 131.0 | 19.8 |
| Legume, nuts & seeds | 11.4 | 7.4 | 0.0 | 11.9 | 8.5 | 0.0 | 17.1 | 11.6 | 4.3 | 22.9 ^b | 14.0 | 3.6 |
| Vegetables | 12.7 | 9.2 | 0.0 | 15.9 | 18.7 | 8.0 | 27.4 | 32.1 | 9.0 | 29.8 | 27.5 | 14.2 |
| Fruits | 56.3 | 135 | 0.0 | 60.9 | 205.7 ^c | 0.0 | 11.0 | 22.9 | 0.0 | 11.1 | 28.2 | 0.0 |
| Meat, eggs, fish | 8.2 | 4.7 | 10.6 | 13.2 | 8.9 | 6.7 | 29.7 | 18.7 | 3.7 | 40.0 ^b | 31.7 ^c | 9.1 |
| Soft drinks | 1.3 | 0.7 | - | 6.6 ^b | 19.6 ^c | - | 1.0 | 0.2 | - | 2.5 ^b | 4.4 ^c | - |

^a Deep fried: grains; legume nuts, seeds; meat, eggs, and fish; salted: vegetables; preserved or caned: fruits ^b *P* values <0.05 of chi-square tests comparing between two years; ^c *P* values <0.05: t-test between two years

FPOH; Most subjects (about 80%) ate ready-to-eat grains in 1991 and 1997. The number of the subjects that ate meat, eggs, and fish prepared outside the home increased by almost 10% from 1991 to 1997 for both age groups and the consumption per person increased from 16.0 to 20.1g for the subjects, aged 6–11 y, while it increased from 18.7 to 31.7g for the subjects, aged 12–18y. The number of the subjects who consumed fresh fruit outside the home decreased from 1991 to 1997, for age 6–11y, and the consumption per person decreased almost 50%. The number of those, aged 12–18y, who consumed fruit remained the same, but the amount consumed increased by about 6g per person.

As for the trends of cooking methods for FPOH, more than 20% of grains consumed were deep-fried, but the percentage of deep-fried grains decreased by about 4–5% from 1991 to 1997. The percentage of deep fried meat, eggs, and fish as FPOH increased slightly. For vegetables, there was a significant trend that the consumption of salted vegetables, prepared outside the home increased; consumption tripled for the 6–11 y age group and almost doubled for the 12–18 y age group.

Discussion

Overall this study showed that the percentage of snacking among Chinese children varies by income with increases among higher income groups while the percentage of eating FPOH increased in the middle and upper income groups. Snacking contributed about 8% of the energy intake for snackers, compared with over 15% from FPOH among those who ate FPOH. Fruit was a major component of snacking: snacks based on fruit intake almost doubled over the study period as did snacks based on soft drink consumption. Animal source food consumption was a key component of FPOH and its intake also increased.

The impact of environment factors on Chinese child/adolescent eating patterns.

The impact of environment factors on snacking and eating food prepared outside the home are different. The data analysis (not presented) showed that the income gap between the high and low income groups in 1997 is greater than that of 1991 with minimal or no real income growth among the poor. The comparison between the increasing snacking behaviour in the high income group and the decreasing snacking behaviour in the low income group strongly reflects this polarization of income in the Chinese population.

The trends for eating food prepared outside the home were not as sensitive to income dynamics as were the trends of snacking. The number of children or adolescents who ate food prepared outside the home increased in medium and high income groups while the number of those who ate food prepared outside the home remained relatively stable in the low income group from 1991 to 1997.

The eating patterns in China differ from those of the developed western countries

The snacking and eating food prepared outside the home patterns are different for Chinese children and adolescents compared with those in western developed countries.

Only about 10% Chinese children and adolescents consumed any snacks in 1997, contrasted with 91% of American children and adolescents.⁵ The energy intake from snacking for those who snacked was less than 10% for Chinese children and adolescents versus 25% for American children and adolescents and 17–23% for British young adult.^{3,7} The typical snacks for Chinese children and adolescents are fruits, grains and vegetables. For American children, snacks are more variable with the greatest concentration in high energy dense foods, such as salty snacks, desserts, candy, and soft drinks.⁸ The soft drink is an important snack source for the American children, but it contributed minimal to the snacking behaviour of Chinese Children. The soft drink has been imported into China since 1980s, but the price for soft drinks is high compared with other snack foods. Future trends in China might find greater soft drink intake but there is minimal evidence of this to date.

Fruit is the major snack among the Chinese children and adolescents, and more than 200g was consumed by the snackers in 1997. Fruits are important factors for reducing the energy density of the diet and for providing many nutrients and food constituents that protect against key noncommunicable diseases. Deep frying is also not a major preparation method for snacks as compared with many salty and high fat foods found among American snacks.

The reason for the Chinese children from low and high income family to consume snacks might differ. Children and adolescents obtained more energy from snacks in the low income group than the upper income group. Thus, for low income snackers, the snacks might represent a way to meet an energy deficiency from missed meals or the long time period between two meals.

Snackers consume more energy in both China and US

It is generally felt that increased snacking is linked with increased overall energy intake.² But the findings are mostly based on the studies done in the developed countries. The dramatic increase in extra energy intake for snackers compared with non-snackers between 1991 and 1997 among Chinese children and adolescents supported this argument - although snacking still contributed a small proportion of overall energy intake, even among snackers.

Eating food prepared outside the home does not always mean extra energy intake in China

Eating food prepared outside the home is regarded as a cause of increased energy intake in the US.^{2,9,10} In the US population aged 2 and older, energy intake from food prepared outside home increased from 25% in 1977–78 to 35% in 1995.⁴ In contrast, this study showed Chinese children and adolescents FPOH behaviour is not linked with added caloric intake. However there is an increase in the higher energy dense consumption of meat, egg and fish in the FPOH.

Grazing environment

There is a concern about the “grazing” environment factors in western higher income countries.⁷ Adolescents are increasingly ‘grazing foods’ instead of consuming ‘proper meals’, and this may have undesirable nutritional and social consequences. But in China, it might be true that

the price of ready-to-eat snacks is still a major factor preventing children and adolescents from snacking extensively since the percentage of snackers was strongly affected by income level. Chinese children are also encouraged by their parents to consume regular meals due to the belief that meals are healthier than snacks. It is possible to determine that even the small snacking trend among higher income Chinese children is not negative since Chinese snacks are healthful lower energy dense foods such as fruits. That might explain why the snack for the high income group only accounts for 6% of total energy intake.

Summary

Evaluating dietary trends among Chinese children is helpful for understanding the nutrition transition in China; however without studies in other lower income and transitional countries, it is not possible to extrapolate from this study to that of other countries.

Limitations of this study

The definition of 'snack' usually relates to energy content or time of eating which may not always agree with cultural or individual perceptions about 'meal' or 'snack'. This may lead to significant variance in the definition of snack across different studies and cultures.¹¹

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Original Article

Trends in eating behaviours among Chinese children (1991–1997)

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近几年中国儿童饮食方式的改变趋势（1991～1997）

通过中国健康与营养调查所得的资料，本研究针对近几年中国青少年儿童在零食和零售的即食食品的消费进行了讨论。本调查于 1991 年和 1997 年分别对 3223 名和 2836 名年龄在 6 到 18 岁的青少年儿童进行了研究。我们记录了这些被调查人员三天的饮食以及 1989 年水平的人均工资。那些有吃零食习惯的孩子的比例在各个工资阶段间的差距很大，并且那些有吃零售的即食食品习惯的孩子的父母工资一般为中高等水平。零食能够提供大约 8% 的能量，而零售的即食食品提供的能量要超过 15%。水果是零食的主要组成部分：在我们调查阶段，这些被调查者消耗的水果几乎是软饮料的两倍。动物源性食物是零售的即食食品的主要组成部分，其消费量亦在增加。

关键词：消费趋势、零食、即食食品、便携食品、儿童、青少年、中国。