

## Are Child Eating Patterns Being Transformed Globally?

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### Abstract

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**Objective:** To examine the extent to which child dietary patterns and trends are changing globally.

**Research Methods and Procedures:** Diets of children 2 to 19 years of age were studied with nationally representative data from Russia and the United States, nationwide data from China, and regional data from metropolitan Cebu, Philippines. Twenty-four-hour dietary recalls were examined at several points in time to examine trends in calories consumed away from home, snacking behavior, and soft drink and modern fast food consumption. Urban–rural trends were compared.

**Results:** U.S. and Cebu youth consume more than one-third of their daily calories and a higher proportion of snack calories from foods prepared away from home. In contrast, away from home food consumption is minimal in Chinese and Russian children. U.S. and Cebu youth consume about one-fifth of their total daily energy from snacks, but snacks provide a much lower proportion of energy in Russia (~16%) and China (where snacks provide only ~1% of energy). Fast food plays a much more dominant role in the American diet (~20% of energy vs. 2% to 7% in the other countries), but as yet does not contribute substantially to children's diets in the other countries. Urban–rural differences were found to be important, but narrowing over time, for China and Cebu, whereas they are widening for Russia.

**Discussion:** This research suggests that globalization of the fast food and other modern food sectors is beginning to affect child eating patterns in several countries undergoing

nutrition transition. However, the contribution of fast food and soft drinks to the diet of children remains relatively small in China, Russia, and Cebu, Philippines, relative to the United States.

**Key words:** away from home eating, fast food, snacking, child diet trends

### Introduction

Over the past 15 years, there is increasing evidence that the structure of dietary intakes and the prevalence of obesity among children around the world have been changing at an increasingly rapid pace (1). Most available evidence, especially in the area of dietary behavior, comes from the United States and other higher-income countries. Among the prominent trends in these settings are increased snacking and away from home consumption and a shift toward more fast food and calorically sweetened beverages. There has been a rapid global shift toward increased availability of fast foods and processed foods, as well as changes in food distribution and marketing, but it is not clear how these changes have affected child diets.

Among U.S. children, changing dietary patterns are associated with concomitant increases in energy intake and a higher percentage of calories from energy-dense nutrient-poor foods and snacks (2–7) eaten at greater frequency throughout the day (3,8). Additionally, an increasing number of meals are consumed away from home (2,4,6). From 1977 to 1996, the percentage of meals consumed from restaurant and fast food sources jumped from 9.6% to 23.5% for the average American. This represents an increase of 104% to 255%, depending on the age group (4). Between 1994 and 1996, men 18 to 39 years of age obtained 17% of their total daily caloric intake from fast food establishments (9). The rise in food consumption away from home is paralleled by the increase in commercial eating places (89%) and fast food restaurants (146%). Using spending as a measure of consumption, recent reports show that “eating out” now accounts for nearly 40% of food spending (2), and fast food sales increased 300% from 1970 to 1980.

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**Table 1.** Characteristics of the U.S., China, Russia, and Cebu surveys

	United States	Russia	China	Cebu
Representation	Nationally representative	Nationally representative	National, includes eight provinces	Regional: central Visayas
Years of survey	1977–78, 1989–91, 1994–98	1994, 2003	1991, 2000	1994, 1998, 2002
Ages of participants	2 to 18 years at each cross-section	2 to 18 years at each cross-section	2 to 18 years at each cross-section	Cohort age 11 years in 1994
Number of dietary recalls per survey round	3	1	3	2
Percent urban	75	76	36	75

Associated with the rise in fast and convenience food outlets has been a shift in the types of foods being consumed in the United States. Consumption of soft drinks, other sweetened beverages, and fast food has increased dramatically for adolescents (2–4,10,11). Although availability and consumption of fruits and vegetables has been increasing since 1970 (2,12), the average number of servings per day remains far below the recommended levels (2). Lytle et al. (13) found that, as children moved from the third to eighth grade, fruit and vegetable consumption decreased by 41% and 25%, respectively, whereas soft drink consumption more than tripled. Concomitant decreases in milk and fruit juice intake were also observed (13).

These patterns and trends are important because of their potential health consequences for children. Past and ongoing U.S. research is beginning to document how away from home eating, including restaurant and fast food consumption, and snacking and soft drink consumption increase total energy intake and, thus, have consequences on child obesity (14–19).

There is limited information about children outside of the United States and Europe (20–23) and little comparative study of trends in other parts of the world. In particular, we lack information about countries undergoing rapid socioeconomic change. The focus of this paper is on changes in the structure of diet among youth in Russia, China, and the Philippines compared with the United States. We examined trends in away from home consumption, snacking, and the level of modern “Western” foods consumed. We used nationally representative dietary data from the United States and Russia, along with an eight-province survey from China and a survey of a large metropolitan area in the Philippines (7,24–27).

These countries were chosen for comparison for several reasons. First, they represent different levels of modernization and exposure to globalization of diet patterns. Of the

four settings, China is the poorest and was the most isolated from modern food services such as fast food restaurants until the 1990s. The United States represents the other end of the spectrum. Second, our ongoing longitudinal studies in China, Russia, and Cebu (Philippines) allow us to track dietary changes over time in countries undergoing very rapid socioeconomic transitions. Third, our long history and intensity of research in these populations provides us with a better understanding of the contexts in which change is occurring. Given the potential health effects of trends in snacking and away from home food consumption, our comparative research is important for its worldwide program and policy implications.

## Research Methods and Procedures

### *Survey Design and Sample*

Table 1 summarizes broad similarities and differences across the four studies.

*United States.* We used data from 2- to 18-year-old participants in nationally representative surveys of the U.S. population, namely the 1977 to 1978 (hereafter referred to as 1977) Nationwide Food Consumption Survey (NFCS77) and the 1989–91 (hereafter referred to as 1989) and 1994 to 1996 (hereafter referred to as 1996) Continuing Survey of Food Intake by Individuals (CSFII96). The latter is combined with the 1998 child supplement for children 2 to 9 years of age. The surveys from 1977 and 1989 included stratified area probability samples of non-institutionalized U.S. households in the 48 contiguous states and, in 1996, all 50 states. These surveys were self-weighting, multistage, stratified area samples of the U.S. population. We used all days of 24-hour recall data available from each survey. Detailed information pertaining to each survey has been published previously (7).

*Russia.* The Russia Longitudinal Monitoring Survey is a household-based survey of individuals and is the first nationally representative sample from the Russian Federation. We used the Phase II data collected in 1994 and 2003 from ~4000 households in 65 primary sampling units. While there was a longitudinal component to the survey, we used the nationally representative cross-sectional sample in each round. As with the U.S. data, sample weights and design corrections were used for the Russian data. The Russia sample was 76% urban, which corresponds to the national average. One 24-hour recall was available from each survey (26). Energy intake was calculated using food composition tables developed by Skurikhin and Volgarev (28).

*China.* Analysis was based on data from the China Health and Nutrition Survey (CHNS), an ongoing longitudinal project (27). Samples from 1991 and 2000 were used. A multistage, random cluster procedure was used to draw the sample in eight provinces. While not designed to be nationally representative, coverage was national. Counties in the eight provinces were stratified by income (low, middle, and high), and a weighted sampling scheme was used to randomly select four counties in each province. In addition, the provincial capital and a lower income city were selected. Villages, townships within the counties, and urban and suburban neighborhoods within the cities were selected randomly. The survey included 190 primary sampling units consisting of 32 urban neighborhoods, 30 suburban neighborhoods, 32 townships, and 96 villages. Overall, the sample was 36% urban. Survey design controls, but not sample weights, were used with these data.

The Chinese diet data were derived from 24-hour recalls on 3 consecutive days, combined with cooking oil weighed and measured at the household level. The latter provides an accurate measure of the total edible oil used in household cooking and, thus, a better measure of fat intake (29,30). Energy intake was calculated using food composition tables developed by the Institute of Nutrition and Food Hygiene (31).

*Cebu.* We use data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS). In 1983, all pregnant women living in 33 randomly selected urban and rural communities of Metro Cebu, Philippines, were asked to participate in this study. Their singleton infants, born within a 1-year time period, were included and have been followed since birth. The sample is ~73% urban. Here, we used data from the 1994 ( $n = 2198$ ), 1998 ( $n = 2106$ ), and 2002 ( $n = 2040$ ) surveys when dietary intake was collected using two 24-hour dietary recalls. Cooking methods for each food were noted, and fat and energy intakes were estimated for oil added in cooking. Energy intake was calculated using year-appropriate Philippines Food Composition Tables pro-

vided by the Food and Nutrition Research Institute (32). As was the case for the China data, survey design controls, but not sample weights, were used with these data. In contrast to the other data sets, the CLHNS is a regional sample focused on a large urban center and surrounding rural areas, some of which are on remote islands and in mountainous areas.

### *Age Groups*

For China, Russia, and the United States, we analyzed three age groups (2 to 5.9, 6 to 11.9, and 12 to 18.9 years of age), as well as the total sample. The CLHNS is a cohort study, and we used data from three survey rounds, when participants had mean ages of 11.5, 15.5, and 17.9 years.

### *Eating Behaviors*

Mothers served as proxy informants for children under 10 years of age in Russia and China, under 12 years of age in the United States, and under 14 years of age in Cebu. For each food listed in the 24 hour recalls, information was collected on the eating occasion (whether considered by the respondent to be a meal or snack) and place of preparation and/or consumption. We were interested in place of preparation primarily to understand the extent to which there was a pattern of increased consumption of foods fully prepared away from home, particularly in the form of fast foods or ready-made meals. The surveys were not directly comparable in how food source was identified. For the United States, information was available on where food was obtained and whether it was ever in the home. We distinguished vending machines, stores, and restaurants (including fast food) as away from home sources. For Cebu, we collected only place of preparation and identified restaurants, street vendors, stores, and school feeding programs as away from home sources. It should be noted, however, that school feeding programs are limited and typically provide only bulgur as a breakfast food to the poorest children. Place of consumption was not known for Cebu. Thus, we could not determine the extent of home consumption of foods prepared elsewhere (e.g., take out foods consumed at home).

For Russia, data were derived from questions that asked where each food was consumed and whether it was home cooked or not. For place of consumption, we could differentiate restaurant, school, and work from home. However, a large number of foods were not home-cooked and, in these cases, we could not determine where preparation took place. However, we know from our experience in Russia and from other analyses (33) that items such as bread purchased at stores fall into this category. There is little or no tradition of take-out food (i.e., purchase of ready-made foods that were eaten at home) in Russia.

China is the only case where we have identically coded information on place of preparation and place of consumption. We, therefore, used China data to show how results were affected by these distinctions.

<sup>1</sup> Nonstandard abbreviations: CLHNS, Cebu Longitudinal Health and Nutrition Survey.

To examine the thousands of foods contributing to energy intake, food groups were developed for each country, with U.S. groups serving as a model (34). The food groups were structured to represent the main behaviors of interest.

We were interested in three main behaviors. The first was consumption from specific food groups that represent potentially unhealthy trends. We, therefore, defined groups that represent the following: 1) fast food (pizza, hamburgers, french fries, and other deep-fried items); 2) modern snacks (salty snacks such as potato or corn chips, pretzels); 3) traditional snacks (for Russia, these include items such as pumpkin and sunflower seeds; for China, these typically include mixtures of preserved, salted, or roasted beans and plums, and peanuts or sunflower seeds; for Cebu, these are usually small rolls and similar bakery products); 4) candies and desserts; and 5) soft drinks (calorically sweetened carbonated beverages and fruit drinks). Collectively, these items are typically high in calories but low in micronutrients. The second was meal patterns, with a focus on snacking. The third was place of preparation and/or consumption, examining the extent to which there was a trend of increased intake of foods prepared entirely outside of the home.

### *Statistical Analysis*

Given our focus on changing food patterns and eating occasions rather than energy intake, all intakes are expressed as a percentage of total daily energy intake. Foods were first categorized by food group and eating occasion (snack vs. non-snack meal according to local definitions). We calculated the percentage of total daily energy intake contributed by each food group and further subdivided these intakes into snacks and non-snack meals. For example, snack calories are the total of all snack calories consumed by the relevant population divided by the total calories consumed by that population. Values represent average per capita consumption for the sample, not intakes only among consumers. Similarly, we calculated the percentage of daily calories derived from foods prepared and/or consumed away from home vs. prepared and consumed at home. Values were averaged across the number of days available for each child at each survey. Results were stratified by age group within each survey year for China, Russia, and the United States (2 to 5.9, 6 to 10.9, and 11 to 18.9 years of age). Because Cebu participants were part of a cohort study, all were similar in age at each survey round. The samples were stratified by urban and rural residence to provide additional data for the figures.

For the United States and Russia, survey means were calculated using SAS 8.1 to control for survey design effects. Because our focus was on time trends, we assessed differences by survey year within food groups, meal type, and eating location using *t* tests, denoting statistical significance as  $p < 0.01$ .

## **Results**

### *Are There Shifts in Away from Home Dietary Intake?*

The source of food (home vs. away from home) by meal type (meal or snack) for children and adolescents from the United States, Philippines, Russia, and China are presented in Table 2. Children in Cebu and the United States consumed the most calories from foods prepared away from home. Cebu youth consumed nearly 40% of total calories from foods prepared away from home. Snack foods in Cebu were predominantly prepared away from home (81.6% in 2002 to 90.3% in 1998). The foods prepared away from home and consumed as snacks were typically small rolls and soft drinks purchased at small stores or bakeries, whereas the away from home foods consumed as meals more typically came from street vendors or small cafeterias and included rice and vegetable dishes and fried foods such as egg rolls. Home preparation of snack foods increased over time, with levels in 2002 being ~7 percentage points higher than in 1994. This seems to represent an age-related trend of consuming morning coffee with milk and sugar, which was reported as a pre-breakfast snack.

In all age groups in the United States, the percentage of calories consumed away from home increased significantly from 1977 to 1996, such that by 1996, more than one-third of calories were from away from home sources. While young children (2 to 5.9 years of age) typically consumed fewer calories from away from home sources, their increase in time was substantial (e.g., nearly doubling from 13.3% of total calories in 1977 to 25.6% in 1996). The trend, which was similar for both meals and snacks, was accounted for primarily by an increase in the percentage of calories consumed at restaurants and fast food establishments.

By contrast, in 2003, Russian youth consumed only ~15% of total calories, and in 2003, ~32% of snack calories, away from home. There was no significant trend in home consumption observed from 1994 to 2003.

In China, we found differences in the percentage of calories prepared vs. consumed at home because some families consumed foods at home that were prepared elsewhere. For total calories and meal calories, estimates based on place of preparation and place of consumption were similar because very few meals were purchased or consumed away from home. For example, in 1991, 9.4% of total calories were prepared away from home, but 6.6% of calories were consumed away from home. Snack foods were more typically prepared away from home, even though they may have been eaten at home. For example, in 2000, 37.1% of snack calories were prepared away from home, but only 22.7% of snack calories were consumed away from home.

Age differences were apparent in all countries. In the United States, preschoolers consumed less food away from home than older children. The opposite was found in China and Russia, where younger preschoolers were fed a larger proportion of their calories away from home, especially in school programs.



**Table 2.** Proportion of energy from key food sources and meals or snacks**A. United States**

Age group (years)	Source	Meals and snacks			Meals			Snacks		
		1977–78	1989–91	1994–98	1977–78	1989–91	1994–98	1977–78	1989–91	1994–98
2 to 5.9	<i>N</i>	2,493	1,107	5,686						
	Vending machine	0.1 <sup>a</sup>	0.0 <sup>ac</sup>	0.1 <sup>c</sup>	0.0	0.0	0.0	0.4 <sup>a</sup>	0.0 <sup>ac</sup>	0.3 <sup>c</sup>
	Home	86.7 <sup>ab</sup>	78.9 <sup>ac</sup>	74.4 <sup>bc</sup>	87.1 <sup>ab</sup>	78.9 <sup>a</sup>	74.0 <sup>b</sup>	83.8 <sup>b</sup>	78.6 <sup>c</sup>	75.7 <sup>bc</sup>
	Store	2.5 <sup>ab</sup>	1.2 <sup>ac</sup>	3.5 <sup>bc</sup>	2.2 <sup>a</sup>	0.6 <sup>ac</sup>	2.7 <sup>c</sup>	4.5 <sup>b</sup>	4.1 <sup>c</sup>	6.4 <sup>bc</sup>
	Fast food/restaurant	2.9 <sup>ab</sup>	11.6 <sup>a</sup>	9.6 <sup>b</sup>	3.0 <sup>ab</sup>	12.7 <sup>a</sup>	11.3 <sup>b</sup>	1.9 <sup>ab</sup>	6.5 <sup>a</sup>	3.8 <sup>b</sup>
	School/daycare	3.3 <sup>b</sup>	5.5	6.6 <sup>b</sup>	3.2 <sup>b</sup>	5.6	6.6 <sup>b</sup>	4.1 <sup>b</sup>	5.3 <sup>c</sup>	6.3 <sup>bc</sup>
	Gift/others	4.5 <sup>b</sup>	2.7 <sup>c</sup>	5.8 <sup>bc</sup>	4.4 <sup>a</sup>	2.2 <sup>ac</sup>	5.4 <sup>c</sup>	5.3 <sup>b</sup>	5.5 <sup>c</sup>	7.5 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1385.8 <sup>b</sup>	1381.2 <sup>c</sup>	1560.0 <sup>bc</sup>	1197.7	1146.7 <sup>c</sup>	1208.5 <sup>c</sup>	188.0 <sup>ab</sup>	234.5 <sup>ac</sup>	351.5 <sup>bc</sup>
6 to 10.9	<i>N</i>	3,449	1,245	1,749						
	Vending machine	0.1 <sup>a</sup>	0.0 <sup>ac</sup>	0.1 <sup>c</sup>	0.1 <sup>a</sup>	0.0 <sup>a</sup>	0.0	0.4	0.1 <sup>c</sup>	0.5 <sup>c</sup>
	Home	73.2 <sup>b</sup>	70.4	66.2 <sup>b</sup>	71.9 <sup>ab</sup>	68.9 <sup>a</sup>	65.2 <sup>b</sup>	82.7 <sup>b</sup>	78.9 <sup>c</sup>	70.0 <sup>bc</sup>
	Store	6.3 <sup>ab</sup>	1.6 <sup>ac</sup>	4.1 <sup>bc</sup>	6.3 <sup>ab</sup>	0.8 <sup>ac</sup>	2.7 <sup>bc</sup>	6.3 <sup>b</sup>	6.1 <sup>c</sup>	9.6 <sup>bc</sup>
	Fast food/restaurant	3.1 <sup>ab</sup>	13.4 <sup>a</sup>	11.6 <sup>b</sup>	3.1 <sup>ab</sup>	14.1 <sup>a</sup>	12.9 <sup>b</sup>	2.9 <sup>ab</sup>	9.6 <sup>a</sup>	6.3 <sup>b</sup>
	School/daycare	14.3 <sup>b</sup>	12.3	11.2 <sup>b</sup>	15.7 <sup>b</sup>	14.0	13.3 <sup>b</sup>	3.4	1.8 <sup>c</sup>	2.8 <sup>c</sup>
	Gift/others	3.0 <sup>b</sup>	2.3 <sup>c</sup>	6.7 <sup>bc</sup>	2.8 <sup>b</sup>	2.1 <sup>c</sup>	5.8 <sup>bc</sup>	4.3 <sup>b</sup>	3.4 <sup>c</sup>	10.6 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1786.1 <sup>b</sup>	1770.5 <sup>c</sup>	1871.2 <sup>bc</sup>	1574.2 <sup>b</sup>	1521.2	1492.7 <sup>b</sup>	211.9 <sup>b</sup>	249.3 <sup>c</sup>	378.5 <sup>bc</sup>
11 to 18.9	<i>N</i>	6,289	1,656	1,573						
	Vending machine	0.5 <sup>b</sup>	0.3 <sup>c</sup>	0.8 <sup>bc</sup>	0.3	0.1 <sup>c</sup>	0.5 <sup>c</sup>	1.6 <sup>b</sup>	1.0 <sup>c</sup>	2.1 <sup>bc</sup>
	Home	74.0 <sup>ab</sup>	68.4 <sup>a</sup>	61.2 <sup>b</sup>	73.6 <sup>ab</sup>	67.5 <sup>a</sup>	60.0 <sup>b</sup>	76.9 <sup>b</sup>	73.8 <sup>c</sup>	65.8 <sup>bc</sup>
	Store	5.4 <sup>a</sup>	2.5 <sup>ac</sup>	5.0 <sup>c</sup>	5.0 <sup>ab</sup>	1.7 <sup>ac</sup>	3.7 <sup>bc</sup>	7.8 <sup>b</sup>	6.7 <sup>c</sup>	10.2 <sup>bc</sup>
	Fast food/restaurant	6.2 <sup>ab</sup>	16.6 <sup>ac</sup>	18.6 <sup>bc</sup>	5.9 <sup>ab</sup>	17.2 <sup>ac</sup>	20.7 <sup>bc</sup>	7.9 <sup>ab</sup>	12.8 <sup>a</sup>	10.5 <sup>b</sup>
	School/daycare	11.3 <sup>b</sup>	10.0	8.1 <sup>b</sup>	12.8 <sup>b</sup>	11.4	9.8 <sup>b</sup>	1.6	1.6	1.8
	Gift/others	2.7 <sup>b</sup>	2.3 <sup>c</sup>	6.2 <sup>bc</sup>	2.5 <sup>b</sup>	2.0 <sup>c</sup>	5.3 <sup>bc</sup>	4.1 <sup>b</sup>	4.2 <sup>c</sup>	9.7 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	2047.8 <sup>b</sup>	2019.4 <sup>c</sup>	2234.3 <sup>bc</sup>	1771.6	1719.6	1773.1	276.2 <sup>b</sup>	299.8 <sup>c</sup>	461.3 <sup>bc</sup>
2 to 18.9	<i>N</i>	12,231	4,008	9,008						
	Vending machine	0.3 <sup>a</sup>	0.1 <sup>ac</sup>	0.5 <sup>c</sup>	0.2 <sup>a</sup>	0.1 <sup>ac</sup>	0.3 <sup>c</sup>	1.1 <sup>b</sup>	0.5 <sup>c</sup>	1.3 <sup>bc</sup>
	Home	75.7 <sup>ab</sup>	71.1 <sup>a</sup>	65.2 <sup>b</sup>	75.2 <sup>ab</sup>	70.2 <sup>ac</sup>	64.2 <sup>bc</sup>	79.4 <sup>b</sup>	76.4 <sup>c</sup>	69.1 <sup>bc</sup>
	Store	5.2 <sup>a</sup>	1.9 <sup>ac</sup>	4.5 <sup>c</sup>	4.9 <sup>ab</sup>	1.2 <sup>ac</sup>	3.2 <sup>bc</sup>	6.9 <sup>b</sup>	5.9 <sup>c</sup>	9.2 <sup>bc</sup>
	Fast food/restaurant	4.8 <sup>ab</sup>	14.6 <sup>a</sup>	14.8 <sup>b</sup>	4.7 <sup>ab</sup>	15.4 <sup>a</sup>	16.7 <sup>b</sup>	5.7 <sup>ab</sup>	10.4 <sup>a</sup>	7.9 <sup>b</sup>
	School/daycare	10.9 <sup>b</sup>	9.8	8.7 <sup>b</sup>	12.1 <sup>b</sup>	11.1	10.2 <sup>b</sup>	2.4 <sup>b</sup>	2.5 <sup>c</sup>	3.0 <sup>bc</sup>
	Gift/others	3.1 <sup>b</sup>	2.4 <sup>c</sup>	6.3 <sup>bc</sup>	2.9 <sup>ab</sup>	2.1 <sup>ac</sup>	5.5 <sup>bc</sup>	4.3 <sup>b</sup>	4.2 <sup>c</sup>	9.5 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1832.2 <sup>b</sup>	1778.2 <sup>c</sup>	1959.7 <sup>bc</sup>	1599.0 <sup>ab</sup>	1510.8 <sup>a</sup>	1550.1 <sup>b</sup>	240.2 <sup>b</sup>	267.4 <sup>c</sup>	409.6 <sup>bc</sup>

 $p \leq 0.01$ .

Superscript letters represent significance: a, 1977–78 and 1989–91; b, 1977–78 and 1994–98; c, 1989–91 and 1994–98.

Source: Continuing Survey of Individual Food Intake 1989–91 and 1994–98 and the Nationwide Food Consumption Survey 1977–78.

**Table 2.** (continued)**B. Metropolitan Cebu Region, the Philippines**

Source	Meals and snacks			Meals			Snacks		
	1994	1998	2002	1994	1998	2002	1994	1998	2002
<i>N</i>	2198	2106	2040						
Home	60.3 <sup>ab</sup>	64.5 <sup>ac</sup>	61.5 <sup>bc</sup>	79.8 <sup>ab</sup>	77.9 <sup>ac</sup>	71.0 <sup>bc</sup>	11.0 <sup>b</sup>	9.7 <sup>c</sup>	18.4 <sup>bc</sup>
Restaurant	2.7 <sup>ab</sup>	5.6 <sup>ac</sup>	8.2 <sup>bc</sup>	2.0 <sup>ab</sup>	5.1 <sup>ac</sup>	8.7 <sup>bc</sup>	4.2 <sup>ab</sup>	7.6 <sup>a</sup>	5.8
Feeding program	1.5 <sup>ab</sup>	0.0 <sup>a</sup>	0.0 <sup>b</sup>	0.0	0.0	0.0	5.4 <sup>ab</sup>	0.0 <sup>a</sup>	0.0 <sup>b</sup>
Street foods	14.4 <sup>ab</sup>	14.5 <sup>ac</sup>	16.8 <sup>bc</sup>	12.7 <sup>ab</sup>	13.3 <sup>ac</sup>	17.0 <sup>bc</sup>	18.7	19.8	15.9
Store	20.1	15.0	13.1	5.0	3.5	3.0	58.3	62.1	58.5
Missing	1.0 <sup>ab</sup>	0.3 <sup>ac</sup>	0.0	0.4	0.2	0.0	2.4 <sup>ab</sup>	0.7 <sup>ac</sup>	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total energy (kcal)	1199.3	1618.5	1909.7	859.8	1299.7	1685.9	339.5	318.8	345.9

$p \leq 0.01$ .

Superscript letters represent significance: a, 1994 and 1998; b, 1994 and 2002; c, 1998 and 2002.

Source: Cebu Longitudinal Health and Nutrition Survey, 1994, 1998, 2002.

**C. Russia**

Age group (years)	Food Source	Meals and snacks		Meals	Snacks
		1994	2003	2003	2003
2 to 5.9	<i>N</i>	579	301		
	Home	81.5	76.0	75.5 <sup>a</sup>	78.0
	Restaurant	1.3	0.6	0.3	1.7
	School	16.6	23.1	24.0	19.1
	Work	0.1	0.0	0.0	0.0
	Other	0.5	0.4	0.2	1.1
	Total	100.0	100.0	100.0	100.0
	Total energy (kcal)	1427.2	1438.3	1162.2	276.1
6 to 10.9	<i>N</i>	925	475		
	Home	85.4	83.2	86.1 <sup>a</sup>	69.4
	Restaurant	0.7	0.4	0.4	0.6
	School	13.1	15.2	13.1	25.0
	Work	0.0	0.0	0.0	0.0
	Other	0.8	1.2	0.4	4.9
	Total	100.0	100.0	100.0	100.0
	Total energy (kcal)	1651.4	1728.7	1423.8	304.9
11 to 18.9	<i>N</i>	1,330	1,158		
	Home	89.5	87.2	91.1 <sup>a</sup>	65.3
	Restaurant	2.3	2.4	2.0	4.2
	School	6.4	6.8	4.4 <sup>a</sup>	20.0
	Work	0.3	0.5	0.4	0.6
	Other	1.5 <sup>a</sup>	3.2 <sup>a</sup>	2.0	10.0
	Total	100.0	100.0	100.0	100.0
	Total energy (kcal)	1982.9	1970.2	1672.4	297.8

**Table 2.** (continued)**C. Russia**

Age group (years)	Food Source	Meals and snacks		Meals	Snacks
		1994	2003	2003	2003
2 to 18.9	<i>N</i>	2,834	1,934		
	Home	86.9	84.6	87.7 <sup>a</sup>	68.5
	Restaurant	1.6	1.6	1.4	2.8
	School	10.2	11.2	9.3	21.3
	Work	0.2	0.3	0.3	0.4
	Other	1.1 <sup>a</sup>	2.3 <sup>a</sup>	1.3	7.1
	Total	100.0	100.0	100.0	100.0
	Total energy (kcal)	1758.6	1811.1	1515.1	296.0

$p \leq 0.01$ .

Superscript letters represent significance: a, 1994 and 2003.

Source: Russia Longitudinal Monitoring Survey, 1994 and 2003.

**D. China: place of consumption**

Age group (years)	Food groups	Meals and snacks		Meals		Snacks	
		1991	2000	1991	2000	1991	2000
2 to 5.9	<i>N</i>	1,109	467				
	Home	91.1 <sup>a</sup>	87.4 <sup>a</sup>	91.7 <sup>a</sup>	88.1 <sup>a</sup>	74.5	62.8
	School	4.5	2.5	3.9	2.3	19.7	9.1
	Restaurant	1.1 <sup>a</sup>	9.7 <sup>a</sup>	1.1 <sup>a</sup>	9.5 <sup>a</sup>	2.4	17.8
	Other	3.3 <sup>a</sup>	0.1 <sup>a</sup>	3.3 <sup>a</sup>	0.1 <sup>a</sup>	3.5	0.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1163.9	996.2	1122.2	969.1	41.7	27.1
6 to 10.9	<i>N</i>	1,225	802				
	Home	94.9 <sup>a</sup>	95.0 <sup>a</sup>	95.1 <sup>a</sup>	95.1 <sup>a</sup>	80.2	85.7
	School	1.2	2.4	1.1	2.3	8.6	4.3
	Restaurant	1.7	2.4	1.7	2.3	6.9	9.9
	Other	2.2 <sup>a</sup>	0.1 <sup>a</sup>	2.1 <sup>a</sup>	0.1 <sup>a</sup>	4.3	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1627.7	1434.8	1605.2	1417.9	22.5	16.9
11 to 18.9	<i>N</i>	1,953	1,861				
	Home	93.4 <sup>a</sup>	93.3 <sup>a</sup>	93.5 <sup>a</sup>	93.4 <sup>a</sup>	85.9	79.2
	School	3.2	4.3	3.2	4.2	7.2	6.6
	Restaurant	1.3	2.4	1.3	2.3	5.9	13.9
	Other	2.1 <sup>a</sup>	0.0 <sup>a</sup>	2.1 <sup>a</sup>	0.0 <sup>a</sup>	1.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	2117.8	1810.0	2104.0	1791.0	13.8	18.9
2 to 18.9	<i>N</i>	4,287	3,130				
	Home	93.4 <sup>a</sup>	93.1 <sup>a</sup>	93.6 <sup>a</sup>	93.3 <sup>a</sup>	79.1	77.3
	School	2.9	3.7	2.7	3.6	13.3	6.6
	Restaurant	1.4 <sup>a</sup>	3.1 <sup>a</sup>	1.4 <sup>a</sup>	3.0 <sup>a</sup>	4.5	13.8
	Other	2.3 <sup>a</sup>	0.1 <sup>a</sup>	2.3 <sup>a</sup>	0.1 <sup>a</sup>	3.0	0.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1731.0	1592.4	1707.5	1572.8	23.5	19.6

**Table 2.** (continued)**D. China: place of preparation**

Age group (years)	Food groups	Meals and snacks		Meals		Snacks	
		1991	2000	1991	2000	1991	2000
2 to 5.9	<i>N</i>	1,109	467				
	Home	86.7 <sup>a</sup>	86.9	88.0 <sup>a</sup>	87.7 <sup>a</sup>	51.7	57.8
	School	5.5 <sup>a</sup>	2.7 <sup>a</sup>	5.2	2.6	11.8	6.8
	Restaurant	3.1 <sup>a</sup>	8.0 <sup>a</sup>	2.9 <sup>a</sup>	8.0 <sup>a</sup>	9.3	7.0
	Other	4.7 <sup>a</sup>	2.4 <sup>a</sup>	3.9 <sup>a</sup>	1.7 <sup>a</sup>	27.1	28.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1163.9	996.2	1122.2	969.1	41.7	27.1
6 to 10.9	<i>N</i>	1,225	802				
	Home	91.4 <sup>a</sup>	93.3 <sup>a</sup>	91.9 <sup>a</sup>	93.7 <sup>a</sup>	61.2	55.0
	School	3.0	2.4	3.0	2.3	6.2	12.1
	Restaurant	2.9	2.7	2.8	2.7	13.3	7.2
	Other	2.6	1.5	2.4 <sup>a</sup>	1.3 <sup>a</sup>	19.3	25.7
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1627.7	1434.8	1605.2	1417.9	22.5	16.9
11 to 18.9	<i>N</i>	1,953	1,861				
	Home	91.3 <sup>a</sup>	92.7 <sup>a</sup>	91.5 <sup>a</sup>	93.0 <sup>a</sup>	70.8	67.8
	School	4.4	4.4	4.4	4.4	6.7	9.0
	Restaurant	2.0	2.1	1.9	2.0	7.6	13.4
	Other	2.3 <sup>a</sup>	0.8 <sup>a</sup>	2.2 <sup>a</sup>	0.7 <sup>a</sup>	14.9	9.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	2117.8	1810.0	2104.0	1791.0	13.8	18.9
2 to 18.9	<i>N</i>	4,287	3,130				
	Home	90.6	92.3	91.0	92.7	59.4	62.9
	School	4.2	3.8	4.2	3.7	8.9	9.2
	Restaurant	2.4	2.8	2.3	2.7	9.9	10.7
	Other	2.8 <sup>a</sup>	1.1 <sup>a</sup>	2.5 <sup>a</sup>	0.9 <sup>a</sup>	21.7	17.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy (kcal)	1731.0	1592.4	1707.5	1572.8	23.5	19.6

$p \leq 0.01$ .

Superscript letters represent significance: a, 1991 and 2000.

Source: China Health and Nutrition Survey 1991 and 2000.

### ***Is Snacking Behavior Changing?***

The extent of snacking and the contribution of snacks to total energy intake varied widely across the four countries. The results represent the composite of multiple snacking occasions, particularly in the Philippines and the United States. In the Philippines, snacking is very common, with an afternoon snack a typical feature of the Cebu eating pattern. Approximately 86% of Cebu sample youths reported consuming at least one food item as a snack in the 2002 survey, and, on average, 18% of daily calories came from snacks, mostly in the form of bakery products, soft drinks, and milk

and sugar added to coffee. The percentage of calories from snacks declined as the cohort aged (with total energy from snacks remaining relatively constant, but total energy intake increasing, as would be expected as body size increases with age). This trend reflects a decline in the percentage of youth who consumed snacks and lower intakes among consumers. Unfortunately, we cannot distinguish whether the overall decline in percentage calories from snacks reflects an age trend or a secular trend.

In the United States, snacking is also highly prevalent: 93.2% of youth reported consuming any food as a snack in



1996, and snacks contributed ~22% of total calories in this survey. This represents a large increase since 1977, reflecting both an increase in the percentage of youth who reported consuming a food as a snack and an increase in amount per consumer. The prevalence of snacking is much lower in China, with only 15.3% and 11.8% of Chinese youth reporting consuming any food as a snack in 1991 and 2000, respectively. With so few snackers, <1% of total energy comes from foods consumed as snacks, with no significant trend between 1991 and 2000. Data from Russia do not allow us to examine snacking trends over time. In the 2003 survey, 70.7% of youth reported consuming any food as a snack, and 16% of energy was derived from snacking.

#### ***Are the Food Shifts Found in the United States Common across the Globe among Children?***

We defined food groups to capture potentially unhealthy eating trends. The food groups account for different proportions of all foods consumed, depending on the country. From the most recent surveys in each country, the “other” category (foods not captured by the designated groups) is smallest for the United States and Russia (32.2% and 34.1% of total calories, respectively), intermediate for Cebu (48.5%), and quite high for China (87.4%). This pattern reflects the high consumption of staples (rice in Cebu, rice and wheat products in China), which fall into the “other” category. The percentage of snack foods not falling into one of the named food groups is much smaller in each country.

The United States is characterized by marked increases in soft drinks and fruit drinks, fast food (french fries, hamburgers, cheeseburgers, pizzas, and Mexican food are the major ones), and salty snacks (Table 3A–D). Intake of these foods doubled from 10.5% to 21.2% of total energy intake from 1977 to 1996. In Cebu, fast food consumption did not significantly increase over time, but soft drinks consumed as snacks more than doubled in Cebu youth from 1994 to 2002. In Russia, these modern items represent only 1.3% of intake in 1994, increasing to 2.1% in 2003. Consumption of these items was negligible in China.

In the most recent survey data, soft drinks represented 8.5% of U.S. youth’s total energy, 3% in Cebu, and less than 0.5% in China and Russia. In the United States, soft drink consumption with meals showed a greater increase than as a snack. Overall, consumption of fast food remains quite low except in the United States.

#### ***Are the Food Shifts Found in the United States Linked to Children Residing in Urban Areas?***

The key results presented above for the total sample of each country are stratified by urban or rural residence in Figures 1–4. In China and Cebu, where there is rapid economic growth, the proportion of energy from foods prepared away from home was higher in urban areas in both

time periods, but the urban–rural difference declined over time (Figure 1). In Cebu, there was a 12% urban–rural difference in 1994, which declined to only 5% in 2002, as a result of increasing away from home consumption among rural youth and decreasing consumption among urban youth. In China, the urban–rural difference was halved from 1991 to 2000. In contrast, in Russia, where economic inequality is great and minimal economic progress has occurred in rural areas, we find a widening gap as the urban–rural difference in percentage of away-from-home calories went from 0.8% in 1994 to 6.4% in 2003. The differences in the United States were also in the direction of more away from home intake in rural areas.

Snacking behaviors also differed between urban and rural areas. In all countries, a higher percentage of urban residents reported consuming snacks, and the urban–rural difference remained similar over time (Figure 2). Consistent with the higher percentage of youth who reported consuming snacks in urban areas, the percentage of calories from snacks was also higher among urban youth (Figure 3).

An urban–rural difference in the consumption of calorically sweetened beverages and fast foods is apparent in Cebu but not in the other countries (Figure 4). In China and Russia, consumption of these foods was quite low in all areas, preventing any meaningful comparisons. In the United States, soft drink consumption was slightly higher among urban than among rural youth.

## **Discussion**

While the expansion of global fast food franchises and proliferation of local fast food establishments is a well-recognized phenomenon (35,36), these data from large surveys in China, Russia, and Cebu, Philippines, show that there is not yet widespread consumption of fast food and soft drinks among youth in these settings. Our comparison of results across all four countries provides an indication of the enormous heterogeneity of dietary patterns and trends across the world. By no means do these results represent the universe of patterns. We have examined, in the case of China and Russia, countrywide trends and trends stratified by a census-based urban–rural dichotomy. While one might expect more consumption of modern, fast food in urban areas, our data show only small urban–rural differences in soft drinks and fast food use among youth in these countries. It is possible that further analysis would reveal important differences by region and in the most rapidly modernizing cities compared with rural areas. In cities such as Moscow, Beijing, and Shanghai, American fast food franchises selling hamburgers, pizza, and fried chicken are clearly visible and proliferating. In Metro Cebu, the second largest urban area of the Philippines, American and Cebu fast food establishments are common. However, the ratio of these to the total population is very small relative to the United States,

**Table 3.** Proportion of total energy intake from selected food groups

A. United States		Age group (years)	Food groups	Both snacks and meals			Meals			Snacks		
				1977-78	1989-91	1994-98	1977-78	1989-91	1994-98	1977-78	1989-91	1994-98
2 to 5.9			Fast food	2.6 <sup>ab</sup>	4.5 <sup>ac</sup>	4.9 <sup>bc</sup>	2.9 <sup>ab</sup>	5.2 <sup>a</sup>	5.9 <sup>b</sup>	0.7 <sup>b</sup>	0.9 <sup>c</sup>	1.4 <sup>bc</sup>
			Soft drinks	4.6 <sup>b</sup>	5.1 <sup>c</sup>	5.9 <sup>bc</sup>	4.0 <sup>b</sup>	4.2 <sup>c</sup>	5.5 <sup>bc</sup>	8.8 <sup>b</sup>	9.5	7.0 <sup>b</sup>
			Traditional snacks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Candies and desserts	9.9 <sup>b</sup>	10.0 <sup>c</sup>	10.7 <sup>bc</sup>	5.4	4.8	4.8	38.3 <sup>b</sup>	35.7 <sup>c</sup>	31.0 <sup>bc</sup>
			Modern snacks	2.3 <sup>ab</sup>	3.1 <sup>ac</sup>	5.2 <sup>bc</sup>	1.4 <sup>b</sup>	1.7 <sup>c</sup>	2.4 <sup>bc</sup>	7.7 <sup>ab</sup>	9.8 <sup>ac</sup>	14.8 <sup>bc</sup>
			Fruits, fruit juice, and vegetables	7.9 <sup>b</sup>	9.0 <sup>c</sup>	10.0 <sup>bc</sup>	7.2 <sup>b</sup>	8.2	8.8 <sup>b</sup>	12.1 <sup>b</sup>	12.9 <sup>c</sup>	14.3 <sup>bc</sup>
			Meat, fish, poultry	19.9 <sup>ab</sup>	15.1 <sup>a</sup>	14.1 <sup>b</sup>	22.6 <sup>ab</sup>	17.7 <sup>a</sup>	17.3 <sup>b</sup>	2.4 <sup>b</sup>	2.5 <sup>c</sup>	3.2 <sup>bc</sup>
			Milk and milk products (except ice cream)	18.0	17.7	15.9	17.8 <sup>b</sup>	17.9	15.8 <sup>b</sup>	19.0 <sup>b</sup>	16.9 <sup>c</sup>	16.6 <sup>bc</sup>
			Other	35.0 <sup>b</sup>	35.5	33.3 <sup>b</sup>	38.7	40.4	39.5	10.9 <sup>b</sup>	11.9 <sup>c</sup>	11.8 <sup>bc</sup>
			Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6 to 10.9			Total energy	1385.8 <sup>b</sup>	1381.2 <sup>c</sup>	1560.0 <sup>bc</sup>	1197.7	1146.7 <sup>c</sup>	1208.5 <sup>c</sup>	188.0 <sup>ab</sup>	234.5 <sup>ac</sup>	351.5 <sup>bc</sup>
			Fast food	3.2 <sup>ab</sup>	6.7 <sup>a</sup>	6.5 <sup>b</sup>	3.5 <sup>ab</sup>	7.6 <sup>a</sup>	7.5 <sup>b</sup>	0.9 <sup>b</sup>	1.1 <sup>c</sup>	2.6 <sup>bc</sup>
			Soft drinks	4.1 <sup>ab</sup>	5.1 <sup>ac</sup>	6.8 <sup>bc</sup>	3.4 <sup>ab</sup>	4.5 <sup>ac</sup>	6.0 <sup>bc</sup>	9.4 <sup>b</sup>	8.9 <sup>c</sup>	9.7 <sup>bc</sup>
			Traditional snacks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Candies and desserts	11.2 <sup>b</sup>	11.3 <sup>c</sup>	13.5 <sup>bc</sup>	7.2	6.7	7.1	41.3 <sup>b</sup>	39.7 <sup>c</sup>	39.0 <sup>bc</sup>
			Modern snacks	2.2 <sup>ab</sup>	3.7 <sup>ac</sup>	5.0 <sup>bc</sup>	1.5 <sup>b</sup>	2.1	2.7 <sup>b</sup>	7.6 <sup>ab</sup>	13.7 <sup>ac</sup>	13.8 <sup>bc</sup>
			Fruits, fruit juice, and vegetables	7.4	7.9	6.9	7.3 <sup>b</sup>	7.9 <sup>c</sup>	6.7 <sup>bc</sup>	8.5 <sup>b</sup>	8.0 <sup>c</sup>	7.4 <sup>bc</sup>
			Meat, fish, poultry	20.9 <sup>ab</sup>	16.5 <sup>a</sup>	15.1 <sup>b</sup>	23.3 <sup>ab</sup>	18.7 <sup>a</sup>	18.0 <sup>b</sup>	2.8 <sup>b</sup>	3.2	3.8 <sup>b</sup>
			Milk and milk products (except ice cream)	17.0 <sup>ab</sup>	15.1 <sup>a</sup>	13.6 <sup>b</sup>	17.1 <sup>ab</sup>	15.5 <sup>a</sup>	14.4 <sup>b</sup>	16.2	12.6	10.2
			Other	34.0	33.6	32.7	36.8	37.0	37.6	13.3 <sup>b</sup>	12.7 <sup>c</sup>	13.4 <sup>bc</sup>
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
Total energy	1786.1 <sup>b</sup>	1770.5 <sup>c</sup>	1871.2 <sup>bc</sup>	1574.2 <sup>b</sup>	1521.2	1492.7 <sup>b</sup>	211.9 <sup>b</sup>	249.3 <sup>c</sup>	378.5 <sup>bc</sup>			

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11 to 18.9	Fast food	3.9 <sup>ab</sup>	8.0 <sup>ac</sup>	9.2 <sup>bc</sup>	4.1 <sup>ab</sup>	8.7 <sup>ac</sup>	10.3 <sup>bc</sup>	2.8 <sup>b</sup>	3.7 <sup>c</sup>	4.8 <sup>bc</sup>
	Soft drinks	5.1 <sup>ab</sup>	7.2 <sup>ac</sup>	10.5 <sup>bc</sup>	4.0 <sup>ab</sup>	6.0 <sup>ac</sup>	9.1 <sup>bc</sup>	12.4 <sup>ab</sup>	14.1 <sup>ac</sup>	15.9 <sup>bc</sup>
	Traditional snacks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Candies and desserts	10.9	10.1 <sup>c</sup>	11.2 <sup>c</sup>	7.1	6.3	6.3	35.1 <sup>b</sup>	32.0 <sup>c</sup>	30.2 <sup>bc</sup>
	Modern snacks	2.2 <sup>ab</sup>	3.8 <sup>ac</sup>	5.2 <sup>bc</sup>	1.4 <sup>ab</sup>	2.0 <sup>ac</sup>	2.8 <sup>bc</sup>	7.5 <sup>ab</sup>	14.1 <sup>ac</sup>	14.2 <sup>bc</sup>
	Fruits, fruit juice, and vegetables	6.3	6.2	5.4	6.3 <sup>b</sup>	6.2	5.3 <sup>b</sup>	5.9 <sup>b</sup>	5.8 <sup>c</sup>	5.5 <sup>bc</sup>
	Meat, fish, poultry	23.5 <sup>ab</sup>	18.8 <sup>a</sup>	16.9 <sup>b</sup>	26.2 <sup>ab</sup>	21.1 <sup>a</sup>	20.1 <sup>b</sup>	5.9 <sup>b</sup>	5.8	4.9 <sup>b</sup>
	Milk and milk products (except ice cream)	14.8 <sup>ab</sup>	12.4 <sup>ac</sup>	10.1 <sup>bc</sup>	14.9 <sup>ab</sup>	12.6 <sup>ac</sup>	10.4 <sup>bc</sup>	14.1	11.4	9.2
	Other	33.3	33.5	31.5	36.0	37.0	35.7	16.3 <sup>b</sup>	13.1 <sup>c</sup>	15.4 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy	2047.8 <sup>b</sup>	2019.4 <sup>c</sup>	2234.3 <sup>bc</sup>	1771.6	1719.6	1773.1	276.2 <sup>b</sup>	299.8 <sup>c</sup>	461.3 <sup>bc</sup>
2 to 18.9	Fast food	3.5 <sup>ab</sup>	6.9 <sup>ac</sup>	7.6 <sup>bc</sup>	3.7 <sup>ab</sup>	7.7 <sup>a</sup>	8.7 <sup>b</sup>	2.0 <sup>b</sup>	2.3 <sup>c</sup>	3.5 <sup>bc</sup>
	Soft drinks	4.8 <sup>ab</sup>	6.1 <sup>ac</sup>	8.5 <sup>bc</sup>	3.8 <sup>ab</sup>	5.2 <sup>ac</sup>	7.5 <sup>bc</sup>	11.1 <sup>b</sup>	11.5 <sup>c</sup>	12.3 <sup>bc</sup>
	Traditional snacks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Candies and desserts	10.8 <sup>b</sup>	10.5 <sup>c</sup>	11.8 <sup>bc</sup>	6.9 <sup>ab</sup>	6.1 <sup>a</sup>	6.2 <sup>b</sup>	37.1 <sup>b</sup>	35.1 <sup>c</sup>	32.8 <sup>bc</sup>
	Modern snacks	2.2 <sup>ab</sup>	3.6 <sup>ac</sup>	5.1 <sup>bc</sup>	1.4 <sup>ab</sup>	2.0 <sup>ac</sup>	2.7 <sup>bc</sup>	7.6 <sup>ab</sup>	13.0 <sup>ac</sup>	14.2 <sup>bc</sup>
	Fruits, fruit juice, and vegetables	6.8	7.3	6.7	6.7 <sup>b</sup>	7.1	6.4 <sup>b</sup>	7.5 <sup>b</sup>	8.0 <sup>c</sup>	7.9 <sup>bc</sup>
	Meat, fish, poultry	22.2 <sup>ab</sup>	17.4 <sup>a</sup>	15.9 <sup>b</sup>	24.9 <sup>ab</sup>	19.7 <sup>a</sup>	19.0 <sup>b</sup>	4.6 <sup>b</sup>	4.3 <sup>c</sup>	4.2 <sup>bc</sup>
	Milk and milk products (except ice cream)	15.9 <sup>ab</sup>	14.3 <sup>a</sup>	12.3 <sup>b</sup>	16.0 <sup>ab</sup>	14.5 <sup>ac</sup>	12.6 <sup>bc</sup>	15.4 <sup>b</sup>	13.0 <sup>c</sup>	11.1 <sup>bc</sup>
	Other	33.8	33.9	32.2	36.6	37.7	37.0	14.7 <sup>b</sup>	12.7 <sup>c</sup>	14.1 <sup>bc</sup>
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy	1839.2 <sup>b</sup>	1778.2 <sup>c</sup>	1959.7 <sup>bc</sup>	1599.0 <sup>ab</sup>	1510.8 <sup>a</sup>	1550.1 <sup>b</sup>	240.2 <sup>b</sup>	267.4 <sup>c</sup>	409.6 <sup>bc</sup>

$p \leq 0.01$ .

Superscript letters represent significance: a, 1977–78 and 1989–91; b, 1977–78 and 1994–98; c, 1989–91 and 1994–98.

Source: Continuing Survey of Individual Food Intake 1989–91 and 1994–98, and the Nationwide Food Consumption Survey 1977–78.

Food group	Meals and snacks			Meals			Snacks		
	1994	1998	2002	1994	1998	2002	1994	1998	2002
Fast food	0.7 <sup>b</sup>	0.7	0.7 <sup>b</sup>	0.0 <sup>b</sup>	0.1	0.1 <sup>b</sup>	2.4	3.3	3.2
Soft drinks	1.6 <sup>ab</sup>	2.8 <sup>ac</sup>	3.0 <sup>bc</sup>	0.5 <sup>ab</sup>	1.1 <sup>ac</sup>	1.7 <sup>bc</sup>	4.2 <sup>ab</sup>	9.9 <sup>a</sup>	8.9 <sup>b</sup>
Traditional snacks	18.7	14.3	11.7	6.8	4.2	3.1 <sup>b</sup>	48.8	55.5	50.6
Candies and snacks	4.7 <sup>ab</sup>	2.4 <sup>a</sup>	2.3 <sup>b</sup>	1.7 <sup>b</sup>	1.0 <sup>c</sup>	0.6 <sup>bc</sup>	12.4 <sup>ab</sup>	8.3 <sup>ac</sup>	10.0 <sup>bc</sup>
Modern snacks	2.6 <sup>ab</sup>	0.9 <sup>ac</sup>	0.6 <sup>bc</sup>	0.2	0.0	0.0	8.7 <sup>ab</sup>	4.6 <sup>ac</sup>	2.9 <sup>bc</sup>
Fruits, fruit juice, and vegetables	2.0 <sup>b</sup>	1.4 <sup>c</sup>	1.4 <sup>c</sup>	1.2 <sup>b</sup>	1.0 <sup>c</sup>	0.9 <sup>bc</sup>	3.9 <sup>a</sup>	3.0 <sup>a</sup>	3.4
Meat, fish, poultry	17.0 <sup>ab</sup>	22.8 <sup>ac</sup>	31.4 <sup>bc</sup>	22.3 <sup>ab</sup>	27.1 <sup>ac</sup>	36.7 <sup>bc</sup>	3.6 <sup>b</sup>	5.0 <sup>c</sup>	7.3 <sup>bc</sup>
Milk and milk products (except ice cream)	0.5 <sup>ab</sup>	0.5 <sup>a</sup>	0.5 <sup>b</sup>	0.4 <sup>a</sup>	0.4 <sup>ac</sup>	0.2 <sup>c</sup>	0.7 <sup>ab</sup>	1.1 <sup>ac</sup>	1.8 <sup>bc</sup>
Other	52.2 <sup>ab</sup>	54.2 <sup>ac</sup>	48.5 <sup>bc</sup>	66.8 <sup>ab</sup>	65.2 <sup>ac</sup>	56.5 <sup>bc</sup>	15.4 <sup>ab</sup>	9.4 <sup>ac</sup>	11.9 <sup>bc</sup>
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total energy	1199.3 <sup>ab</sup>	1618.5 <sup>ac</sup>	1909.0 <sup>bc</sup>	859.8 <sup>ab</sup>	1299.7 <sup>ac</sup>	1563.1 <sup>bc</sup>	339.5	318.8 <sup>c</sup>	345.9 <sup>c</sup>

*p* ≤ 0.01.

Superscript letters represent significance: a, 1994 and 1998; b, 1994 and 2002; c, 1998 and 2002.  
Source: Cebu Longitudinal Health and Nutrition Survey, 1994, 1998, 2002.

**C. Russia**

Age group (years)	Food group	Meals and snacks			Meals			Snacks		
		1994	1998	2003	1994	1998	2003	1994	1998	2003
2 to 5.9	Fast food	0.1		0.0			0.0			0.3
	Soft drinks	0.2		0.4			0.3			0.0
	Traditional snacks	23.6 <sup>a</sup>		18.6 <sup>a</sup>			17.9 <sup>a</sup>			21.6
	Candies and desserts	6.1		7.0			5.1			15.2
	Modern snacks	1.2		1.2			1.0			2.3
	Fruits, fruit juices, and vegetables	10.3		11.4			9.8 <sup>a</sup>			17.8
	Meat, fish, poultry	13.3		15.1			17.2			6.4
	Milk and milk products (except ice cream)	8.0		7.4			6.9 <sup>a</sup>			9.5
	Other	37.3		38.8			41.8			26.1
	Total	100.0		100.0			100.0			100.0
	Total energy	1427.2		1438.3			1162.2 <sup>a</sup>			276.1
	Fast food	0.3		0.5			0.2			1.9
	Soft drinks	0.2		0.4			0.3			1.0
	Traditional snacks	26.9		24.8			24.0 <sup>a</sup>			28.4
6 to 10.9	Candies and desserts	5.5		6.5			4.9			14.1
	Modern snacks	1.0		1.7			1.3			3.7
	Fruits, fruit juices, and vegetables	8.4		9.0			7.5 <sup>a</sup>			16.1
	Meat, fish, poultry	17.7		18.2			20.1			9.7
	Milk and milk products (except ice cream)	5.2		5.8			5.8			5.9
	Other	34.6		33.1			36.1 <sup>a</sup>			19.3
	Total	100.0		100.0			100.0			100.0
	Total energy	1651.4		1728.7			1423.8 <sup>a</sup>			304.9

11 to 18.9	Fast food	0.2	0.1	0.1	0.2
	Soft drinks	0.2 <sup>a</sup>	0.6 <sup>a</sup>	0.4	1.2
	Traditional snacks	29.6	28.8	27.7 <sup>a</sup>	34.9
	Candies and desserts	3.5	4.0	2.9	10.0
	Modern snacks	0.8	1.3	0.9	3.6
	Fruits, fruit juices, and vegetables	6.4	7.0	6.2	12.0
	Meat, fish, poultry	19.3	20.3	21.8	11.8
	Milk and milk products (except ice cream)	5.3	4.4	4.4 <sup>a</sup>	4.3
	Other	34.7	33.5	35.5 <sup>a</sup>	21.9
	Total	100.0	100.0	100.0	100.0
	Total energy	1982.9	1970.2	1672.4 <sup>a</sup>	297.8
2 to 18.9	Fast food	0.2	0.2	0.1	0.7
	Soft drinks	0.2 <sup>a</sup>	0.5 <sup>a</sup>	0.4	1.1
	Traditional snacks	27.8	26.3	25.5 <sup>a</sup>	30.9
	Candies and desserts	4.5	5.1	3.7 <sup>a</sup>	12.0
	Modern snacks	0.9	1.4	1.0	3.4
	Fruits, fruit juices, and vegetables	7.7	8.2	7.0 <sup>a</sup>	14.1
	Meat, fish, poultry	17.8	19.1	20.8	10.4
	Milk and milk products (except ice cream)	5.7	5.2	5.1 <sup>a</sup>	5.6
	Other	35.1	34.1	36.5 <sup>a</sup>	21.8
	Total	100.0	100.0	100.0	100.0
	Total energy	1758.6	1811.1	1515.1 <sup>a</sup>	296.0

$p \leq 0.01$ .

Superscript letters represent significance: a, 1994 and 2003.

Source: Russia Longitudinal Monitoring Survey, 1994 and 2003.

#### D. China

Age group (years)	Food groups	Meals and snacks		Meals		Snacks	
		1991	2000	1991	2000	1991	2000
2 to 5.9	Fast food	0.0	0.0	0.0	0.0	0.0	0.0
	Soft drinks	0.0	0.0	0.0	0.0	0.5	0.0
	Traditional snacks	0.9	0.7	0.7	0.7	5.6	2.5
	Candies and desserts	1.6	1.5	1.1	1.3	16.7	9.4
	Modern snacks	0.0	0.0	0.0	0.0	0.0	0.0
	Fruits, fruit juices, and vegetables	3.3	3.5	2.6	3.2	22.7 <sup>a</sup>	12.5 <sup>a</sup>
	Meat, fish, poultry	10.6	15.2	10.9	15.0	2.4	23.8
	Milk and milk products (except ice cream)	0.8	1.4	0.6	1.3	6.4	5.2
	Other	82.8 <sup>a</sup>	77.6 <sup>a</sup>	84.2 <sup>a</sup>	78.5 <sup>a</sup>	45.7	46.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	Total energy	1163.9 <sup>a</sup>	996.2 <sup>a</sup>	1122.2 <sup>a</sup>	969.1 <sup>a</sup>	41.7	27.1



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6 to 10.9	Fast food	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Soft drinks	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.3	2.6	0.0	0.0
	Traditional snacks	0.6	0.9	0.5	0.8	4.1	11.3	0.0	4.1	11.3	0.0	0.0
	Candies and desserts	0.5	0.8	0.3	0.6	15.8	18.6	0.0	15.8	18.6	0.0	0.0
	Modern snacks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fruits, fruit juices, and vegetables	3.0	3.5	2.6	3.3	28.7	20.8	0.0	28.7	20.8	0.0	0.0
	Meat, fish, poultry	9.1	13.3	9.2	13.4	1.6	2.2	0.0	1.6	2.2	0.0	0.0
	Milk and milk products (except ice cream)	0.1 <sup>a</sup>	0.8 <sup>a</sup>	0.1	0.7	0.5	6.6	0.0	0.5	6.6	0.0	0.0
	Other	86.7 <sup>a</sup>	80.6 <sup>a</sup>	87.2 <sup>a</sup>	81.1 <sup>a</sup>	47.9	38.0	0.0	47.9	38.0	0.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	0.0	0.0
	Total energy	1627.7 <sup>a</sup>	1434.8 <sup>a</sup>	1605.2 <sup>a</sup>	1417.9 <sup>a</sup>	22.5	16.9	0.0	22.5	16.9	0.0	0.0
11 to 18.9	Fast food	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Soft drinks	0.0	0.0	0.0	0.0	0.1	0.9	0.0	0.1	0.9	0.0	0.0
	Traditional snacks	0.7	0.9	0.7	0.9	6.2	2.6	0.0	6.2	2.6	0.0	0.0
	Candies and desserts	0.3	0.3	0.2	0.3	13.0	2.0	0.0	13.0	2.0	0.0	0.0
	Modern snacks	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fruits, fruit juices, and vegetables	2.6	3.5	2.4	3.4	25.3	14.8	0.0	25.3	14.8	0.0	0.0
	Meat, fish, poultry	8.1 <sup>a</sup>	12.9 <sup>a</sup>	8.1 <sup>a</sup>	13.0 <sup>a</sup>	2.9	1.4	0.0	2.9	1.4	0.0	0.0
	Milk and milk products (except ice cream)	0.1	0.3	0.1	0.2	0.8	5.4	0.0	0.8	5.4	0.0	0.0
	Other	88.2 <sup>a</sup>	81.9 <sup>a</sup>	88.5 <sup>a</sup>	82.0 <sup>a</sup>	51.8	72.8	0.0	51.8	72.8	0.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	0.0	0.0
	Total energy	2117.8 <sup>a</sup>	1810.0 <sup>a</sup>	2104.0 <sup>a</sup>	1791.0 <sup>a</sup>	13.8	18.9	0.0	13.8	18.9	0.0	0.0
2 to 18.9	Fast food	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Soft drinks	0.0	0.0	0.0	0.0	0.6	1.1	0.0	0.6	1.1	0.0	0.0
	Traditional snacks	0.7	0.9	0.6	0.9	5.3	4.5	0.0	5.3	4.5	0.0	0.0
	Candies and desserts	0.6	0.5	0.4	0.4	15.4	7.2	0.0	15.4	7.2	0.0	0.0
	Modern snacks	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fruits, fruit juices, and vegetables	7.8	3.5	2.5 <sup>a</sup>	3.4 <sup>a</sup>	25.0	15.6	0.0	25.0	15.6	0.0	0.0
	Meat, fish, poultry	8.8 <sup>a</sup>	13.2 <sup>a</sup>	8.9 <sup>a</sup>	13.3 <sup>a</sup>	2.3	6.2	0.0	2.3	6.2	0.0	0.0
	Milk and milk products (except ice cream)	0.2	0.5	0.2	0.4	3.3	5.6	0.0	3.3	5.6	0.0	0.0
	Other	86.9 <sup>a</sup>	81.2 <sup>a</sup>	87.4 <sup>a</sup>	81.5 <sup>a</sup>	47.9	59.7	0.0	47.9	59.7	0.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	0.0	0.0
	Total energy	1731.0 <sup>a</sup>	1592.4 <sup>a</sup>	1707.5 <sup>a</sup>	1572.8 <sup>a</sup>	23.5	19.6	0.0	23.5	19.6	0.0	0.0

$p \leq 0.01$ .

Superscript letters represent significance: a, 1991 and 2000.

Source: The China Health and Nutrition Survey, 1991 and 2000.

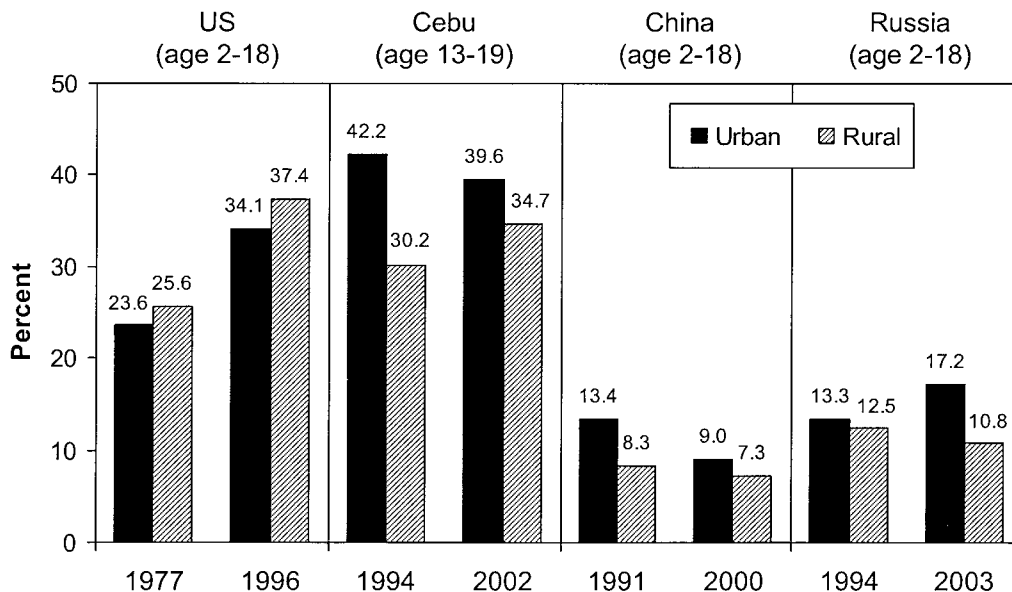


Figure 1: The proportion of total daily energy from foods consumed and/or prepared away from home by urban-rural residence.

and this may account for the low overall fast food consumption and the small urban-rural differences we observed.

**Away from Home Food Consumption**

The most noticeable difference across the countries is in away from home food intake. U.S. and Cebu youth consume more than one-third of their total daily calories from foods prepared away from home. In the United States, away from home sources contribute similarly to meal and snack calo-

ries, whereas in Cebu, most snack calories (in the range of 80% to 90%) are from away from home sources. U.S. and Cebu snack foods are typically processed or fast food (United States), bakery products (Cebu), or soft drinks (United States and Cebu). In addition, more meals are purchased away from home and either eaten away (in restaurants or fast food establishments in the United States) or brought home from small cafeterias and street vendors (Cebu). In the United States, this trend has been attributed to

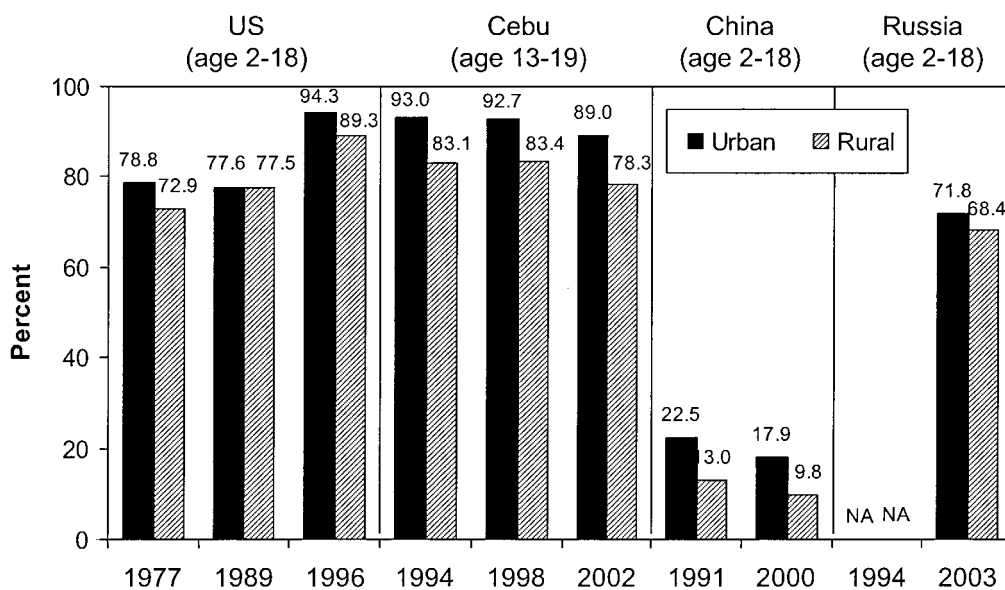


Figure 2: The percentage of participants who reported consuming any food item as a snack by urban-rural residence.

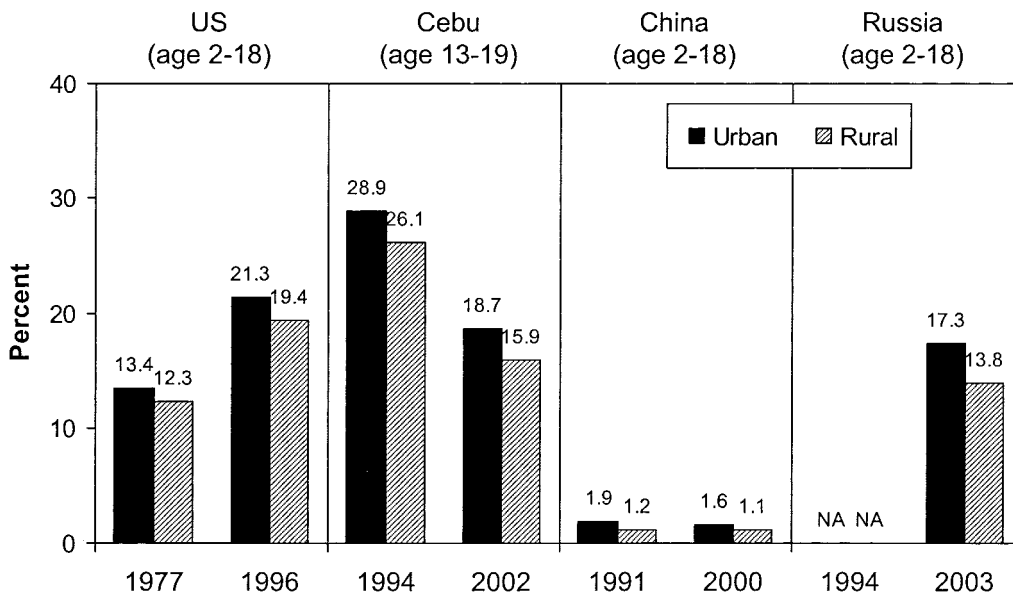


Figure 3: Trends in snacking behavior. Percentage of total daily energy consumed from snacks by urban-rural residence.

a wide range of factors, including reduced food prices, innovations that have reduced non-market household food preparation time, increased access to the fast food and restaurant sector, and unemployment (37–40). In Cebu, small eateries are ubiquitous and for a long time have provided an inexpensive and convenient alternative to home food preparation.

In contrast, Chinese children consume very little of their total energy from foods prepared or eaten away from home, although more snack foods are purchased away from home. Chinese snack foods are typically a biscuit, some peanuts, or fruit. Eating in restaurants is rare in Chinese families, and there is not a tradition of purchasing inexpensive foods from street vendors as is the case in Cebu. Similarly, in Russia,

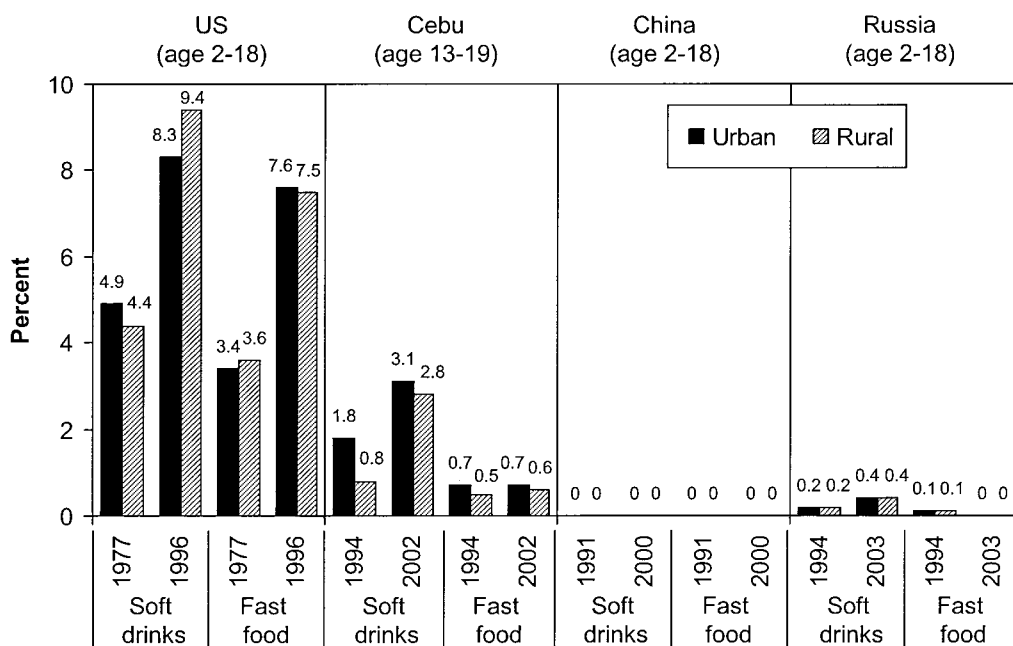


Figure 4: The percentage of total daily energy derived from modern fast foods (pizza, hamburgers, Mexican foods such as tacos) and soft drinks or fruit drinks by urban-rural residence.

there is not yet a tradition of bringing ready-prepared foods into the home nor is there a prevalent practice of taking children to restaurants to eat.

### **Snacking**

Snacking is common in the United States, Cebu, and Russia, but few Chinese youth reported consuming snacks. The contribution of snacks to total energy intake varies substantially across the four settings, because the percentage of total calories derived from snacks for the entire sample reflects differences in both the number of snack consumers and the amount consumed among snackers. Thus, for China, the low prevalence of snacking translates into only a trivial contribution of snacks to total energy intake in the population of youth. The United States and Cebu are characterized by a high level of snacking, with the vast majority of youth consuming at least one food as a snack on a daily basis. Snacking in these settings contributes about one-fifth of total daily energy. Snacking can be an important way to meet the energy and nutrient needs of growing children, or it can lead to excess energy intake. For example, whereas Cebu snackers had higher total energy intakes, in many cases, these still fell below the current recommended daily intake. In contrast, there is evidence from the United States that snack calories contribute to intakes in excess of needs and may contribute to obesity (13,41–44).

### **Types of Foods Consumed**

Fast food plays a much more dominant role in the American diet. U.S. youth consume close to one-fifth of all their calories from sweetened beverages and fast food, whereas youth in other countries consume 2% to 7% of their calories from such food items. Nonetheless, as we have shown elsewhere, the sweetening of diets reflected in total caloric sweeteners consumed is a worldwide trend (10). Salty snacks are increasingly important in the United States and Russia, whereas soft drinks are increasingly consumed as snacks by Cebu youth.

The low overall intake of modern fast foods in Russia and parts of Asia may be partly accounted for by the relative cost of these foods. The Cebu and China samples comprise both urban and rural residents, many of whom live in quite low-income households. Fast food remains relative expensive, particularly in comparison with local home-based eateries and street vendors and when fuel and time costs are taken into account. For example, in Cebu, a fast food meal of a small burger, french fries, and a soft drink costs about \$0.90, whereas a traditional meal of rice and a mixed meat and vegetable dish purchased at a local eatery would cost much less. In China, a burger, fries, and soft drink would cost about \$4.00 (30 Chinese Yuan), which is about four times the cost of an equivalent traditional meal of rice and

a mixed meat and vegetable dish. Availability is also a factor, with modern fast food options found primarily in the most urbanized areas.

### **Urban–Rural Residence**

As expected, urban residents engage more in the modern eating behaviors as they consume more food away from home, snack more often, and consume more fast foods and soft drinks. The trends are mixed, and if anything, for away from home behavior, there is a narrowing of the urban–rural difference, and in many cases, there is no clear trend.

### **Health Implications**

There is certainly growing evidence of the increase in child obesity across the world (22), and some scholars have shown how components of these dietary trends are part of the child obesity epidemic (17,23,41,44).

A recent emphasis by the World Health Organization on diet, activity, and obesity has highlighted the influence of modern food processing and production and marketing in changing worldwide diets (45,46). Among the World Health Organization recommendations to governments were: 1) discourage advertising of unhealthy dietary practices and physical inactivity and 2) work with consumer groups and the private sector to deal with marketing of food to children, sponsorship, and advertising.

The results of this study do not invalidate this effort. First, we do not provide evidence here on the penetration of modern marketing and advertising into all of these countries. Second, we do not focus on modern urban areas such as Moscow and Shanghai, where the penetration of modern marketing techniques and fast food concerns is faster. Our analysis has focused on population level trends rather than trends within subgroups that might be at greater risk (e.g., higher income, more urban households). Our results for China and Russia show, as yet, a minimum invasion of fast foods and soft drinks on a countrywide level. Even in Cebu, where there is an obvious proliferation of fast food establishments, there is relatively little consumption of fast food items (aside from soft drinks) by Cebu youth in our sample. To provide further context for our results, it is important to note that the prevalence of overweight, using the definition of the International Obesity Task Force (20) for children or a BMI  $>25$  kg/m<sup>2</sup> for those 18 to 18.9 years of age, is relatively low in our samples compared with the United States. For example, the prevalence of overweight and obesity was 11.2% in Chinese children 6 to 11 years of age and 5.5% among youth ages 12 to 18 years (China Health and Nutrition Survey 2000 data); 9.7% in Russian children 7 to 13 years of age (47); and 5.4% in Cebu 18-year-old youth (CLHNS2002).

What this study shows is that programs and policies to encourage healthy eating will need to vary greatly in terms of focus as we attempt to shift diets toward healthier ones

worldwide and to combat what has become a universal shift toward greater child obesity. Further research should address regional and socioeconomic differences in the trends we report here as well as the specific relationship of these trends to child health outcomes.

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