



Snacking Is Prevalent in Mexico^{1–3}

Kiyah J. Duffey,^{4,6} Juan A. Rivera,⁷ and Barry M. Popkin^{4,5*}

⁴Department of Nutrition and ⁵Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill, NC; ⁶Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, VA; and ⁷Nutrition and Health Research Center, National Institute of Public Health, Cuernavaca, Mexico

Abstract

Background: Snacking has increased globally, but little is known about how Mexicans consume foods outside meals.

Objective: The aim was to examine the prevalence and patterns of snacking behavior among Mexicans.

Methods: We used data from children and adults (aged ≥ 2 y; $n = 9937$) from the Mexican National Nutrition Survey (MNNS) 1999 and the Mexican National Health and Nutrition Survey (NHNS) 2012 to examine the prevalence of snacking as well as amount (kcal) and contribution of snacks to total energy intake per day. Snacking was defined as eating outside of the 3 main meals. We calculated per capita (among the total population) and per consumer ("snackers") estimates of the number of snacks per day, kilocalories per snack, kilocalories per day from snacks, and the percentage of energy from snacks. Top foods consumed during snack occasions were also examined for the NHNS 2012. All results were weighted to account for survey design and to be nationally representative.

Results: In 2012, an estimated 73% of the population consumed snacks on a given day, with estimates ranging from 70% among ≥ 59 y olds to 77% among 2–11 y olds. An average of 1.6 snacks/d were consumed by the population. This value was slightly higher (2.1 snacks/d) among snackers. Snacks provided an average of 343 kcal/d per snacker (17% of total energy/d). Fruit was the most commonly consumed snack food by all ages except for 12–18 y olds. Salty snacks, sweet snacks, sugar-sweetened beverages, and milk were frequently in the top 5 categories across age groups. Differences were observed between age groups.

Conclusions: Snacking is prevalent in the Mexican population. Many, but not all, of the foods consumed during snack occasions are foods considered "foods to limit" in the United States. J. Nutr. doi: 10.3945/jn.114.198192.

Introduction

Mexico has witnessed a dramatic increase in the prevalence of overweight and obesity over the past 2 decades (1), with the rate of change in obesity prevalence being the highest documented globally (2,3). Along with increases in overweight have been considerable increases in the prevalence of nutrition-related noncommunicable diseases (4,5), such as diabetes mellitus, which now represent major health concerns facing the Mexican population. These changes led to major initiatives by the Mexican government to reduce obesity (6), including the passage of an 8% junk food tax and a 10% sugar-sweetened beverage (SSB)⁸ tax in January 2014.

Although numerous factors likely play a role in the development of nutrition-related noncommunicable diseases, energy imbalance resulting from shifts in the amount and/or sources of food intake is

important. Recent evidence demonstrated increases in the percentage of energy coming from SSBs and energy-containing beverages (7,8) that were shown in meta-analyses generally (9–12) and in the Mexican population specifically (13) to be positively associated with higher weight, greater weight gain, obesity, and diabetes.

Evidence suggests that snacking is increasing globally (14–18), especially among children, and among those at the highest amounts of reported intake (i.e., top consumers) (16). In the United States, children and adults consumed an average of 3 snacks/d in 2003–2006 (15,16). Increasingly, these snacking events comprised beverages only, although food-only snacking occasions also increased over time (16). The extent to which snacking occurs within the Mexican population, and the contribution of various foods and beverages to these snacking occasions, is understudied. This is particularly important because the recent junk food tax focuses on many foods considered to be snack foods such as salty snacks. The goal of this article is to describe snacking frequency, the contribution of snacks to total energy intake, and the foods and beverages most commonly consumed at these snacking events among Mexicans aged ≥ 2 y.

Methods

Sample. Data were drawn from the Mexican National Health and Nutrition Survey (NHNS) 2012. For trends data only, we also examined

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³ Supplemental Tables 1 and 2 are available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at <http://jn.nutrition.org>.

⁸ Abbreviations used: MNNS, Mexican National Nutrition Survey; NHNS, Mexican National Health and Nutrition Survey; SSB, sugar-sweetened beverage.

* To whom correspondence should be addressed. E-mail: popkin@unc.edu.

data collected from the Mexican National Nutrition Survey (MNNS) 1999 (19). Both surveys were cross-sectional, multistage, stratified, and cluster-sampled representative surveys conducted by Mexico's Instituto Nacional de Salud Pública (National Institute of Public Health). The design and methods were described elsewhere (20,21). The MNNS1999 surveyed 21,503 Mexican households, with a household response rate of 82.3%. Because of budget restrictions, it only collected information on preschoolers (1–4 y), school-aged children (5–11 y), and women of childbearing age (12–49 y) (19,22). We analyzed data from 9937 individuals with complete data. Briefly, the NHNS 2012 was conducted between October 2011 and May 2012 and surveyed 50,528 households with a household response rate of 87% (20,21). Dietary intake data were collected on a random subsample of individuals of all ages ($n = 9937$). Each region's data were collected in the same month of the year for both surveys. Data collection was approved by Mexico's National Institute of Public Health Internal Review Board, and all participants gave informed consent.

Dietary data. In each survey, dietary intake was collected by trained interviewers with the use of a single 24-h recall on a stratified sample of the population. The methodology in 1999 was a traditional printed questionnaire with probes similar to the multipass system noted below but handled verbally by trained dietitians, whereas in 2012 an automated 5-step multiple-pass method (called AMPM plus) was used (19,20). Briefly, the AMPM plus approach obtained information about food characteristics reported by participants—for example, if the food was raw or processed, packaged/bottled or not, or frozen or not—as well as detailing information about the place of consumption and other activities during the meal (e.g., watching television). Interviews were conducted to collect information on both weekdays and weekend days. Participants were asked about foods and beverages consumed over the previous 24 h as well as the amount consumed. Foods (e.g., apple, yogurt) were recorded as consumed, whereas mixed dishes (e.g., beef tacos) were recorded as 1 item (tortillas, fried rice without vegetables and stew) and then disaggregated by using either a disaggregated preparation (i.e., a recipe was used to assign nutritional information when the food was made at the home) or a standard preparation (when the food was consumed outside the home and the specific proportion of ingredients was partially or totally unknown). Information on foods obtained outside the home was also collected, although the major difference between the 2 surveys was less detailed probing of away-from-home intake in 1999. Participants were specifically asked to report food and beverages consumed between principal meals both inside and outside the home. Interviewers were provided with numerous resources to aid in data collection, including a manual with photos of the most commonly consumed foods, a food scale, and measuring cups and serving spoons of various sizes. Interviewers were trained in techniques to assist participants in the estimation of portion sizes and to avoid omission. The primary meal planner was asked to report intake for children <12 y of age.

Some slight differences exist between the MNNS1999 and NHNS 2012. First, the MNNS 1999 used fewer additional probes for away-from-home eating. Second, when dishes were prepared at home, detailed information about the recipe was collected in both surveys but the ingredients only were captured in MNNS 1999, whereas the ingredients and dish names were captured in NHNS 2012. For example, interviewers collected data about the dish name (e.g., a taco) for the MNNS 1999 data but the name was not coded; rather, only the ingredients (e.g., beef, onion, tortillas) were coded. In contrast, both dish names and ingredients were coded in NHNS 2012. As such, we could not examine trends in the specific foods consumed at snacks between these 2 time points, although we can track changes in energy intake.

Snacking. Snacking was self-reported by respondents as any food consumed outside the 3 main meals (breakfast, lunch, dinner). The times of the snack occasions were predefined as follows: before breakfast, midmorning snack, midafternoon snack, and before going to sleep (late night). Per the questionnaire design and because of experience with other diet surveys conducted by the Instituto Nacional de Salud Pública research team, up to 4 snacks were recorded during midmorning and midafternoon snack periods but only 1 was recorded “before breakfast”

and at the “late night” snacking occasion. Specifically, respondents were asked “Mrs./Mr./young man/woman [NAME OF THE RESPONDENT]: Now tell me, in which mealtime did you eat each food or dish [MENTION THE FOOD AND DISH LIST]?” If the interviewer identified that the respondent did not understand the question, the interviewer could give examples.

The food groups used in this study are listed in **Supplemental Table 1**. They are based on U.S. food groupings (23) with additions made by our Mexican collaborators to reflect food and beverage groupings relevant to Mexican eating patterns. The most commonly consumed food or beverage consumed at 1 of the predefined snacking occasions (those that fell outside 1 of the 3 main meals) was water (**Supplemental Table 2**). For the purposes of this study, plain water was not considered a snack, particularly because it is essential for human health (24–26) and individuals should freely consume water inside and outside of meals and snacks in healthy populations.

Population characteristics. Several characteristics of the Mexican population were described. The following 4 regions shown in **Table 1** have common geographic and socioeconomic characteristics: 1) north (Baja California, Baja California Sur, Coahuila, Chihuahua, Durango, Nuevo León, Sonora, Tamaulipas), 2) center (Aguascalientes, Colima, Estado de México, Guanajuato, Jalisco, Michoacán, Morelos, Nayarit, Querétaro, San Luis Potosí, Sinaloa, Zacatecas), 3) Mexico City, and 4) south (Campeche, Chiapas, Guerrero, Hidalgo, Oaxaca, Puebla, Quintana Roo, Tabasco, Tlaxcala, Veracruz, Yucatán).

Education was also classified into 4 groups, including less than primary school, completed primary school (included normal and technical middle school), completed high school (included normal and technical high school), and more than high school. For children aged

TABLE 1 Estimated distributions of demographic characteristics: Mexico, 2012¹

Characteristics	Sample size	Percentage
	<i>n</i>	
Gender		
Female	5212	52.3 ± 0.92
Male	4725	47.7 ± 0.92
Age		
2–5 y	2071	8.4 ± 0.30
6–11 y	2025	11.8 ± 0.41
12–18 y	2325	17.0 ± 0.48
19–39 y	1508	29.5 ± 0.90
40–59 y	983	21.9 ± 0.87
≥60 y	1025	11.3 ± 0.54
Geographical area		
Rural	3732	27.2 ± 0.69
Urban	6205	72.8 ± 0.69
Region		
North	2366	19.7 ± 0.57
Central	3628	30.3 ± 0.72
Mexico City	481	18.4 ± 0.93
South	3462	31.6 ± 0.74
Education ²		
Less than primary school	832	8.1 ± 0.45
Completed primary school ³	6942	66.1 ± 0.86
Completed high school ⁴	1168	13.9 ± 0.65
More than high school	659	9.4 ± 0.61

¹ Values are mean percentages ± SEs unless otherwise indicated. Data are from the Mexican National Health and Nutrition Survey, 2012.

² The highest level of education completed for children <18 y of age is reported for the head of household (either mother or father).

³ Includes normal and technical middle school.

⁴ Includes normal and technical high school.

≤18 y, this item referred to their head of household's (either mother or father) highest level of education completed.

Statistical analysis. All analyses were conducted in Stata version 13 and were weighted to be nationally representative and to account for the complex survey design. Five age groups were created including the following: 2–5, 6–11, 12–18, 19–39, 40–59, and ≥60 y. Analyses on snacking were conducted for the full population and within age groups.

We created several per day and per snack measures to examine snacking behavior within each age group. Per day values included the following: the average number of snacks (/d), the average energy from snacks (kcal/d from snacks), and the percentage of energy contributed by snacks (% of total energy/d from snacks). We also calculated energy per snack (kcal/snack). These values were estimated for the entire population (per capita) and for those who consumed at least 1 snack on a given day (referred to as “snackers”). The percentage of the population who consumed at least 1 snack during the specified times of day (e.g., midmorning) was also estimated. We also ranked food and beverage categories according to their frequency of consumption at snack occasions and estimated the contributions of the top 5 food and beverage categories to total energy intake. Values are presented as means, or percentages, and SEs.

Results

The Mexican population studied consisted of a higher proportion of women between the ages of 19 and 39 y living in urban areas (Table 1). Approximately 66 ± 0.9% of Mexican adults completed primary school, with 9% having completed more than a high school education. Approximately 30 ± 0.7% and 32 ± 0.7% of the population were from the central and south regions of Mexico, respectively (Table 1).

An estimated 73% of the population consumed snacks across all snacking occasions. Per capita (including nonconsumers), there was an average of 1.6 snacks/d at 130 kcal/snack (Table 2). In total, snacks provided an average of 250 kcal/d, accounting for 12% of total energy/d. Among snackers, an average of 2.1 snacks/d was consumed, accounting for just over 16% of total energy/d. Among snackers, snacks provided almost 100 kcal/d more energy compared with the energy intake of the total population (Table 2).

Differences in snacking behavior existed by age group (Table 2). Adults aged 40–59 y had the lowest percentage of snackers (67%), whereas 2- to 5-y-old children had the highest percentage

(79%; Table 2). Children aged 2–5 y old also consumed the highest percentage of daily energy from snacks (19.5% per capita and 24.5% per snacker), but the average calories per day and calories per snacking occasion was higher among 12- to 18-y-olds (Table 2). The range in the number of snacks among those who reported snacking was small across age groups [range: 1.9 (for ≥60 y olds) to 2.5 (for 2–5 y olds)]; however, there was a 100-kcal/snack difference in the average snacking occasion and a nearly 200-kcal/d difference in the number of calories from snacks between those aged 12–18 y old and ≥ 60 y old (Table 2). Taken together, children aged 2–5 y had the largest percentage of snackers and consumed the largest number of snacks per day, which accounted for the greatest percentage of total energy per day, but 12- to 18-y-old snackers consumed more energy per snack and more energy per day from snacks than any other age group.

Across all age groups the most popular snacking times were midmorning and midafternoon (Table 3). Among children (2–11 y), adolescents (12–18 y), and older adults (≥60 y), the percentage reporting at least 1 midafternoon snack was higher than the percentage reporting at least 1 midmorning snack. Across all age groups, and in the total population, the lowest percentage of individuals reported consuming before-breakfast snacks (Table 3). Between 14% and 20% of individuals across age groups reported consuming a late-night snack. In all age groups, the midafternoon snacks also provided the most calories per snack (Table 3).

There was homogeneity in the top foods/beverages reported as consumed during snacking occasions: a total of 10 food and beverage categories made up all top-ranked foods and beverages reported as snacks and 4 food and beverage categories (salty snacks, sweet snacks, soda, and fruit) appeared in the top 5 for all age groups (Table 4). Fruit was the most commonly consumed food category at a snack occasion for all age groups except for those aged 6–11 and 12–18 y (where it was ranked second after salty snacks; Table 4). At least 1 beverage appeared in the top 5 snack foods for all age groups, including fluid milk, soda, and coffee and tea. Older Mexicans consumed a wider variety of foods during snack events than did younger children. For example, ~39% of individuals ≥60 y old reported consuming 1 of the top 3 foods, whereas 74% of children aged 2–5 y consumed 1 of the top 3 foods reported at a snacking occasion (Table 4).

TABLE 2 Estimated number of snacking events and energy from snacks per capita and per consumer by age group: Mexico, 2012¹

	All ages	Age group					
		2–5 y	6–11 y	12–18 y	19–39 y	40–59 y	≥60 y
Sample size, <i>n</i>	9937	2071	2418	1932	1508	983	1025
Per capita							
Snack frequency, <i>number/d</i>	1.6 ± 0.03	2.0 ± 0.06	1.5 ± 0.04	1.6 ± 0.05	1.6 ± 0.05	1.4 ± 0.06	1.3 ± 0.06
Snack energy, <i>kcal</i>	130 ± 3.9	136 ± 5.9	167 ± 8.5	161 ± 8.6	136 ± 8.9	102 ± 9.6	82 ± 6.9
Energy from snacks, <i>kcal/d</i>	250 ± 7.3	301 ± 11.4	316 ± 14.5	319 ± 19.4	251 ± 15.9	191 ± 17.1	142 ± 12.1
Energy from snacks, % of total energy intake	12.2 ± 0.29	19.5 ± 0.70	14.6 ± 0.49	13.8 ± 0.73	10.5 ± 0.61	8.6 ± 0.72	7.9 ± 0.69
Snack consumers, %	72.7 ± 0.84	79.4 ± 1.35	75.6 ± 1.37	73.2 ± 1.47	74.5 ± 1.66	66.5 ± 2.18	69.7 ± 2.23
Per consumer							
Snack frequency, <i>number/d</i>	2.1 ± 0.03	2.5 ± 0.05	2.0 ± 0.04	2.1 ± 0.05	2.1 ± 0.05	2.1 ± 0.07	1.9 ± 0.06
Snack energy, <i>kcal</i>	178 ± 5.0	172 ± 7.0	221 ± 10.1	220 ± 11.2	183 ± 11.2	154 ± 13.7	121 ± 9.6
Energy from snacks, <i>kcal/d</i>	343 ± 9.1	378 ± 12.8	415 ± 16.9	435 ± 24.7	336 ± 20.0	287 ± 23.8	207 ± 16.2
Energy from snacks, % of total energy intake	16.7 ± 0.34	24.5 ± 0.76	19.2 ± 0.53	18.8 ± 0.89	14.1 ± 0.75	12.9 ± 0.94	11.6 ± 0.94

¹ Values are means ± SEs for the number of snacks per day (snack frequency), the energy value of each snack (snack energy), and the energy contribution of snacks (energy from snacks) expressed in kilocalories and as a percentage of total energy intake for the total population (per capita) and for those consuming at least 1 snack on a given day (per consumer). Data are from the Mexican National Health and Nutrition Survey, 2012.

TABLE 3 Estimated percentages of individuals consuming snacks at specified times of day, mean number of snacks consumed at these times, and mean energy content of each snack for those consuming at least 1 snack on a given day, by age group: Mexico, 2012¹

	Sample size	Snack occasions			
		Before breakfast	Midmorning	Midafternoon	Late night
	<i>n</i>				
All ages	9937				
Snack consumers, %		13.6 ± 0.69	59.7 ± 1.58	64.8 ± 1.37	16.9 ± 0.61
Snack frequency, <i>number/d</i>		0.19 ± 0.009	0.82 ± 0.019	0.89 ± 0.016	0.23 ± 0.008
Energy from snacks, <i>kcal</i>		32 ± 3.6	88 ± 3.8	119 ± 4.4	41 ± 3.8
Age group					
2–5 y	2071				
Snack consumers, %		16.3 ± 1.18	70.8 ± 2.94	88.3 ± 3.03	20.6 ± 1.39
Snack frequency, <i>number/d</i>		0.20 ± 0.014	0.89 ± 0.033	1.11 ± 0.033	0.26 ± 0.017
Energy from snacks, <i>kcal</i>		42 ± 4.5	96 ± 6.8	121 ± 5.6	36 ± 3.7
6–11 y	2418				
Snack consumers, %		8.3 ± 0.83	60.1 ± 2.09	72.7 ± 2.24	13.9 ± 1.02
Snack frequency, <i>number/d</i>		0.11 ± 0.011	0.79 ± 0.024	0.96 ± 0.025	0.18 ± 0.013
Energy from snacks, <i>kcal</i>		25 ± 5.0	137 ± 10.0	155 ± 9.6	25 ± 2.8
12–18 y	1932				
Snack consumers, %		10.6 ± 1.11	58.4 ± 2.95	72.6 ± 3.08	15.4 ± 1.12
Snack frequency, <i>number/d</i>		0.15 ± 0.015	0.80 ± 0.036	0.99 ± 0.035	0.21 ± 0.015
Energy from snacks, <i>kcal</i>		24 ± 3.9	120 ± 11.4	162 ± 11.1	31 ± 6.3
19–39 y	1508				
Snack consumers, %		14.2 ± 1.68	62.9 ± 3.07	62.2 ± 2.83	17.9 ± 1.47
Snack frequency, <i>number/d</i>		0.19 ± 0.029	0.84 ± 0.037	0.83 ± 0.034	0.24 ± 0.019
Energy from snacks, <i>kcal</i>		40 ± 10.5	76 ± 7.4	105 ± 9.0	55 ± 8.5
40–59 y	983				
Snack consumers, %		14.8 ± 1.58	55.3 ± 4.20	52.3 ± 3.28	16.1 ± 1.47
Snack frequency, <i>number/d</i>		0.22 ± 0.023	0.83 ± 0.054	0.79 ± 0.044	0.24 ± 0.021
Energy from snacks, <i>kcal</i>		25 ± 5.1	68 ± 10.7	105 ± 13.7	45 ± 13.1
≥60 y	1025				
Snack consumers, %		14.1 ± 2.22	48.2 ± 4.09	50.4 ± 3.26	16.2 ± 1.85
Snack frequency, <i>number/d</i>		0.21 ± 0.031	0.71 ± 0.054	0.74 ± 0.044	0.24 ± 0.026
Energy from snacks, <i>kcal</i>		23 ± 4.9	45 ± 6.1	88 ± 10.3	26 ± 5.8

¹ Values are means ± SEs for the percentage of people consuming a snack at the given time period (e.g., midmorning), the number of snacks consumed during each time period, and the energy from snacks during that time period. Predetermined and self-reported eating occasions are defined as follows: before breakfast, breakfast, lunch, midmorning snack, dinner, midafternoon snack, and before going to sleep (late night). Up to 4 snacks were recorded during midmorning and midafternoon snack periods, but only 1 was recorded before breakfast and during the late night snack occasion. Data are from the Mexican National Health and Nutrition Survey, 2012.

We present the trend in snacking behavior between 1999 and 2012 for the age subgroups studied in MNNS 1999 (Table 5). Among all age and gender groupings we saw the same increase of ~1 snack/d in the overall population. We also found a considerable increase in the proportion consuming snacks (percentage consuming) across all age groups, an increase of ~30%. Among those who snacked on any given day, the calories per day from snacks increased among children aged 2–5 y and in women aged 30–39 and 40–49 y, but decreased among children aged 6–11 y and adolescents and young adults (ages 12–18 and 19–29 y). These changes translated to declines in the percentage of total energy per day from snack occasions in all age groups except for the youngest children (aged 2–5 y; Table 5).

Discussion

To date, the prevalence of snacking had not been characterized in the Mexican population. By using nationally representative dietary data for children and adults, we show that snacking is quite prevalent among all age groups, with an average 73% of the population consuming an average of 1.6 snacks/d. Among

those who reported consuming snacks, the average number of snacks was higher at ~2 snacks/d, which accounted for almost 350 kcal/d. Furthermore, we showed that snacks were homogeneous across age groups at the category level. Specifically, 4 categories appeared in the top 5 food and beverage categories across all age groups. Last, we found that there was an increase in the proportion of snackers and number of snacks per day for children, adolescents, and women aged 19–49 y between 1999 and 2012.

A majority of the research on patterns and trends in snacking has occurred in the United States. Between 1989 and 2006, the prevalence of snacking in the United States has steadily increased, accounting for as much as 27% of total daily energy intake among children (15) and 24% of daily energy intake among adults (27). Compared with the results reported here among Mexican adults, snacking was more prevalent among U.S. adults and U.S. adults also reported considerably more energy from snacks. For example, among U.S. adults aged 19–39 y, the average energy from snacks reported in 2003–2006 was ~680 kcal/d (27). By comparison, 19- to 39-y-old Mexican adults (who reported snacking) consumed an average of 336 kcal/d

TABLE 4 Food and beverage groups most frequently consumed as snacks and the mean energy value of these snacks for the total population and for those consuming snacks on a given day, by age group: Mexico, 2012¹

Food and beverage category ²	Snack consumers	Energy from snack occasions	
		Per capita	Per consumer
	%	kcal/d	
All ages (<i>n</i> = 10,886)			
Fruit (<i>n</i> = 2353)	20.4 ± 0.68	28 ± 1.4	128 ± 5.0
Salty snacks (<i>n</i> = 1615)	11.5 ± 0.5	36 ± 2.3	292 ± 14.2
Sweet snacks (<i>n</i> = 1336)	10.4 ± 0.55	9 ± 1.1	91 ± 9.4
Soda (<i>n</i> = 787)	8.5 ± 0.61	12 ± 1.0	133 ± 7.0
Fluid milk (<i>n</i> = 1177)	6.5 ± 0.37	15 ± 1.0	224 ± 10.8
2–5 y (<i>n</i> = 2071)			
Fruit (<i>n</i> = 618)	30.1 ± 1.55	40 ± 3.6	126 ± 10.5
Fluid milk (<i>n</i> = 464)	21.3 ± 1.27	53 ± 5.1	233 ± 15.6
Sweet snacks (<i>n</i> = 375)	19.3 ± 1.39	12 ± 1.1	62 ± 4.8
Salty snacks (<i>n</i> = 371)	15.9 ± 1.28	35 ± 3.2	195 ± 11.2
Grain-based desserts ³ (<i>n</i> = 221)	9.5 ± 0.9	27 ± 3.4	257 ± 22.4
6–11 y (<i>n</i> = 2418)			
Salty snacks (<i>n</i> = 528)	22.4 ± 1.24	84 ± 9.1	340 ± 28.5
Fruit (<i>n</i> = 546)	22.3 ± 1.24	38 ± 4.7	165 ± 17.6
Sweet snacks (<i>n</i> = 407)	16.0 ± 1.16	10 ± 1.0	63 ± 4.8
Grain-based desserts ³ (<i>n</i> = 191)	6.9 ± 0.67	28 ± 4.3	403 ± 51.0
Soda (<i>n</i> = 163)	6.8 ± 0.77	6 ± 1.0	84 ± 10.4
12–18 y (<i>n</i> = 1932)			
Salty snacks (<i>n</i> = 403)	20.4 ± 1.49	78 ± 10.5	367 ± 38.5
Fruit (<i>n</i> = 298)	15.0 ± 1.19	23 ± 3.1	152 ± 17.8
Sweet snacks (<i>n</i> = 269)	14.2 ± 1.28	17 ± 3.7	119 ± 22.2
Soda (<i>n</i> = 187)	11.4 ± 1.35	16 ± 2.6	143 ± 13.8
Grain-based desserts ³ (<i>n</i> = 129)	5.9 ± 0.77	28 ± 4.8	480 ± 68.7
19–39 y (<i>n</i> = 1508)			
Fruit (<i>n</i> = 268)	19.0 ± 1.58	24 ± 2.8	124 ± 11.4
Sweet snacks (<i>n</i> = 126)	9.9 ± 1.36	10 ± 3.0	106 ± 26.4
Soda (<i>n</i> = 142)	9.5 ± 1.13	17 ± 2.6	164 ± 15.1
Salty snacks (<i>n</i> = 149)	9.3 ± 1.16	24 ± 3.1	243 ± 16.4
Coffee and tea (<i>n</i> = 104)	7.4 ± 1.06	10 ± 3.7	132 ± 42.1
40–59 y (<i>n</i> = 983)			
Fruit (<i>n</i> = 187)	18.8 ± 1.65	23 ± 3.3	111 ± 8.5
Soda (<i>n</i> = 77)	9.5 ± 1.80	13 ± 2.7	139 ± 15.0
Coffee and tea (<i>n</i> = 84)	6.5 ± 0.88	4 ± 0.6	57 ± 7.0
Sweet snacks (<i>n</i> = 50)	6.1 ± 1.17	6 ± 2.1	103 ± 29.8
Salty snacks (<i>n</i> = 48)	4.9 ± 0.98	14 ± 3.1	258 ± 38.7
≥60 y (<i>n</i> = 1025)			
Fruit (<i>n</i> = 212)	22.7 ± 2.20	29 ± 4.0	113 ± 11.4
Coffee and tea (<i>n</i> = 67)	10.2 ± 1.74	6 ± 1.2	54 ± 8.4
Soda (<i>n</i> = 53)	5.8 ± 1.52	6 ± 1.3	97 ± 13.0
Quick breads (<i>n</i> = 33)	5.4 ± 1.25	15 ± 3.6	274 ± 11.8
Milk-based beverages (<i>n</i> = 34)	4.2 ± 1.07	6 ± 1.9	152 ± 26.1

¹ Values are means ± SEs and represent the percentage of persons consuming the food or beverage group and the mean energy value of these snacks for the total population (per capita) and for those consuming at least 1 of the specified groups as a snack on a given day (per consumer). Data are from the Mexican National Health and Nutrition Survey, 2012.

² Water was the most frequently reported food and beverage group by all ages at all snack occasions. Results for water can be found in Supplemental Table 2.

³ Includes cakes, cookies, pies, pastries, and other grain-based desserts.

from snacks. Estimates of snacking in the United States are more similar to other high-income European (28–30) and Middle Eastern (31) countries than they are to Mexico.

Minimal research on snacking in low- to middle-income countries exists. One study compared snacking patterns from children (aged 2–19 y) in 4 different countries (United States, Russia, China, and the Philippines). By using 24-h recalls,

the authors found that children in the United States and the Philippines consumed ~20% of their total daily energy intake from snacks, compared to 16% in Russia and just 1% in China (14). There were important urban/rural differences, which were narrowing over time for China and the Philippines.

More current estimates of snacking in China suggest that the prevalence of snacking has increased substantially from earlier

TABLE 5 Trends in snacking among Mexican children (ages 2–11 y), adolescent girls (ages 12–18 y), and women (ages 19–49 y) by age group between 1999 and 2012¹

	Children				Women									
	2–5 y		6–11 y		Adolescent Girls (12–18 y)		19–29 y		30–39 y		40–49 y		All women	
	1999	2012	1999	2012	1999	2012	1999	2012	1999	2012	1999	2012	1999	2012
Per capita														
Snack frequency, <i>number/d</i>	0.6	2.0	0.6	1.5	0.6	1.6	0.5	1.5	0.4	1.6	0.4	1.4	0.5	1.6
Snack energy, <i>kcal</i>	98	136	149	167	200	161	97	158	58	110	60	97	114	130
Energy from snacks, <i>kcal/d</i>	137	301	220	316	288	319	123	278	73	219	70	189	158	250
Snack energy, % of total energy intake	11.6	19.5	12.9	14.6	15.7	13.8	7.5	11.6	5.0	9.3	4.5	8.6	9.4	12.2
Snack consumers, %	48.9	79.4	45.6	75.6	50.5	73.2	40.6	75.5	35.8	73.3	36.3	68.2	41.9	72.7
Per consumer														
Snack frequency, <i>number/d</i>	1.2	2.5	1.3	2.0	1.3	2.1	1.2	2.1	1.2	2.2	1.1	2.1	1.2	2.1
Snack energy, <i>kcal</i>	201	172	327	221	395	220	239	210	163	150	167	142	272	178
Energy from snacks, <i>kcal/d</i>	280	378	483	415	570	435	303	369	204	298	193	277	377	343
Snack energy, % of total energy intake	23.9	24.5	28.3	19.2	31.2	18.8	18.5	15.3	13.9	12.6	12.3	12.5	22.4	16.7

¹ Values are means for the number of snacks per day (snack frequency), the energy value of each snack (snack energy), and the energy contribution of snacks (energy from snacks) expressed in kilocalories and as a percentage of total energy intake for the total population (per capita) and for those consuming at least 1 snack on a given day (per consumer). Data are from the Mexican National Health and Nutrition Survey, 2012 and Mexican National Nutrition Survey, 1999.

estimates. For example, Wang et al. (17) reported snacking prevalence that ranged from 36% among adults aged ≥ 45 y to 59% among children aged 2–6 y (in 2009) with the use of 3 repeated 24-h recall survey data.

In Brazil, an average 74% of the population reported consuming snacks on any given day (from 24-h recall data), although the prevalence within specific age subgroups was higher in Brazil (18) than was observed among the Mexican population. For example, $\sim 75\%$ of Brazilian adults aged ≥ 60 y reported snacking, whereas $\sim 70\%$ of Mexican adults aged ≥ 59 y reported snacking. The average energy from snacks as well as the contribution of snacks to overall energy intake in the Brazilian population is more similar to those values observed in the United States than in Mexico. Among Brazilians aged ≥ 10 y, the average snack contributed between 280 and 233 kcal/d for light (1–2 snacks/d) and heavy (≥ 3 snacks/d) snackers, respectively, accounting for 22% and 36% of total energy intake among those groups (18). These values are considerably higher than those observed in the Mexican population in our present study. Even within age subgroups, snacking prevalence and contribution to total energy per day are greater in Brazil than in Mexico.

Despite differences in the prevalence of snacking, there is considerable homogeneity in the specific foods consumed during a snacking event. The largest food group contributors to snack energy among Chinese children were grains, fruit, beverages, fast foods, and animal foods, with some of the specific foods being fresh and canned fruit and high-fat cookies and cakes (17). The contribution of milk beverages and low-calorie drinks to snacking also substantially increased among Chinese children between 1991 and 2009. Similarly, among Brazilians aged ≥ 10 y, sweetened desserts, fruit, sweetened coffee and tea, SSBs, and a traditional salty food (called *salgados*) made up the top 5 snack foods. These results are similar to our present findings that sweet and salty snacks, grain-based desserts (e.g., cakes and cookies), and milk beverages were the top contributing snacks among Mexican children, with salty snacks, SSBs, and coffee and tea among the top contributors among Mexican adults.

These results are more meaningful since the Mexican government passed an 8% excise tax on “junk foods,” including sweet and salty snacks and grain-based desserts, and a 10% tax

on beverages containing added sugar except for dairy beverages. According to our findings, the new taxes comprise many of the food and beverage categories currently consumed as snacks by the Mexican population. The extent to which these excise taxes will impact snacking behaviors is yet to be determined; however, this study will serve as a baseline measure to evaluate how the tax will affect the types and amounts of foods and beverages consumed as snacks.

We acknowledge several limitations. The NHNS 2012 is an observational data set that relies on self-reported data. Dietary data are based on a single 24-h recall and might not reflect usual intake in any given individual. However, a single 24-h estimate has been shown to be an unbiased estimate of intake in an individual, and the mean of a single 24-h recall in a population can provide an estimate of the population’s usual mean intake (32). Self-reported intake, more generally, may be affected by reporting errors when completed with the use of a proxy, as is the case for dietary recall among young children. In addition, rather than self-identify foods consumed as snacks, snacking occasions were predefined for respondents as any eating occasion occurring outside the typical 3 meals/d. Furthermore, the number of snacks reported before breakfast and after the evening meal was truncated to 1, which could have affected the results reported here. However, our definition of snacking is similar to other published studies (33–37). The MNNS 1999 has the additional limitation that researchers did not probe in as much detail for away-from-home consumption, thus potentially undercounting snacking events.

In conclusion, the present study is the first in our knowledge to examine snacking behavior among a nationally representative population in Mexico. We found that snacking is prevalent among all age groups in this population, accounting for 12% and 17% of total energy/d in the population at large and among snackers, respectively. Some of the most commonly consumed food categories are quality sources of macro- and micronutrients, specifically fruit (in all age groups) and milk (among younger age groups). However, the remaining top food categories consumed at snacking occasions consisted of foods that, in the United States, have been identified as sources of empty calories (23,38–40). To the extent possible, further research should follow these behaviors

to understand trends over time and evaluate the association between these types of eating behaviors with overall health in this population. An additional important question will be to understand how the recent 8% junk food tax will affect snacking behavior more broadly and the types of foods consumed during snacking occasions more specifically.

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