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The contribution of at-home and away-from-home food to dietary intake among 2–13y Mexican children

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Abstract

Objectives—Away-from-home foods have been shown to have lower nutritional quality and larger portion sizes as compared to many foods prepared at home. The objective of this study was to describe calorie and nutrient intakes among 2–13y old Mexican children by eating location (at-home and away-from-home), overall, by socio-economic status (SES), and by urbanicity.

Design—Dietary intake was collected via one 24-hr recall in the 2012 Mexican National Health and Nutrition Survey (ENSANUT). Location was reported for each food consumed. Results were adjusted for age, sex, weight status, socio-economic status and urbanicity.

Setting—Mexico (nationally representative)

Subjects—2–5y (n=1905) and 6–13y (n=2868) children

Results—Children consumed the majority of daily energy at home (89% and 82%, respectively). The most common away-from-home eating location was the school (22% 2–5y; 43% 6–13y old), followed by street (14% 2–5y; 13% 6–13y old). The most common foods consumed away-from-home were wheat, rice, and corn mixed dishes, and sugar-sweetened beverages (SSBs), pastries/candy/desserts, milk (2–5y only) and salty snacks (6–13y). Multivariate models showed that high SES 2–5 year-olds consumed 14% of daily energy away-from-home relative to 8% among low SES 2–5 year-olds, and high SES 6–13 year-olds consumed 21% of daily energy away-from-home compared to 14% among low SES 6–13 year-olds. There were no differences by urban residence.

Conclusions—Among Mexican children, most foods and beverages were consumed at home. However, the percent of foods consumed or purchased away-from-home increased with age and with SES.

Keywords

eating location; energy intake; child diet; fast food; Latin America

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Introduction

Overweight and obesity are a major health concern in Mexico, with an estimated prevalence of 9% among pre-school-age children (0–59 months)[1] and 35.1% among school-age children (5–11y)[2]. Identifying dietary behaviors or environments that are linked to excess energy intake is a critical step in understanding where along the pathway policies or interventions can help prevent the continued rise of obesity. The away-from-home food environment is one potential area for improvement, as previous research has found that away-from-home food tends to have lower nutritional quality, including more calories, total fat, and saturated fat, as well as less dietary fiber, vitamin C, calcium, and iron[3, 4]. Larger portion sizes of away-from home foods also contributes to increased energy intake[5–8].

In the United States of America (US), away-from-home consumption accounts for 31% of total energy among 2–5y and 36% among 6–11y olds[9]. Recent research has also found that of calories from stores, fast food, and school, all are comprised of about 32–35% "empty" calories from solid fats and added sugars (SOFAS).[10]

Little is known about away-from-home food and beverage intake in Mexico, and how this contributes to food group and total daily intake. Quantifying the extent to which children consume daily energy away-from-home and the dietary quality associated with away-from-home foods and beverages, including schools, can help pinpoint which aspects of the food environment could be improved. This is especially true for lower socio-economic status (SES) households, which tend to have poorer diet quality and poorer health outcomes, and urban households, which in many other countries tend to have higher intake of away-from home foods[4]. The objective of the present study was first to describe the intake of children ages 2–5y and 6–13 years by eating location (at-home and away-from-home), including the nutritional quality of foods consumed and the types of foods consumed. In addition, mean caloric intake from at-home and away-from-home locations by SES and urbanicity was evaluated.

Methods

Study population

The Encuesta Nacional de Salud y Nutrición 2012 (ENSANUT 2012) (Mexican National Health and Nutrition Survey) is a cross-sectional, multistage, stratified, and cluster-sampled survey of 50,528 households (response rate 87%) that was conducted by Mexico's Instituto Nacional de Salud Pública (National Institute of Public Health) between October 2011 and May 2012. The primary sampling units were geostatistical basic areas, or Mexico's census units. The survey was designed to be representative at the regional and state level, including rural and urban areas within each state, and with oversampling of low-socioeconomic subpopulations. The sample was designed to achieve adequate samples by age group, including pre-schoolers (children age 0–4y), elementary school-age children (5–9y), and adolescents (10–19y)[11, 12]. Trained interviewers were used to perform all assessments, including dietary interviews and anthropometry, in respondents' homes.

Dietary assessment

To capture information on the types and amount of foods and beverages consumed during the preceding 24 hours, dietary intake data were collected on a random subsample across all ages (*n*=9,937) using one 24-h recall administered via the Automated 5-step Multiple Pass Method[13]. This 24-h recall method was adapted to the Mexican context[14] by the Mexico Institute of Public Health, including translation to the Spanish language and adaptations to reflect unique characteristics of food intake in Mexico (e.g., characteristics of purchased foods [raw or processed, packaged or unpackaged, frozen or not frozen], location of intake and portion sizes).

For children younger than 15y old, the primary household meal preparer reported food intake, with children confirming food and beverages consumed while not in the presence of the primary meal preparer (e.g., at school). Interviewers used tools to aid in portion size estimation, including photos of commonly consumed foods, a food scale, measuring cup, and serving spoon. When the weight or volume was not reported, grams or milliliters of the item consumed were imputed by age group, region of residence, and meal time. Participants reported the eating occasion for each item consumed, including breakfast (first meal of the day), lunch (often the main meal, consumed between noon and mid-afternoon), dinner (evening meal), almuerzo, (which is a meal that occurs after breakfast typically late morning or noon), and as a snacking occasion (any food or beverage contributing >0 kcal that was consumed between the customary mealtimes).

Whole foods were reported as consumed (i.e. banana; yogurt). Mixed dishes were reported as a single item and then disaggregated into component ingredients using either a standard recipe (when the mixed dish was consumed away-from-home or the specific proportion of ingredients was partially or wholly unknown) or a custom recipe (when the mixed dish was prepared at home and ingredients were known). A standard recipe is based on a weighted average of typical recipes (comprised of ingredients), whereas a custom recipe reflects ingredient by ingredient what a particular mixed dish contained. The food groups used in this study were based on the food groups used in the 2008 US Feeding Infants and Toddlers Study[15].Two trained Mexican dietary research specialists and a Nestlé nutrition scientist modified existing groups and created additional groups to reflect foods consumed by children in Mexico, such as the addition of tortillas.

The most recent Mexican food composition tables were used[14]. To calculate solid fats and added sugars (SoFAS), each food was linked at the ingredient level (single foods, standardized recipes) or dish level (custom recipes) to the US Department of Agriculture (USDA) Food and Nutrient Database for Dietary Studies, and then further linked to the 2005 Food Pyramids Equivalent Database[16].

Categorization of at-home and away-from-home

Respondents reported an eating location (i.e. where the food was consumed) for all foods and beverages consumed. Items were classified as "at-home" if they were consumed in the home; otherwise, the location was classified as away-from-home and included work, school, in transportation, restaurant, sports arena, street vendor, "puesto ambulante" (similar to street vendor), and other. The source of food (i.e. where the food was obtained) was only directly reported for foods for which a standardized recipe was reported, with only limited options available (home, supermarket, restaurant, or fast food). Thus we examined only the location of food consumption and not the location of food purchased.

Additional covariates

Urbanicity was based on the population and categorized as rural or urban (>2,500 residents). SES was based on households assets (pre-calculated in ENSANUT 2012), and grouped into tertiles (low, medium, high) for the population. Overweight and obesity was classified using International Obesity Task Force cut-points [17, 18]. Of 5027 children 2–13y, 254 were excluded because they had missing information on weight status (5% of sample). Age was stratified by pre-primary-school age (2–5y, n=1905) and primary school age (6–13y, n=2868) (total analytical sample, n=4773).

Statistical analysis

First, socio-demographic characteristics were summarized by eating location using t-tests for means. Then, the mean per capita intake of energy, macronutrients and micronutrients as well as the mean per capita caloric intake from food groups were examined by eating location. To examine whether eating location differed by urbanicity and SES, we used multivariate linear regression stratified by age group (2–5y vs. 6–13y) controlling for key covariates, including day of recall (weekday vs. weekend), age (continuous), sex, weight status (normal weight vs. overweight/obesity), urbanicity (in SES models), and SES (in urbanicity models). For the multivariate analysis, margins commands were used to predict mean energy intake for each level of consumption status of each key eating occasion, adjusted for the aforementioned variables. Finally, we conducted a sensitivity analysis comparing the socio-demographic characteristics and mean daily caloric intakes for children excluded due to missing weight status and those included. Statistical analyses were conducted using Stata v.14 (College Station, TX). All analyses were adjusted to be nationally representative using STATA's svy commands and stratum-specific probability weights supplied by ENSANUT to account for complex survey design. Statistical significance for multivariate analyses was defined at $p<0.01$.

Results

Mean daily energy intake was 1494 kcal/day ± 23 for 2–5y children and 1907 ± 24 kcal/day for 6–13y children (Table 1). Overall, the majority of daily calories were consumed at-home, although this decreased with age (89% for 2–5y vs. 82% for 6–13y, $p<0.05$). Boys consumed significantly more calories than girls, but away-from-home consumption was similar between boys and girls. Children living in the North consumed more daily energy than those in the South, and those living in the Central region and Mexico City consumed more calories away-from-home. There were no differences in total daily energy by urbanicity. There was a positive association between SES and total daily energy intake. Away-from-home food intake was higher on weekdays (20% of daily calories) vs. weekends (9% of daily calories, $p<0.05$).

As a result of the much higher energy intake from at-home eating location, at-home foods were the largest contributor not only to daily energy but also for all macro- and micro-nutrients (Table 2). This included SOFAS, with 88% of total daily SOFAS intake consumed at-home for 2–5y olds, and 80% of total daily SOFAS intake consumed at-home for 6–13 y olds.

With regards to calories contributed, wheat/rice mixed dishes, corn mixed dishes, sugar-sweetened beverages (SSBs), and pastries/candy/desserts were the top contributors to away-from-home food intake for both age groups, while milk was a top 5 contributor for 2–5 year-olds and salty snacks for 6–13 year olds (Figure 1a and b).

The models of adjusted predicted mean energy intake showed a positive association between SES and total energy intake for younger but not older children (1363 ± 37 kcal/day for low SES 2–5y vs. 1583 ± 45 kcal/day for high SES 2–5y, p<0.05, and 1867 ± 44 for low SES 6–13y vs. 1912 ± 45 kcal/day for high SES 6–13y, no significant difference) (Figure 2). Low SES children also ate a greater percent of daily energy at home (92% and 86% for 2–5y and 6–13y, respectively) compared to high SES children (86% and 79%, respectively) though this was statistically significant for 2–5y children only (p<0.05). Despite differences in unadjusted analyses, there were no major differences in total energy intake or eating location by urbanicity.

The most common away-from-home eating location was the school (22% 2–5y; 43% 6–13y old), followed by street vendors (14% 2–5y; 13% 6–13y old) (Supplement Table 1). The school eating location contributed to 6% and 13% of mean % daily calories among 2–5y and 13y old children respectively, and was predominantly driven by intake of almuerzo. Snacking occasions were the biggest contributor to street vendor intake.

The sensitivity analysis comparing children excluded for missing weight status vs. included children with complete information on weight status found that 2–5y children with missing weight status consumed fewer calories in total (1345 ± 57) and at home (1157 ± 63 kcal/day) compared to 2–5y with non-missing weight status (1494 ± 23 kcal/day total calories and 1333 ± 24 kcal/day at-home calories, p<0.05 for each comparison), but there were no differences in away-from-home calories., For 6–13y, there were no differences for total daily, at-home, or away-from-home calorie intake. Children with missing weight status were more likely to be in the highest tertiles of SES (37% vs 27%) (p<0.05), but there were no differences in urbanicity.

Discussion

Among Mexican children age 2–13y, the majority of food intake was consumed at home. Younger and older children consumed only 11% and 19% of food away-from home, respectively, which is substantially lower than the US, where children age 2–12y consume between 29% and 35% of calories away-from-home [19, 20]. In general, little is known about away-from-home food intake in Latin America, making comparisons difficult, but evidence from Brazil shows that among individuals ages 10y and older, 43% consumed at least one food item away-from-home daily (18% of total daily intake) [21].

In line with energy contributions, foods consumed at-home contributed most of children's daily macro- and micro-nutrients, including calories from added sugar and solid fat. Wheat and rice mixed dishes, and corn mixed dishes, including sandwiches, tacos, enchiladas, and pasta dishes were among the biggest contributors to away-from-home foods. SSBs and pastries, candy and other desserts were also top contributors. Children aged 6–13y consumed a disproportionate amount of calories from these food groups away-from-home: for example, they consumed 36% of salty snacks and 30% pastries, candies, and desserts away-from-home (compared to 18% of overall calories consumed away-from-home). On the other hand, children age 6–13y also consumed disproportionately more yogurt (40%), fruit (25%), 100% fruit juice (48%), and vegetables (20%) away-from-home. While research from Brazil shows that that away-from-home foods tended to be high energy density (e.g., baked and fried snacks, pizza, soft drinks, sandwiches, and sweets) [21], these results show that for Mexican children, away-from-home foods can be both a source of staple foods as well as snack-type foods and SSBs.

This combination of both healthy and less-healthy away-from-home foods may be because the majority of away-from-home foods were consumed at school. While away-from-home food intake increased with age, this was predominantly driven by higher food intake at school during almuerzo, the late-morning meal (in Mexico, it is common for children to consume lunch, often the biggest meal of the day, upon returning home from school). However, it is important to consider that food consumed at school may be obtained from various sources (for example, it could be prepared at home, in the school, or at a restaurant or other vendor near the school), and these different sources could be linked to nutritional quality. One nationally representative study found that in 2013, 41% of 9–10y children brought food from home to school, while 29% purchased food at school, and 30% did both (Lopez-Olmedo 2016, unpublished data). An additional study of 8 public schools in Tijuana found that while virtually all preschoolers consume food prepared at home at school, this declines as children age, whereas the purchase of unhealthy food both inside and outside the school increases with age [22]. The same study found that whereas food from home tended to be healthier, with fruits and vegetables among the most commonly brought-from-home items, food purchased both in and outside the school was comprised largely, of foods such as 'fried foods, soft drinks, ice cream, yogurt high in sugar, pastries, cookies, processed soups and sweets' as well as burgers, pizza, burritos, and quesadillas.

It was not possible to ascertain whether the foods brought from home were more or less healthy than those purchased at school. Unfortunately, we were not able to ascertain the source of the food consumed, and thus were unable to examine the extent to which foods consumed at school were brought from home vs. purchased elsewhere. Future iterations of Mexico's National Health and Nutrition Survey should take into account where food was acquired (or purchased) as well as where it was consumed. It is also important to note that, in addition to being both a source and location of food intake in kids, schools serve an important role in providing nutrition information to children. In 2010, the Mexican Secretariat of Health and the Secretariat of Public Education issued guidelines on food and beverages allowed for sale and recommended to be consumed in schools [23]. These guidelines provide the nutritional criteria of breakfast, lunch, and snacks consumed at school, and encourage, for example, the daily consumption of fruits and vegetables, plain drinking water and consumption of whole grains. [23].

After school, the street was the most common location of away-from-home food intake. Previous research has found that, similar to other developing countries, street vendors are especially important sources of dietary intake [24, 25], with a study using Mexico's 2006 National Health and Nutrition Survey showing that of adults >20y, 32% consumed meals, 37% consuming snacks, and 54% consumed drinks from street vendors at least once a month [26]. In our study, the prevalence of consuming food in the street was still somewhat low (13–14%), but this survey reflects only a single day of intake and it is possible that more children would report intake of street foods if a longer term dietary assessment was conducted. A second important question relates to what food and beverages are sold by street vendors, and the degree to which these street vendors contribute to foods consumed at- or after-school, as the food retail environment around schools will influence the nutritional quality of what children buy and eat [27]. Finally, while away-from-home food intake from restaurants and other locations remained low across age groups, a systematic review of multiple countries shows that the energy contribution of these foods increases into adolescence, suggesting shifts towards more away-from-home foods may be an issue to monitor in this population as well [4].

Our study also found a positive association between SES, total daily energy intake, and away-from-home food intake, but no relationship between urbanicity and total or away-from-home food intake. There is currently a dearth of evidence about the association between these socio-demographic factors and diet quality among children, but a previous study using Mexico's 2006 National Health and Nutrition Survey found that among adults, urban households and those with higher education had higher away-from- home food expenditures [26]. Studies of the nutrition transition tend to show that as countries develop, higher urbanicity is associated with more varied diets, but that the burden of low quality diet shifts to the urban poor as diets move away from fresh fruits and vegetables, pulses, potatoes and other staples to fast and convenience foods marked by higher sugar, salt, and fat [28, 29]. Future work should continue to monitor shifts in eating location and dietary quality by urbanicity and SES, as well as how these factors influence weight gain over time, as studies of Mexican adults have already noted that disparities in obesity vary by both SES and urbanicity [30] [31].

Finally, the sensitivity analysis comparing found that children excluded from main analyses due to missing weight status were more likely to be high SES, and among 2–5y, had lower total and at-home daily caloric intakes compared to those with complete information on weight status. Inclusion of this sample of children with missing weight status in our main analyses may have strengthened the positive association between high SES and calories consumed away-from-home among 2–5y, as the excluded sample had a higher % of kcal from away-from-home foods as well as a higher proportion of high SES. However, because those with missing weight status comprised such a small sample of the population, inclusion of this sample would be unlikely to change our overall findings.

Limitations

As previously noted, a major limitation was the inability to accurately classify the source from which foods were purchased or obtained. This is important not only for understanding food intake in schools, but understanding the overall intake of pre-prepared foods, including the degree to which foods purchased away-from-home are consumed at home (take-out, delivery). First, understanding the extent to which food stores are source of purchased foods is important, as SSBs and high-energy dense nonessential foods purchased at stores are subject to taxation in Mexico as of January 1st, 2014. In addition, it would be useful to understand whether foods consumed at-home were home-prepared or processed, packaged, or otherwise pre-prepared, which may be important indictors of nutritional quality of foods, with some processed foods tending to be of poorer nutritional quality [32, 33].

In addition, we were unable to explicitly examine foods consumed at daycare centers. This could be important, especially for younger children, as previous research in Mexico has found that although day care centers menus met minimum My Plate recommendations for each food category except for whole grains, for children age 48–72 months, menus included excessive high-calorie beverages including full-fat milk, fruit juice, and SSBs, and overall excess energy [34].

While it would be useful to examine the association between away-from-home food intake and overweight and obesity, especially considering the high prevalence in this population, the cross-sectional nature of this survey precludes causal examination of this relationship. Future longitudinal work will be needed to understand first if away-from-home foods increases over time, and also whether intake location or source is linked to excess energy, poorer dietary quality, and weight gain over time. It will also be important to consider selection issues associated with away-from-home eating, as previous work has found that children who eat more away-from-home food also eat less healthy diets at home [35]. Finally, in understanding diet-disease associations, a single 24-h recall as used in this study would likely be inadequate to characterize individual intake of episodically consumed foods, including those consumed at less-frequented locations such as restaurants or sports arenas.

Conclusion

Mexican children consume the majority of daily energy at-home, although away-from-home food intake increases with age and with SES. Away-from-home food intake included both healthy and unhealthy foods and did not disproportionately contribute to intakes of solid fat or added sugar. Future work will be needed to monitor potential increases of away-from-home food intake as Mexico continues to develop, and to evaluate the nutritional quality of foods consumed across locations, especially in day care centers and schools.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Kroker-Lobos MF, Pedroza-Tobías A, Pedraza LS, et al. The double burden of undernutrition and excess body weight in Mexico. Am J Clin Nutr. 2014; 100:1652S–1658S. [PubMed: 25411308]
2. Aburto TC, Cantoral A, Hernandez-Barrera L, et al. Usual Dietary Energy Density Distribution Is Positively Associated with Excess Body Weight in Mexican Children. J Nutr. 2015; 145:1524–1530. [PubMed: 25926409]
3. Guthrie JF, Lin B-H, Frazao E. Role of food prepared away from home in the American diet, 1977–78 versus 1994–96: changes and consequences. J Nutr Educ Behav. 2002; 34:140–150. [PubMed: 12047838]
4. Lachat C, Nago E, Verstraeten R, et al. Eating out of home and its association with dietary intake: a systematic review of the evidence. Obesity Reviews. 2012; 13:329–346. [PubMed: 22106948]
5. Young LR, Nestle M. The Contribution of Expanding Portion Sizes to the US Obesity Epidemic. American Journal of Public Health. 2002; 92:246–249. [PubMed: 11818300]
6. Young LR, Nestle M. Expanding portion sizes in the US marketplace: implications for nutrition counseling. J Am Diet Assoc. 2003; 103:231–240. [PubMed: 12589331]
7. Nielsen SJ, Popkin BM. Patterns and trends in food portion sizes, 1977–1998. JAMA. 2003; 289:450–453. [PubMed: 12533124]
8. Piernas C, Popkin BM. Food portion patterns and trends among U.S. children and the relationship to total eating occasion size, 1977–2006. J Nutr. 2011; 141:1159–1164. [PubMed: 21525258]
9. US Department of Agriculture Agricultural Research Service. [cited 2016 February 17] Away from Home: Percentages of Selected Nutrients Contributed by Food and Beverages Consumed Away from Home, by Gender and Age, in the United States, 2011–2012, What We Eat in America, NHANES 2011–2012. 2014. Available from: www.ars.usda.gov/nea/bhnrc/fsrg
10. Poti JM, Slining MM, Popkin BM. Where are kids getting their empty calories? Stores, schools, and fast-food restaurants each played an important role in empty calorie intake among US children during 2009–2010. J Acad Nutr Diet. 2013; 114:908–917. [PubMed: 24200654]
11. Romero-Martínez M, Shamah-Levy T, Franco-Núñez A, et al. Encuesta Nacional de Salud y Nutrición 2012: diseño y cobertura. Salud Pública de México. 2013; 55:S332–S340. [PubMed: 24626712]
12. Gutierrez JP, Rivera-Dommarco J, Shamah-Levy T, et al. Encuesta Nacional de Salud y Nutrición 2012. Resultados Nacionales Cuernavaca, México: Instituto Nacional de Salud Pública. 2012
13. Moshfegh AJ, Rhodes DG, Baer DJ, et al. The US Department of Agriculture Automated Multiple-Pass Method reduces bias in the collection of energy intakes. Am J Clin Nutr. 2008; 88:324–332. [PubMed: 18689367]
14. Lopez-Olmedo N, Carriquiry AL, Rodriguez-Ramirez S, et al. Usual intake of energy and macronutrients in the Mexican population. J Nutr. (In press).
15. Briefel RR, Kalb LM, Condon E, et al. The Feeding Infants and Toddlers Study 2008: study design and methods. J Am Diet Assoc. 2010; 110:S16–S26. [PubMed: 21092765]
16. USDA Agricultural Research Service USDA National Nutrient Database for Standard Reference. Nutrient Data Laboratory Home Page. http://www.ars.usda.gov/ba/bhnrc/ndl
17. Cole TJ, Bellizzi MC, Flegal KM, et al. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ. 2000; 320:1240–1243. [PubMed: 10797032]
18. Río-Navarro BE, Velázquez-Monroy O, Sánchez-Castillo CP, et al. The high prevalence of overweight and obesity in Mexican children. Obes Res. 2004; 12:215–223. [PubMed: 14981213]
19. Poti JM, Popkin BM. Trends in energy intake among US children by eating location and food source, 1977–2006. J Am Diet Assoc. 2011; 111:1156–1164. [PubMed: 21802561]
20. Ng SW, Slining MM, Popkin BM. Turning point for US diets? Recessionary effects or behavioral shifts in foods purchased and consumed. Am J Clin Nutr. 2014; 99:609–616. [PubMed: 24429538]

21. Bezerra IN, Souza AdM, Pereira RA, et al. Contribution of foods consumed away from home to energy intake in Brazilian urban areas: the 2008–9 Nationwide Dietary Survey. Br J Nutr. 2013; 109:1276–1283. [PubMed: 22850427]
22. Vargas L, Jiménez-Cruz A, Bacardí-Gascón M. Unhealthy and Healthy Food Consumption Inside and Outside of the School by Pre-school and Elementary School Mexican Children in Tijuana, Mexico. J Commun Health. 2013; 38:1166–1174.
23. Secretaría de Salud. ACUERDO mediante el cual se establecen los lineamientos generales para el expendio o distribución de alimentos y bebidas en los establecimientos de consumo escolar de los planteles de educación básica. México: Diario Oficial de la Federación; 2014.
24. Dixon J, Omwega AM, Friel S, et al. The health equity dimensions of urban food systems. Journal of Urban Health. 2007; 84:118–129.
25. Steyn NP, Mchiza Z, Hill J, et al. Nutritional contribution of street foods to the diet of people in developing countries: a systematic review. Public Health Nutr. 2014; 17:1363–1374. [PubMed: 23680029]
26. Langellier BA. Consumo y gasto en alimentos preparados fuera de casa en adultos mexicanos en 2006. Salud Pública de México. 2015; 57:4–13. [PubMed: 25629274]
27. Davis B, Carpenter C. Proximity of fast-food restaurants to schools and adolescent obesity. Am J Public Health. 2009; 99:505–510. [PubMed: 19106421]
28. Zhai F, Du S, Wang Z, et al. Dynamics of the Chinese diet and the role of urbanicity, 1991–2011. Obes Rev. 2014; 15:16–26. [PubMed: 24341755]
29. Popkin BM. Synthesis and implications: China's nutrition transition in the context of changes across other low-and middle-income countries. Obes Rev. 2014; 15:60–67. [PubMed: 24341759]
30. Smith KV, Goldman N. Socioeconomic differences in health among older adults in Mexico. Soc Sci Med. 2007; 65:1372–1385. [PubMed: 17618717]
31. Ferrer CP, McMunn A, Dommarco JAR, et al. Educational inequalities in obesity among Mexican women: time-trends from 1988 to 2012. PLoS ONE. 2014; 9:e97394.
32. Poti JM, Mendez MA, Ng SW, et al. Is the degree of food processing and convenience linked with the nutritional quality of foods purchased by US households? Am J Clin Nutr. 2015; 99:162–171.
33. Monteiro CA, Levy RB, Claro RM, et al. Increasing consumption of ultra-processed foods and likely impact on human health: evidence from Brazil. Public Health Nutr. 2011; 14:5–13. [PubMed: 21211100]
34. Benjamin Neelon SE, Reyes-Morales H, Haines J, et al. Nutritional quality of foods and beverages on child-care centre menus in Mexico. Public Health Nutr. 2013; 16:2014–2022. [PubMed: 23036360]
35. Poti JM, Duffey KJ, Popkin BM. The association of fast food consumption with poor dietary outcomes and obesity among children: is it the fast food or the remainder of the diet? Am J Clin Nutr. 2014; 99:162–171. [PubMed: 24153348]

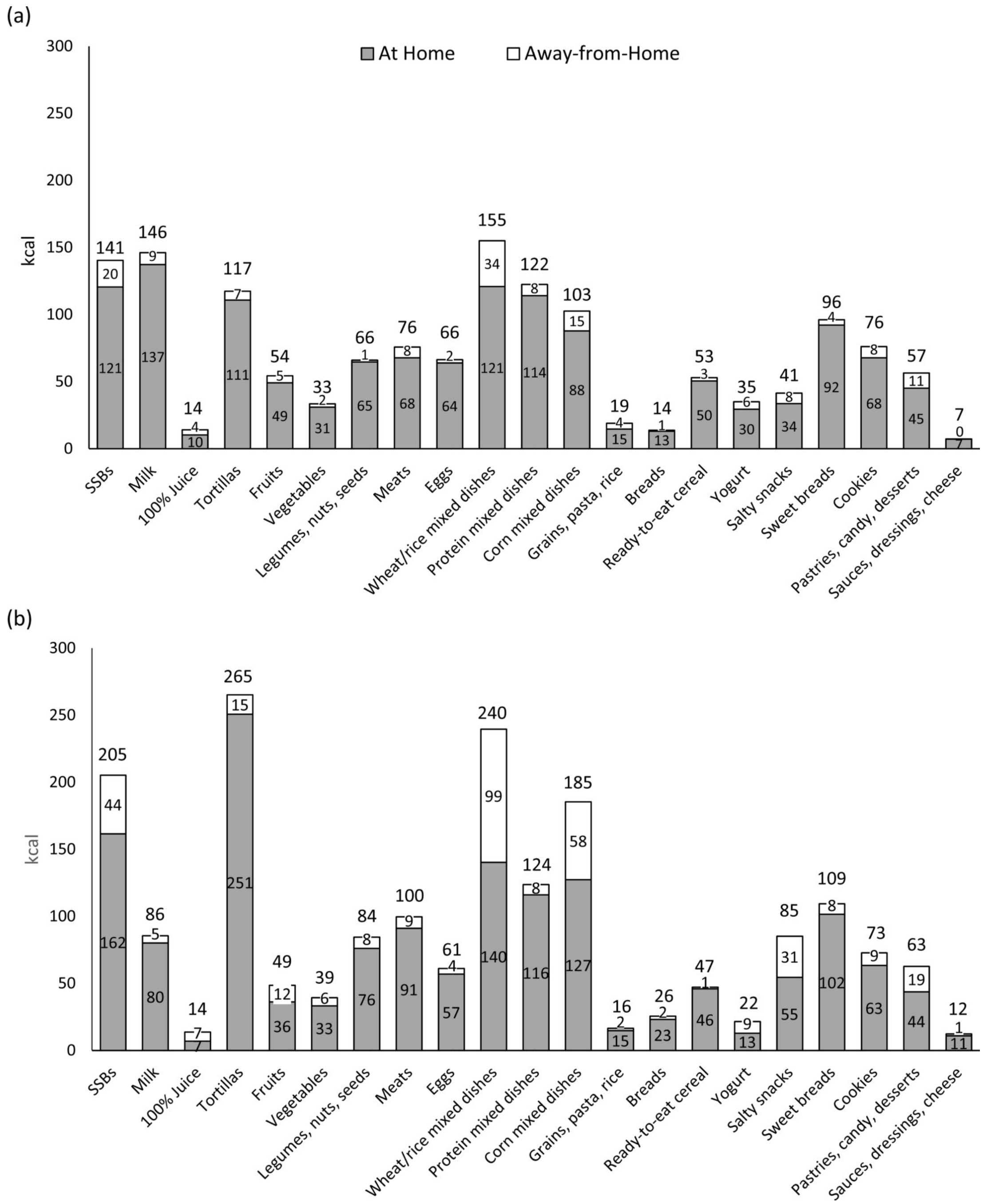

Figure 1.

Mean per capita daily intake of food groups by eating location, Mexican children a) age 2–5y and b) 6–13y

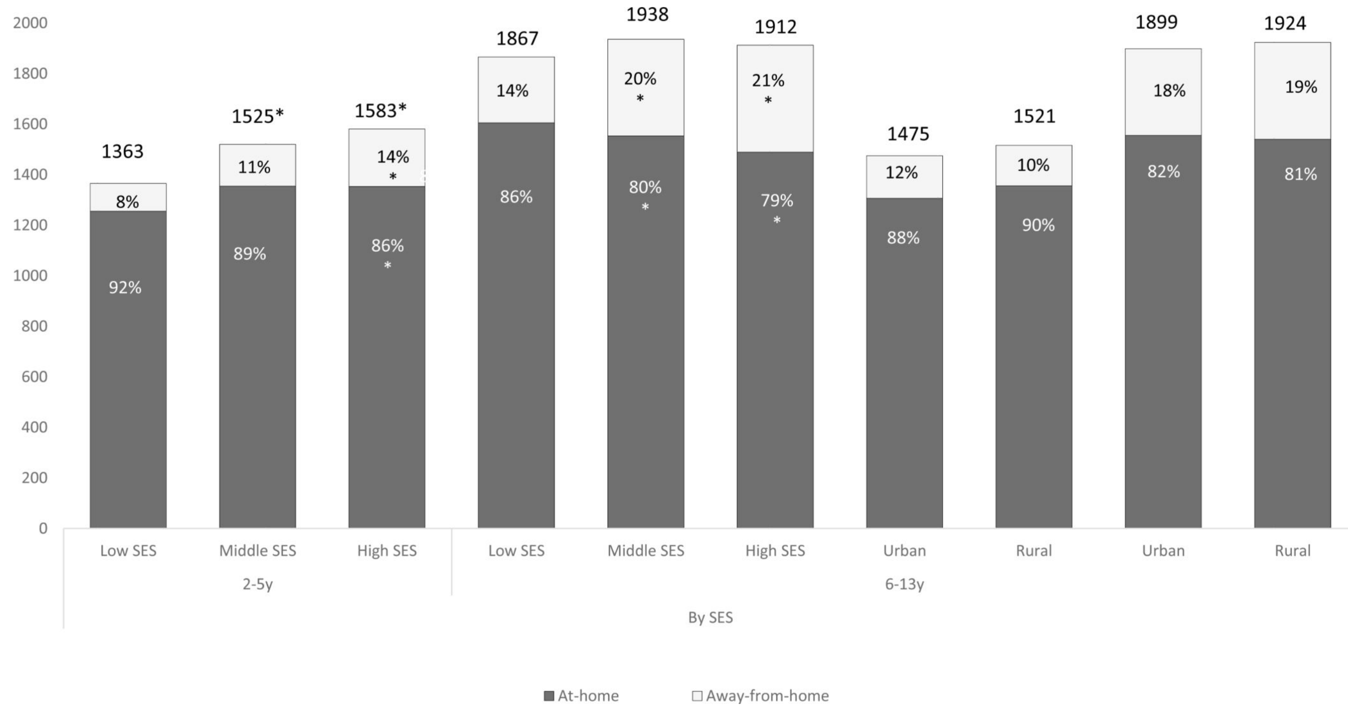

Figure 2.
Adjusted predicted mean caloric intake from at-home and away-from home, by socio-economic status and urbanicity, among Mexican children age 2–5y and 6–13y

Table 1

Percent consumers and mean per capita daily calories from at-home vs. away-from-home eating locations for Mexican children age 2–13y in ENSANUT

		Mean per capita total daily calories		At home			Away-from-home		
	N=	Mean kcal	SE	Percent consumers	Mean kcal	SE	Percent consumers	Mean kcal	SE
Age									
2–5 y (ref)	1905	1494	23	99	1333	24.4	37	161	10.4
6–13 y	2868	1907	24	99	1549	23.1	56	359	14.8
Sex									
Male (ref)	2415	1854	28	99	1565	27.8	48	289	17.5
Female	2358	1712	23	99	1403	22.5	52	310	14.2
Region									
South (ref)	1735	1756	28	100	1506	26	41	251	16
Central	1734	1726	28	99	1399	28	53	327	18
North	1077	1867	40	99	1571	39	52	295	19
Mexico City	227	1853	74	99	1499	69	60	355	49
Urbanicity									
Rural (ref)	1869	1759	29	100	1489	29	42	270	17
Urban	2904	1793	24	99	1481	23	53	312	15
Weight status									
Normal weight (ref)	3642	1760	21	99	1488	20	47	272	11
Overweight/obese	1131	1852	36	100	1471	35	58	381	30
Socio-economic status									
Lowest tertile (ref)	1800	1717	30	100	1505	30	37	212	15
Middle tertile	1707	1807	32	99	1486	34	53	320	16
Highest tertile	1266	1826	36	99	1457	32	60	369	27
Dietary recall on weekday									
Yes (ref)	3512	1788	22	99	1439	20	57	349	13
No	1261	1769	37	99	1611	39	28	158	17
Eating occasion, per capita									
Breakfast (ref)	3953	380	7	74	328	7	10	52	5

	Mean per capita total daily calories			At home			Away-from-home		
	N=	Mean kcal	SE	Percent consumers	Mean kcal	SE	Percent consumers	Mean kcal	SE
Almuerzo	2254	220	8	26	125	7	19	95	6
Lunch	4322	521	12	83	473	12	8	48	4
Dinner	3888	360	8	79	345	8	3	15	2
Total snacks	3358	302	11	57	212	8	25	89	8

BOLD indicates that the percent consumers of that eating location or food source or the mean per capita calories from that eating location or source was different than the referent group, via chi-square test for percent consumer or t-test for means, respectively, p<0.05

[a]Sample sizes for demographics are based on all respondents with non-missing values on the model variables used in Table

[b]Sample sizes for eating occasion are those who consumed >0 kcal during the eating occasion.

Table 2

Micro- and macro-nutrient intake by eating location and food source, children age 2–13y in ENSANUT

	Location of food consumption											
	2–5 y						6–13 y					
			At Home		AFH				At Home		AFH	
	Mean	**SE**	**%**	**SE**	**%**	**SE**	**Mean**	**SE**	**%**	**SE**	**%**	**SE**
Macronutrients												
Energy (kcal/d)	1494.1	23.4	89	0.7	11	0.7	1907.5	23.7	82	0.7	18	0.7
Total Fat (kcal/d)	502.1	10.1	89	0.7	11	0.7	644.7	11.0	81	0.7	19	0.7
Saturated fat (kcal/d)	195.7	4.2	89	0.8	11	0.8	232.7	4.4	82	0.7	18	0.7
Monounsaturated fatty acids (kcal/d)	170.1	4.0	89	0.8	11	0.8	220.4	4.3	81	0.8	19	0.8
Polyunsaturated fatty acids (kcal/d)	110.1	3.4	88	0.9	12	0.9	154.6	3.4	80	0.8	20	0.8
Solid fat (kcal/d)	224.8	7.8	89	0.8	11	0.8	261.8	9.1	82	0.8	18	0.8
Carbohydrate (kcal/d)	811.5	14.9	89	0.7	11	0.7	1047.9	13.3	82	0.6	18	0.6
Total Sugar (kcal/d)	341.1	7.9	88	0.7	12	0.7	370.9	6.9	80	0.7	20	0.7
Added Sugars (kcal/d)	188.3	5.9	86	1.0	14	1.0	221.3	5.1	78	0.9	22	0.9
SOFAS (solid fat+added sugar; (kcal/d)	413.0	10.6	88	0.7	12	0.7	483.1	11.5	80	0.8	20	0.8
Protein (kcal/d)	207.2	4.3	90	0.7	10	0.7	252.1	4.1	84	0.6	16	0.6
Dietary fiber (g/d)	15.0	0.5	88	0.9	12	0.9	21.4	0.4	82	0.7	18	0.7
Antioxidants												
Vitamin C (mg/d)	100.4	3.9	87	0.9	13	0.9	119.8	4.8	79	0.8	21	0.8
Vitamin E (mg/d)	5.7	0.2	89	0.8	11	0.8	7.3	0.2	80	0.8	20	0.8
B vitamins												
Thiamin (mg/d)	1.1	0.0	90	0.8	10	0.8	3.5	2.2	84	0.6	16	0.6
Riboflavin (mg/d)	1.4	0.0	90	0.7	10	0.7	1.5	0.0	85	0.6	15	0.6
Niacin (mg/d)	13.3	0.4	90	0.8	10	0.8	16.3	0.3	85	0.6	15	0.6
Vitamin B-6 (mg/d)	1.3	0.0	90	0.8	10	0.8	2.8	1.1	84	0.6	16	0.6
Folate (μg dietary folate equivalents/d)	175.0	8.4	89	0.9	11	0.9	206.3	6.4	83	0.7	17	0.7
Vitamin B-12 (μg/d)	3.3	0.3	90	0.8	10	0.8	3.7	0.2	85	0.7	15	0.7
Bone-related nutrients												

	Location of food consumption											
	2–5 y						6–13 y					
			At Home		AFH				At Home		AFH	
	Mean	SE	%	SE	%	SE	Mean	SE	%	SE	%	SE
Calcium (mg/d)	842.7	20.2	90	0.7	10	0.7	861.6	17.0	83	0.7	17	0.7
Phosphorus (mg/d)	1016.7	19.9	90	0.8	10	0.8	1323.4	18.9	85	0.6	15	0.6
Magnesium (mg/d)	243.1	5.3	89	0.8	11	0.8	327.3	5.4	83	0.6	17	0.6
Vitamin D (μg/d)	86.2	5.2	90	1.0	10	1.0	89.0	6.2	83	1.0	17	1.0
Other micronutrients												
Vitamin A (μg retinol activity equivalent/d)	230.0	8.4	90	0.9	10	0.9	238.4	8.7	84	0.9	16	0.9
Vitamin K (μg/d)	42.6	2.4	88	0.9	12	0.9	59.6	2.8	80	0.9	20	0.9
Iron (mg/d)	11.1	0.3	90	0.7	10	0.7	13.2	0.2	84	0.6	16	0.6
Zinc (mg/d)	8.5	0.2	90	0.7	10	0.7	10.3	0.2	84	0.6	16	0.6
Sodium (mg/d)	2039.7	54.8	89	0.8	11	0.8	2734.5	67.3	82	0.7	18	0.7
Potassium (mg/d)	1947.4	47.3	89	0.8	11	0.8	2327.0	39.4	83	0.6	17	0.6