ORIGINAL ARTICLE

Food Insecurity Is Linked to Dietary Intake but Not Growth of Children in the Caribbean

WA Mumena[1], I Francis-Granderson[2], LE Phillip[3], L Johnson-Down[1], K Gray-Donald[1]

ABSTRACT

Objective: *To examine food insecurity and its relationship with children's nutritional health.*
Methods: *The data for the 390 children, aged 7–12 years and their caregivers, recruited from eight schools in Trinidad and seven schools in St. Kitts in 2013–2014 from a study dealing with food and nutrition security were used for this study. Food insecurity was assessed using the USDA's Household Food Security Survey Module, and 24-hour dietary recall of the children was assessed in home interviews. The children's height and weight were measured, and a capillary blood sample was collected at their schools.*
Results: *Overall, 41.5% of the caregivers reported household food insecurity, with 15% of the children living in households with very low food security. Daily intakes of protein and zinc were higher among the children from the 'food secure' vs the 'food insecure' households (protein, 59.6 ± 31.5 g vs 50.9 ± 24.4 g,* p *= 0.003; zinc, 7.33 ± 5.02 mg vs 6.20 ± 3.47 mg,* p *= 0.004, respectively). There were no other differences in their dietary intake. The children's body mass index* z*-score, weight status and height-for-age* z*-score were not associated with their food security status, and there was no evidence of stunting in either group. Anaemia, however, was prevalent (30%) and higher among the children from the food insecure households (39% vs 23%;* p *= 0.002).*
Conclusion: *Household food insecurity was was associated with lower intakes of some nutrients, and anaemia rates were higher among the children living in food insecure households but food insecurity was not related to the indicators of growth or weight status.*

Keywords: Caribbean, children, food security, nutritional health.

INTRODUCTION

Despite the efforts to improve global food security, there remain important challenges in addressing this problem. Substantial strides had been made in reducing child underweight, but this has been globally disproportionate and few indicators of food insecurity and under-nourishment had been tracked at the household level (1).

The association between food insecurity and dietary intake in developing countries is less widely studied. In North America, food insecurity among children and youth have been linked to low intakes of fruits and vegetables (2), inadequate intakes of calcium (3) and protein (4), and lower intakes of vitamin D (5). Also, the relationship between food insecurity and children's nutritional status is not clear. In a number of developing countries, where stunting, wasting and underweight were prevalent, such as Colombia, Pakistan and Tanzania, food insecurity has been associated with stunting and underweight among children (6–9). The studies conducted in North America revealed no such associations (10). A relationship between food insecurity and weight gain as well as obesity has been found in some studies

From: [1]School of Dietetics and Human Nutrition, McGill University 21,111 Lakeshore Road, Sainte-Anne-de-Bellevue, Québec, Canada, [2]Faculty of Food and Agriculture, University of the West Indies, St. Augustine Campus, Trinidad and Tobago, [3]Department of Animal Science, McGill University 21,111 Lakeshore Road, Sainte-Anne-de-Bellevue, Québec, Canada.

Correspondence: Dr K Gray-Donald, School of Dietetics and Human Nutrition, McGill University, 21,111 Lakeshore Road, Sainte-Anne-de-Bellevue, Québec H9X 3V9, Canada.
Email: katherine.gray-donald@mcgill.ca

DOI: 10.7727/wimj.2016.586

(11), but stronger evidence suggested no link between these variables (10, 12, 13). A relationship between food insecurity and anaemia among young children and adolescents has been documented in both the developed (14) and the developing settings (15).

Among Caribbean children, underweight has declined and obesity had become increasingly prevalent (16–19). While food availability data indicate an overabundance of energy, sugars and fats (20, 21), there is a dearth of information on food insecurity and nutritional indicators. Our aim in this study was to examine the association between food insecurity and dietary intake, linear growth, weight status and anaemia of children in two upper-income developing countries in the Caribbean.

SUBJECTS AND METHODS

The study was a part of a broader multidisciplinary project dealing with food and nutrition security, with a focus on the interventions with local farmers and school feeding programmes to improve the nutritional outcomes of children in the Caribbean Community (CARICOM) (22). Ethical approvals were obtained from the McGill Ethics Review Board and the Ministries of Education and the Ministries of Health in Trinidad and Tobago and St. Kitts and Nevis.

The data for this study were collected between September 2013 and April 2014. Children aged 7–12 years and their caregivers were recruited from eight schools in Trinidad and Tobago and seven schools in St. Kitts and Nevis. In Trinidad, the schools selected were those with a high proportion of children consuming the school lunch meals, which were offered to families in need. Schools in St. Kitts, where all the children were offered a free lunch, were selected from rural areas near the capital, Basseterre. One child per family, whose parent signed the consent form, was enrolled.

A baseline and a follow-up survey were conducted but only the follow-up survey data were used in this report as a comprehensive measure of food security was used only at this time. Half of the children were in schools where a project intervention was conducted to increase fruit and vegetable consumption (22).

Measurements

The children's height was measured using a stadiometer, and their body weight was measured with a digital floor scale. A CardioChek (PTS Diagnostics, Indianapolis, Indiana, USA) was used to measure their haemoglobin based on a finger prick capillary blood sample.

During a home visit, caregivers and their children were asked by trained interviewers to recall the types and amounts of foods consumed by the child the previous day in order to complete a single 24-hour dietary recall. Portion models (Santé Quebec, Montreal, Canada) were used to estimate the amounts consumed. The dietary data were compiled using CANDAT Nutrient Analysis Software (Godin London Incorporated, London, ON, Canada), based on the Canadian Nutrient File (2010 version) (23) and Canada's Food Guide (CFG) to define portions (24). The local food labels or recipes were added to the database where needed. The foods were grouped based on the Six Caribbean Food Groups (25) and further division of these food groups was undertaken to measure the milk and the milk products as well as the 'ground provisions'. The vitamin and mineral supplements taken on the day of the recall were included in the nutrient intake values.

An interviewer-administered questionnaire was conducted with the child's caregiver to obtain demographic data and measure food security using the 18-item U.S. Household Food Security Survey Module of the United States Department of Agriculture (USDA) to classify the household food security status (26). This measure was previously validated for use in the Caribbean (27).

The Household Food Security Survey Module of the USDA was validated for this sample by the Rasch model using WINSTEP software (28). Based on the main assumptions in the Rasch model, the 18-item U.S. Household Food Security Survey Module of the USDA was found to be valid (Supplementary Table 1). The children's household food security status was categorized according to the USDA procedures (26).

The World Health Organization (WHO) cut-off points for body mass index (29) were used to define weight status of the children and their caregivers. The WHO cut-off points for haemoglobin were used to identify anaemia among the children aged 5–11 years are < 11.5 g/dL and < 12.0 g/dL for children aged 12 years (30). The race-specific adjustment for the WHO cut-offs was applied in this study to diagnose anaemia among individuals of African descent, as recommended by the WHO/UNICEF/UNU (31).

Statistical analyses

T-tests and analysis of variance were used to compare the means of the various groups and Chi-square tests were used to compare the proportions. The statistical tests were two-tailed, and a significance level of $p < 0.05$ was adopted; Turkey's pairwise comparisons were used

Table 1: Demographic characteristics by household food security status of children and their caregivers from Trinidad and Tobago and St. Kitts and Nevis (n = 390)

	Food secure (n = 228)	**Food insecure (n = 162)**	***p***
Child			
Age, years [a]	9.2 ± 0.97	9.3 ± 0.99	0.210
Girls [b]	49.8	47.5	0.662
Caregiver			
Age, years [a]*	36.1 ± 9.06	34.0 ± 8.32	0.036
BMI, kg/m² [a]	40.4 ± 8.85	39.9 ± 9.50	0.628
Overweight/obese [b]	97.7	96.1	0.422
Female [b]	93.5	94.7	0.662
Unmarried female [b]*	57.9	71.2	0.023
Household size [a]	4.9 ± 1.74	5.3 ± 1.77	0.067
Education, less than secondary [b]	40.0	51.0	0.095

BMI = body mass index.
[a] Mean ± SD.
[b] %.
* Indicate significance at the 0.05 level.

to test the associations of food insecurity and dietary intake. All the statistical analyses were performed using SAS® software version 9.4 (2013, SAS Institute Inc., Cary, NC, USA).

RESULTS

A total of 390 children and their caregivers (232 from Trinidad and 158 from St. Kitts) were included in this study, after excluding 7.0% (n = 26) of the children with very high energy intake (> 4000 kcal), 1.2% (n = 5) with very low reported energy intake (< 700 kcal), and 3.2% (n = 13) and 5.6% (n = 23) of the children, respectively, for whom the data on food security and dietary intake were missing. The haemoglobin data were available for only 331 children.

Overall, 41.5% of households reported being food insecure with higher prevalence in Trinidad than in St. Kitts (46% *vs* 35%, $p = 0.044$). The demographic variables by household food security status are shown in Table 1. The caregivers in the food insecure households were younger ($p = 0.036$) and more likely to be unmarried ($p = 0.023$) than those in the food secure households. There were no other differences in the demographic characteristics between the food secure and the food insecure households.

The dietary intakes of the children living in the food secure *vs* the food insecure households are shown in Table 2. In general, the mean daily intakes (by portions) of milk and milk products, fruits and vegetables were low compared with the recommendations of the CFG (32) and the WHO/FAO (33). The mean protein intake for the children from the food insecure households was 1.46 g/kg body weight *vs* 1.69 g/kg body weight for the children from the food secure households. The dietary intakes of protein and zinc were lower among the children from the food insecure households as compared to food secure households. There were no other differences in the macro- or the micronutrient intakes between the two groups. The intakes of staples, ground provisions, milk, meat, legumes, fruits, and vegetables were similar among the food secure and the food insecure groups.

Table 2: Food and nutrient intake by household food security status among children from Trinidad and Tobago and St. Kitts and Nevis (n = 390)

	Food secure (n = 228)	**Food insecure (n = 162)**	***p***
Staples, portions	5.0 ± 2.8	4.77 ± 3.24	0.224
Ground provisions, portions	0.36 ± 0.95	0.35 ± 0.64	0.220
Meat, portions	1.7 ± 1.4	1.4 ± 1.2	0.127
Legumes and nuts, portions	0.22 ± 0.50	0.24 ± 0.48	0.200
Milk, portions	0.66 ± 1.08	0.54 ± 0.76	0.606
Fruits, portions	1.0 ± 1.5	1.1 ± 1.6	0.972
Vegetables, portions	0.56 ± 0.86	0.53 ± 0.89	0.790
Energy, kcal	1728 ± 620	1635 ± 634	0.105
Carbohydrate, g	248 ± 99.0	243 ± 100	0.704
Protein, g *	59.6 ± 31.5	50.9 ± 24.4	0.003
Fat, g	56.5 ± 30.3	52.5 ± 28.6	0.170
Fibre, g	11.0 ± 6.79	11.3 ± 6.2	0.554
Calcium, mg	535 ± 384	491 ± 294	0.296
Iron, mg	12.2 ± 8.9	11.3 ± 8.4	0.076
Potassium, mg	1540 ± 762	1447 ± 661	0.225
Vitamin A, µg	627 ± 864	552 ± 841	0.190
Vitamin C, mg	175 ± 149	186 ± 185	0.358
Zinc, mg *	7.3 ± 5.0	6.2 ± 3.5	0.004
Total sugar, g	104 ± 56.8	103 ± 55.0	0.794

Values in cells are means ± SD.
* Indicate significance at the 0.005 level.
Note: Foods were grouped based on the six Caribbean food groups; 'milk products' group was a subcategory from 'food from animals', and 'ground provisions' group was a subcategory from 'staples'.
Serving sizes were calculated based on Canada's Food Guide.

The anthropometric measurements of children living in food secure *vs* the insecure households are presented in Table 3. There were no differences in height-for-age (HFA) *z*-scores of children across these two groups and both groups had mean HFA above the mean of the WHO reference values of HFA. Stunting was rare among the children and there was no difference among the children from the food secure and the food insecure households in thinness, overweight or obesity.

A total of 30% of the children included in this study were anaemic. More anaemic children were living in the food insecure households and mean levels of haemoglobin were also lower among the children in the food insecure households (Table 4).

Table 3: Weight status of children in Trinidad and Tobago and St. Kitts and Nevis by household food security status (n = 390)

	Food secure (n = 228)	**Food insecure (n = 162)**	***p***
Height-for-age *z*-score *	0.46 ± 1.0	0.38 ±1.2	0.511
Stunting (%)	0.44	2.5	0.079
BMI *z*-score *	0.44 ± 1.5	0.30 ± 1.5	0.399
Wasting (%)	4.4	7.6	0.194
Healthy weight	62.4	63.5	0.496
Overweight	13.7	13.8	
Obese	19.5	15.1	
Overweight/obese	33.2	28.9	0.375

BMI = body mass index.
Note: Values in cells are percentages unless otherwise specified.
* Mean ± SD.

Table 4: Anaemia status of children from Trinidad and Tobago and St. Kitts and Nevis using race-specific cut-offs for Afro-Caribbean children by household food security status (n = 331)

	Food secure (n = 209)	**Food insecure (n = 156)**	***p***
Anaemia, %	23.2	39.0	0.002
Haemoglobin, mean ± SD	11.9 ± 1.4	11.5 ± 1.4	0.004

DISCUSSION

Despite the high prevalence of food insecurity at the household level, no association was found between the children's household food insecurity and the children's growth or weight status; only the lower intake of protein and zinc was found to be linked to household food insecurity. In this study, the children were growing well, as the mean height for both groups was well above the mean of the WHO growth reference (mean HFA has a *z*-score of 0). The lack of association between food insecurity and the children's growth is consistent with the findings of a study from Brazil (34), where stunting was not prevalent (1.3%). However, our results contrasted with the reports from Columbia (8, 9) and Tanzania (6), countries with high prevalence of stunting and/or underweight. The prevalence of obesity was also unrelated to food insecurity. This finding contrasts with the findings of a number of studies conducted in the USA (10, 35). Although a substantial proportion of the children's families were food insecure, our study revealed that their food insecurity status was not related to their linear growth or weight status.

While the dietary intakes were found to be similar between the children from the food secure and the food insecure households, the intakes of protein and zinc were lower among the children from food insecure households. These findings may reflect lower meat consumption among this group, but we could not identify this relationship using a single day's food intake as this does not provide a true representation of an individual usual dietary intake. Lower meat intakes among the children and lower meat supplies in food insecure households were reported in the USA (36) and Ecuador (37). The protein intakes of the children in our study were unlikely to be a serious nutritional concern, since their mean intake of protein was double the estimated average requirement (EAR) (protein 0.76 g/kg/day for children aged 4–13) for even those in the food insecure group (38, 39).

Despite the clear indication that anaemia was more prevalent among the children from food insecure households, their mean dietary iron intake did not differ by food security status. The relationship between food insecurity and anaemia found in this study is in keeping with findings among young children in Indonesia (15), as well as among American adolescents (14).

In developed countries, such as the USA and Canada, some studies had revealed lower intakes of fruits and vegetables, as well as milk among children from food insecure households (2, 5, 40). In our study, there was no such association between food insecurity and fruit and vegetable intakes. This lack of association might be due to the very low intakes of fruit and vegetable among the entire sample.

This study was the first study to investigate the problem of food insecurity in relation to dietary intake, growth, weight status and anaemia among children in the Caribbean but we would caution against extrapolating the rates of food insecurity and nutritional status to national populations. For example, in the sample from Trinidad, the schools selected were those with a high proportion of children receiving the free lunch, which was offered on the basis of the children's household economic status. The links made between food insecurity and lower protein and zinc intake as well as anaemia, however, could be clearly made within this high-risk group.

CONCLUSION

This study revealed that there was no evidence to suggest that the children's growth and weight status were affected by their food insecurity. However, the diet quality of the children was affected by the food insecurity and might be linked to anaemia, and less apparent differences in their nutritional status. Further research is

Supplementary Table 1: Item calibrations and item-fit statistics of items in the 18-item U.S. Household Food Security Survey Module of the USDA

Item	Item calibration*	Item infit	Item outfit
In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?	5.93	1.20	1.70
In the last 12 months, did (you/ you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?	3.39	0.86	1.09
In the last 12 months, did you lose weight because there wasn't enough money for food?	3.11	0.89	0.28
In the last 12 months, did (child's name/any of the children) ever skip meals because there wasn't enough money for food?	2.60	0.77	0.29
In the last 12 months, (was your child/were the children) ever hungry but you just couldn't afford more food?	2.28	1.03	1.57
In the last 12 months, since (current month) of last year, did you ever cut the size of (your child/any of the children's) meals because there wasn't enough money for food?	0.84	0.77	0.42
In the last month, were you ever hungry but didn't eat because there wasn't enough money for food?	0.74	0.98	0.54
"(My/our child was/the children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	0.19	0.84	0.40
In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?	− 0.07	1.00	0.75
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	− 0.70	0.79	0.61
"(I/we) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	− 2.14	0.91	0.72
"(I/We) relied on only a few kinds of low-cost food to feed (my/our) child/the children) because (I was/we were) running out of money to buy food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	− 2.78	1.09	1.15
"The food that (I/we) bought just didn't last and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	− 3.77	0.85	1.31
"(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	− 3.78	1.19	9.90
"(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?	− 5.83	1.15	2.07

*Item calibration indicates the severity of the item.

needed to determine the prevalence of anaemia, using a better measure such as a venous blood sample, in order to better understand and address the issue of anaemia in school-aged children in the Caribbean.

ACKNOWLEDGEMENTS

This work was carried out with the aid of a grant from the International Development Research Centre (IDRC), Ottawa, Canada, and with the financial support of the Government of Canada provided through the Global Affairs, Canada.

Thanks are due to Dr Theresa Thompson Colon for designing the survey used in this research and Dr Sonia Laszlo for her helpful discussion and suggestions. We wish to acknowledge the collaboration and support from the St. Kitts and Nevis Ministry of Education and Information, and the Ministry of Health and Social Services, and the dedication of the local staff attached to the project, who collectively made the data collection process possible.

AUTHORS' NOTE

WM analysed the data, wrote the paper and had the primary responsibility for final content. IF-G designed the research, oversaw the data collection, revised the manuscript and approved the final version. LP designed the research, oversaw the data collection, revised the manuscript, and approved the final version. LJ-D oversaw the data entry, contributed to the statistical analysis and approved the final version. KG-D designed the research, oversaw the data collection and critically revised the manuscript and approved the final version. The authors declare that they have no conflicts of interest.

REFERENCES

1. FAO. The state of food insecurity in the world 2015. [Internet] 2015 [cited 2015 Nov 21].
2. Kendall A, Olson CM, Frongillo EA. Relationship of hunger and food insecurity to food availability and consumption. J Am Diet Assoc 1996; 1019–24;.
3. Kirkpatrick SI, Dodd KW, Parsons R, Ng C, Garriguet D, Tarasuk V. Household food insecurity is a stronger marker of adequacy of nutrient intakes among Canadian compared to American youth and adults. J Nutr 2015; **145:** 1596–603.

4. Kirkpatrick SI, Tarasuk V. Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. J Nutr 2008; **138:** 9.
5. Mark S, Lambert M, O'Loughlin J, Gray-Donald K. Household income, food insecurity and nutrition in Canadian youth. Can J Public Health 2012; **103:** 94–9.
6. Cordeiro LS, Wilde PE, Semu H, Levinson FJ. Household food security is inversely associated with undernutrition among adolescents from Kilosa, Tanzania. J Nutr 2012; **142:** 1741–7.
7. Cesare MD, Bhatti Z, Soofi SB, Fortunato L, Ezzati M, Bhutta ZA. Geographical and socioeconomic inequalities in women and children's nutritional status in Pakistan in 2011: an analysis of data from a nationally representative survey. Lancet Glob Health 2015; **3:** e229–39.
8. Isanaka S, Mora-Plazas M, Lopez-Arana S, Baylin A, Villamor E. Food insecurity is highly prevalent and predicts underweight but not overweight in adults and school children from Bogotá, Colombia. J Nutr 2007; **137:** 2747–55.
9. Hackett M, Melgar-Quinonez H, Alvarez MC. Household food insecurity associated with stunting and underweight among preschool children in Antioquia, Colombia. Rev Panam Salud Publica 2009; **25:** 506–10.
10. Bhattacharya J, Currie J, Haider S. Poverty, food insecurity, and nutritional outcomes in children and adults. J Health Econ 2004; **23:** 839–62.
11. Jyoti DF, Frongillo EA, Jones SJ. Food insecurity affects school children's academic performance, weight gain, and social skills. J Nutr 2005; **135:** 2831–9.
12. Bhargava A, Jolliffe D, Howard LL. Socio-Economic, behavioural and environmental factors predicted body weights and household food insecurity scores in the early childhood longitudinal study-kindergarten. Br J Nutr 2008; **100:** 438–44.
13. Eisenmann JC, Gundersen C, Lohman BJ, Garasky S, Stewart SD. Is food insecurity related to overweight and obesity in children and adolescents? A summary of studies,1995–2009. Obes Rev 2011; **12:** e73–83.
14. Eicher-Miller HA, Mason AC, Weaver CM, McCabe GP, Boushey CJ. Food insecurity is associated with iron deficiency anaemia in US adolescents. Am J Clin Nutr 2009; **90:** 1358–71.
15. Campbell AA, Akhter N, Sun K, De Pee S, Kraemer K, Moench-Pfanner R et al. Relationship of household food insecurity to anaemia in children aged 6–59 months among families in rural Indonesia. Ann Trop Paediatr 2011; **31:** 321–30.
16. PAHO. Health conditions in the Caribbean Washington, D.C; 1997.
17. Popkin B, Adair L, Ng S. Global nutriiton transition and the pandemic of obesity in developing countries. Nutr Rev 2012; **70:** 3–21.
18. Xuereb G, Johnson P, Morris A, Bocage C, Trotter P, Henry F. Obesity in Caribbean children: its magnitude and current control efforts. CAJANUS 2001; **34:** 6.
19. Schwiebbe L, van Rest J, Verhagen E, Visser RW, Holthe JK, Hirasing RA. Childhood obesity in the Caribbean. West Indian Med J 2011; **60:** 442–5.
20. Ballayram., Henry F. Food and nutrition security in CARIFORUM countries. CAJANUS 2008; 4.
21. CFNI. Vulnerability and food and nutrition security in the Caribbean [Internet] 2007 [cited 2015 Nov 15].
22. Phillip LE, Francis-Granderson I. Improving the nutrition and health of CARICOM populations:final technical report (March 2011 - August 2014): IDRC; 2014.
23. Health Canada. Food and nutrition, the Canadian nutrient file [Internet] 2007[cited 2015 Oct 6].
24. Health Canada. Food and nutrition, what is a food guide serving? [Internet] 2007 [cited 2015 Sep 15].
25. Zephirin, Manuelita P. Manual of Nutrition and Dietetic Practice for the Caribbean: CFNI, PAHO, WHO; 1990.
26. USDA. U.S. household food security survey module: three-stage design, with screeners, Economic Research Service [Internet] 2012 [cited 2015 Oct 15].
27. Gulliford MC, Nunes C, Rocke B. The 18 household food security survey items provide valid food security classifications for adults and children in the Caribbean. BMC Public Health 2006; **6:** 26.
28. Nord M. Introduction to item response theory applied to food security measurement: basic concepts, parameters and statistic [Internet] 2014 [cited 2016 April 13].
29. WHO. BMI-for-age (5–19 years). Growth reference 5–19 years [Internet] 2013 [cited 2016 May 20].
30. WHO, CDC. Worldwide prevelence of anaemia 1993–2005: WHO global database on anaemia [Internet] 2008 [cited 15 Sep 13].
31. Gibson RS. Principles of Nutritional Assessment. 2nd ed. New York: Oxford University Press; 2005.
32. Health Canada. Food and nutrition, Canada's food guide [Internet] 2007 [cited 2015 Oct 16].
33. WHO, FAO. Diet, nutrition and the prevention of chronic diseases, report of a joint WHO/FAO expert consultation. Geneva [Internet] 2002 [cited 2015 Oct 15].
34. Cordeiro MM, Monego ET, Martins KA. Overweight in Goiás'quilombola students and food insecurity in their families. SciELO. 2014; **27:** 405–12.
35. Gundersen C, Lohman BJ, Eisenmann JC, Garasky S, Stewart SD. Child-specific food insecurity and overweight are not associated in a sample of 10- to 15-year-old low-income youth. J Nutr 2008; **138:** 371–8.
36. Matheson DM, Varady J, Varady A, Killen JD. Household food security and nutritional status of Hispanic children in the fifth grade. Am J Clin Nutr 2002; **76:** 210–7.
37. Hackett M, Zubieta AC, Hernandez K, Melgar-Quiñonez H. Food insecurity and household food supplies in rural Ecuador. Arch Latinoam Nutr. 2007; **57:** 10–7.
38. Institute of Medicine Food and Nutrition Board. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, D.C.: The National Academies Press; 2005.
39. Institute of Medicine (US). Dietary reference intakes for vitamin a, vitamin k, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc : a report of the panel on micronutrients. Washington, D.C.: National Academies Press (US); 2001.
40. Dave JM, Evans AE, Saunders RP, Watkins KW, Pfeiffer KA. Associations among food insecurity, acculturation, demographic factors, and fruit and vegetable intake at home in Hispanic children. J Ame Dietetic Association 2009; **109:** 697–701.