

The contribution of school meals to the diet quality of children in Canada: A hierarchical analysis of complex dietary data

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Introduction

- A healthy diet is essential to children's growth and development.
- School food programs (SFPs)** have been shown to improve diet quality and reduce diet-related inequities, although evidence from Canada is scarce.
- Canada is the only G7 country without a national **SFP** but is committed to developing a national SFP.
- Policymakers need evidence on existing SFPs for planning.

Objective

To examine the contribution of meals/snacks provided by schools vs. brought from home to the diet quality of Canadian children.

Methods

- Study Design:** Cross-sectional
- Setting:** 26 schools from disadvantaged communities in Alberta, Canada which have implemented a comprehensive Health Promoting Intervention called APPLE Schools.
- Sample:** 1,474 grade 4-6 students (aged 9-12 years, 49% girls)
- Instruments:** 24-hour diet recall plus in-school survey
- Exposures:**
 - Meal type:** breakfast, morning snack, lunch, afternoon snack, dinner, evening snack
 - Meal source:**
 - Home
 - School
 - Other
- Outcomes:**
 - Food group servings** (vegetables & fruit, grain products, milk & alternatives, meat & alternatives)
 - Sodium** (mg/100 kcal)
 - Free sugars** (g)
 - Diet Quality Index (DQI)**
 - Total energy intake** (kcal)
- Covariates:**
 - Student:** grade, gender, language, family affluence
 - School:** urbanicity, material and social deprivation indices
- Statistical Analysis:**
 - Two-level (meals nested within students) multivariable linear regression models used to evaluate the association of exposures with outcomes, while adjusted for all covariates.
 - Models restricted to meals with non-zero values for each outcome, with logarithmic transformations applied where appropriate.

Results (cont'd)

- Students consumed less than half of the recommended servings of vegetables & fruit; other food groups met national standards.
- 11% of students' total caloric intake came from free sugars.
- Average DQI score was 53 out of 100.
- 5,362 meals (69%) were consumed during school hours; only 4% were sourced from schools.
- Meals consumed during school hours (breakfast to afternoon snack) constituted 57-68% of daily intake for each food group.

Figure 1. Contribution (in relative terms) of meals to the daily intake of each food group.

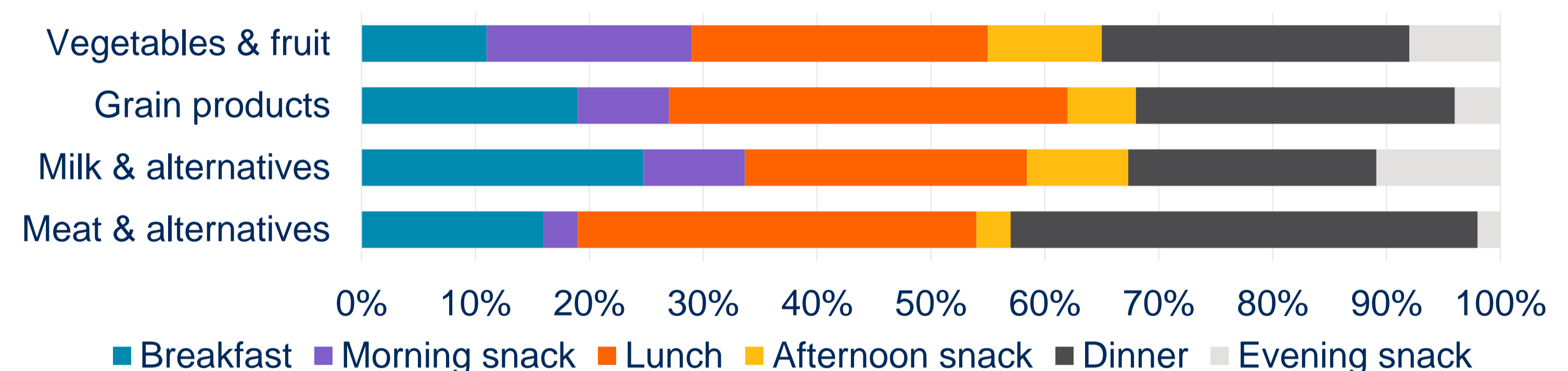


Table 1. Associations between Meal Source and Diet-related Outcomes.

	Meal source (β [95% confidence interval])		
	Home	School	Other
Vegetables & fruit*	Ref.	-14 (-29 to 4)	7 (-4 to 18)
Grain products*	Ref.	-15 (-25 to -4)	-2 (-9 to 5)
Milk & alternatives*	Ref.	24 (5 to 48)	15 (4 to 27)
Meat & alternatives*	Ref.	14 (-13 to 50)	8 (-6 to 23)
Free sugars (% total energy intake)*	Ref.	-39 (-52 to -23)	1 (-12 to 16)
Sodium (mg/100 kcal)*	Ref.	-2 (-18 to 17)	-14 (-22 to -5)
Total energy intake (kcal)*	Ref.	-11 (-27 to 8)	14 (2 to 28)
DQI	Ref.	-1 (-3 to -0.02)	-1 (-2 to -0.3)

Bold indicates statistical significance ($p < 0.05$); Only includes meals consumed during school hours (breakfast, morning snack, lunch, afternoon snack); Adjusted for meal type, student- and school-level covariates; *Coefficients back-transformed and can be interpreted as approximate expected percent increases (+) or decreases (-) in outcome, in comparison to the reference category (home).

Table 2. Associations between Meal Type and Diet-related Outcomes.

	Meal type (β)					
	Breakfast	Morning Snack	Lunch	Afternoon Snack	Dinner	Evening Snack
Vegetables & fruit*	Ref.	3	-22	-10	-12	-17
Grain products*	Ref.	-25	63	-25	58	-23
Milk & alternatives*	Ref.	-6	17	1	23	11
Meat & alternatives*	Ref.	-6	2	-8	12	-25
Free sugars (% total energy intake)*	Ref.	-16	-19	-22	-30	-17
Sodium (mg/100 kcal)*	Ref.	-58	18	-51	-19	-59
Total energy intake (kcal)*	Ref.	-56	60	-62	56	-70
DQI	Ref.	-4	3	-7	5	-7

Bold indicates statistical significance ($p < 0.05$); Includes all meals consumed during and outside school hours; Adjusted for all student- and school-level covariates; *Coefficients back-transformed and can be interpreted as approximate expected percent increases (+) or decreases (-) in outcome, in comparison to the reference category (home).

Strengths and Limitations

- Strengths:** Web-based diet recall tool (reduced recall bias and social desirability bias).
- Limitations:** Less than 5% of meals were provided by schools and model inferences may only be generalized to meals with non-zero outcomes (e.g., >0 servings of specific food group).

Conclusions

- Children in Canada consume few meals provided by schools.
- School meals had lower overall diet quality but included more servings of milk & alternatives and had lower free sugar content, compared to meals sourced from home.
- Main meals had higher diet quality and more servings of grain products than snacks, although breakfast was characterized by higher consumption of free sugars.