

Keeping Pace: The 2009 Survey of Physical Activity and Dietary Intake of Nova Scotia Children and Youth

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Keeping Pace Project

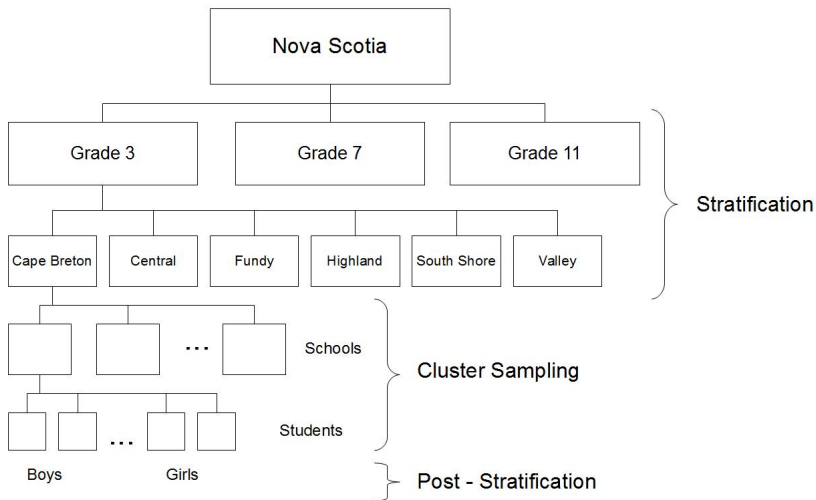
Keeping Pace is a study of physical activity and dietary intake of students in Grades 3, 7, and 11 in Nova Scotia conducted in 2009-2010. The goals of this project are to determine the physical activity levels and usual food intakes of these boys and girls, and the factors that influence their physical activity and dietary intake. The data collection involved the following:

- Accelerometer Data
- Anthropometric Data
- Physical Activity Questionnaire
- Parent Questionnaire
- Food Behaviour Questionnaire
- School Environment Questionnaire

Objective

- The data analysis was conducted by grade and sex.
- The analyses of previous surveys only calculated the sample statistics, without considering any sampling weights or the sample selection method.
- In this survey, instead of calculating sample characteristics, we estimated population characteristics based on the sample data and the sample selection method.
- By considering the sample weights based on the sample selection method, we are able to make conclusions for the entire population.

Sample Selection



Notation

- Each student p in the sample belongs to a school k in a region i and grade j , and has sex d .
- n_{ij} represents the number of schools selected in each stratum
- N_{ij} represents the total number of schools in each stratum
- m_{ijk} represents the number of students selected in each school
- M_{ijk} represents the total number of students in each school.
- \bar{M}_{ijd} represents the average number of students of sex d of the sampled schools in region i and grade j .

Weighted Analysis

- We calculated and assigned a sampling weight to each student.
- The sampling weight reflects how many students in the population are represented by each individual student in the sample.
- The probability a student is selected is equal to the probability their school is selected times the conditional probability the student is selected given their school is selected:

$$P = \frac{n_{ij}}{N_{ij}} \times \frac{m_{ijk}}{M_{ijk}}$$

- The sampling weight is the reciprocal of this probability:

$$w_{ijk} = \frac{N_{ij} \times M_{ijk}}{n_{ij} \times m_{ijk}}$$

Stratum Weights

- The stratum means and variances are combined to calculate the overall mean and variance.
- Each stratum is of a different size, so the strata must also be weighted.
- The stratum weight is determined by the number of primary sampling units (schools) in the stratum divided by the total number:

$$w_{ij} = \frac{N_{ij}}{N_j}$$

Population Mean

- Each stratum mean is the weighted total of the stratum divided by the total weights in the stratum (for that sex).

$$\hat{y}_{ijd} = \frac{\sum_{k \in S_{ij}} \sum_{p \in S_{ijkd}} w_{ijkp} \times y_{ijkp}}{\sum_{k \in S_{ij}} \sum_{p \in S_{ijkd}} w_{ijkp}}$$

- The six stratum means are then combined by a weighted total to determine the overall mean for that grade and sex.

$$\hat{y}_{jd} = \sum_{i \in S_j} w_{ij} \times \hat{y}_{ijd}$$

Population Variance

- The variance for each stratum contains two parts: the variance between the schools, and the variance between students in the same school.

$$\hat{V}(\hat{y}_{ijd}) = \frac{1}{M_{ijd}^2} \left(1 - \frac{n_{ij}}{N_{ij}}\right) \frac{s_{ijd}^2}{n_{ij}} + \frac{1}{n_{ij} N_{ij} M_{ijd}^2} \sum_{k \in S_{ij}} M_{ijkd}^2 \left(1 - \frac{m_{ijkd}}{M_{ijkd}}\right) \frac{s_{ijkd}^2}{m_{ijkd}},$$

$$s_{ijd}^2 = \frac{1}{n_{ij} - 1} \sum_{k \in S_{ij}} (M_{ijkd} \bar{y}_{ijkd} - M_{ijkd} \hat{y}_{ijd})^2,$$

$$s_{ijkd}^2 = \frac{1}{m_{ijkd} - 1} \sum_{p \in S_{ijkd}} (y_{ijkp} - \bar{y}_{ijkd})^2, \quad \bar{y}_{ijkd} = \frac{1}{m_{ijkd}} \sum_{p \in S_{ijkd}} y_{ijkp}$$

- The six stratum variances are then combined by a weighted total to determine the overall variance for that grade and sex.

$$\hat{V}(\hat{y}_{jd}) = \sum_{i \in S_j} w_{ij}^2 \hat{V}(\hat{y}_{ijd})$$

Comparing Two Populations

- We also wish to determine if there is a difference in the mean values between boys and girls in the same grade, or between grade 7 and grade 11 students with the same sex.
- The two sample sizes are not equal, and it is assumed the two populations have unequal variances.
- Welch's t -test is used to determine if the difference is significant.

Physical Activity

Percentage that Met the Physical Activity Standard:
60 minutes or more of moderate or greater
physical activity 5 or more days of the week.

Grade 3		Grade 7		Grade 11	
Boys	Girls	Boys	Girls	Boys	Girls
81.6%	80.3%	28.4%	13.2%	4.5%	0.9%
± 2.69%	± 2.54%	± 3.43%	± 2.66%	± 2.25%	± 0.45%

Eating Well with Canada's Food Guide

Percentage not Meeting Minimum EWCFG
Recommendations for Age and Sex

Minimum Recommended Food Group Servings	Grade 7		Grade 11	
	Boys	Girls	Boys	Girls
Grain Products (6)	46.5% ± 3.14%	53.9% ± 3.07%	43.5% ± 5.52%	48.5% ± 4.24%
Fruits and Vegetables (6-7)	78.4% ± 2.48%	80.8% ± 2.48%	82.0% ± 3.22%	89.0% ± 3.58%
Milk and Alternatives (3-4)	49.9% ± 3.25%	63.2% ± 2.62%	46.6% ± 6.27%	75.4% ± 4.17%
Meat and Alternatives (1-2)	20.7% ± 2.54%	33.0% ± 2.83%	65.5% ± 4.93%	56.6% ± 4.72%

Mean Number of Servings from Food Outside the Four Food
Groups

Grade 7		Grade 11	
Boys	Girls	Boys	Girls
4.63 ± 0.20	3.98 ± 0.13	5.85 ± 0.32	3.58 ± 0.35

Applications

The population estimates have provided data to drive health policy at both the provincial and national levels. For example:

- Obesity Prevention Strategy
- Physical Activity Report Card
- A Statement on Energy Beverage Policy Needs
- Food Labeling Programs

Thank You!

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