A Pilot Comprehensive School Nutrition Program Improves Knowledge and Intentions for Intake of Milk and Milk Alternatives Among Youth in a Remote First Nation

Michelle Gates, RD, MSc; Rhona M Hanning, RD, PhD; Allison Gates, RD, MSc; Andrea Isogai, MES; Leonard JS Tsuji, DDS, PhD; Joan Metatawabin
Outline

- Background
- Setting
- Objective
- Methods
- Results
- Discussion
- Time for questions and discussion
Background

- High prevalence of overweight and obesity among Canadian Aboriginal and American Indian youth\(^1\)

- Low intakes of milk and milk alternatives (MMA - a food group in Canada’s Food Guide)\(^2-5\)
  - In 7 Ontario communities: 72.6 to 84.7% had an inadequate intake of milk & alternatives; 86% had an inadequate calcium intake; 96% had and inadequate vitamin D intake\(^5\)
  - Sun exposure is an unreliable source of vitamin D in northern populations\(^6\)
The United States Centers for Disease Control and Prevention has identified schools as an ideal setting to promote healthy eating\textsuperscript{7}.

- Multicomponent, comprehensive
- Improvements in dietary behavior, knowledge, intentions, self-efficacy\textsuperscript{8-9}

Programs should have a theoretical basis\textsuperscript{10-11}

- Improved effectiveness in achieving behavior change
Setting: Fort Albany First Nation

- Population ~ 900; high proportion of youth
- Cree community on the west coast of James Bay, Ontario (subarctic)
- Remote, isolated
- Fly-in only; ice road available 2 months/year
- One school
- One small grocery store
- 2-3 convenience stores
Objective

- To describe the implementation of a pilot comprehensive school nutrition program over the 2009-2010 school year

- To evaluate the pilot program’s impact on
  - dietary behavior (milk and alternatives & relevant nutrients),
  - knowledge,
  - intentions (goals),
  - and self-efficacy regarding the intake of MMA
Methods: Study Design

- School program was run for 5 weeks

- Guided by Social Cognitive Theory (SCT)\textsuperscript{12}
  - Focus on observational learning, goal setting, self-monitoring

- Included policy, education, food provision, family, community involvement and program evaluation components
**Food Policy Guidelines**

**Snack Program Guidelines for a Healthy School Environment**

A Few Simple Rules:
- The healthiest choices should be served at least 80% of the time (4 days out of 5).
- Less healthy choices should be limited to being served once a week.
- Use Nutrition Fact labels on foods along with these guidelines to help you make healthy choices.

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Healthiest (at least 80%)</th>
<th>Less Healthy (at most 20%)</th>
<th>DO NOT SERVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetables &amp; Fruit</strong> (1 item per day)</td>
<td>Fresh vegetables &amp; fruit</td>
<td>Canned fruit in syrup</td>
<td>Fruit drinks, cocktails, punches, &quot;sides&quot;, or sweated applesauce</td>
</tr>
<tr>
<td></td>
<td>Canned fruit packed in its own juice or light syrup, unsweetened</td>
<td>Low sodium vegetable/tomato juice</td>
<td>Sugar is one of the first ingredients or never</td>
</tr>
<tr>
<td></td>
<td>Unsweetened applesauce</td>
<td>High sodium fruit juice</td>
<td>Fruit roll-ups, fruit by the foot, fruit flavored gummies</td>
</tr>
<tr>
<td></td>
<td>Dried fruits (raisins, apricots, etc.) or fruit leather</td>
<td>Dried fruits (raisins, apricots, etc.) or fruit leather</td>
<td>Fruit or vegetable chips</td>
</tr>
</tbody>
</table>

**Sample Shopping List Using Snack Program Guidelines for a Healthy School Environment**

The following are examples of foods that fit into the Snack Program Guidelines for a Healthy School Environment. However, any food that fits the criteria is acceptable.

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Healthiest (at least 80%)</th>
<th>Less Healthy (at most 20%)</th>
<th>DO NOT SERVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetables &amp; Fruit</strong> (1 item per day)</td>
<td>Small box raisins</td>
<td>Any seasoned vegetable or tomato juice – check the labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apples</td>
<td>Any brand of canned fruit in syrup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bananas</td>
<td>Any brand of sweated applesauce or applesauce brand – check the labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oranges</td>
<td>Sun-type fruit snacks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>½ cup grapes (palm sized)</td>
<td>Any brand of unsweetened applesauce or applesauce brand – check the labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dried apricot halves</td>
<td>Sun-type fruit snacks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Celery sticks</td>
<td>Any brand of canned fruit in syrup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baby carrots</td>
<td>Any seasoned vegetable or tomato juice – check the labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green or red peppers</td>
<td>100% fruit juice – make sure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Any brand of unsweetened applesauce or applesauce brand – check the labels</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sun-type fruit snacks</td>
<td>Any seasoned vegetable or tomato juice – check the labels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100% fruit juice – make sure</td>
<td>100% fruit juice – make sure</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Ontario Ministry of Education & Cancer Care Ontario

UNIVERSITY OF WATERLOO
FACULTY OF APPLIED HEALTH SCIENCES
Nutrition Education

- Adapted from the Power4Bones (P4B) program developed by the Diary Farmers of Canada\textsuperscript{15}
  - Goal setting
  - Peer modeling

- Delivered by a University of Waterloo senior undergraduate student who lived in the community
  - 5 weeks, 30 minutes/week in the classroom
  - Positive role model

Photo source: http://www.power4bones.com
Family Involvement

- Informative handouts sent home to parents weekly
- Could involve simple ‘homework’ activities
  - Goal setting, monitoring

Keep Your Bones Strong with Calcium and Vitamin D

Caution and vitamin D are important for strong bones and teeth.

- Kids need 1-2 servings of milk or calcium-rich foods each day.
- Adults need 2-3 servings of milk or calcium-rich foods each day.

Here are some ideas for calcium-rich meals:

**Breakfast**
- Pour milk in your breakfast cereal or granola.
- Enjoy a cup of low-fat yogurt.
- Make tea with milk.
- Drink hot chocolate made with milk.

**Lunch**
- Add low-fat cheese to a sandwich.
- Have a glass of milk instead of soft drinks.
- Have fast food: cheese, pizza, or lasagna.
- Make milk-based soups.

**Dinner**
- Make a salad with lots of green leafy vegetables.
- Add some low-fat cheese to your salad.
- Serve broccoli or beans as a side dish.
- Enjoy low-fat yogurt for dessert.

**Snacks**
- Make a smoothie with fruit, ice, and yogurt or milk.
- Drink milk, but you can try chocolate or strawberry milk.
- Dip vegetables and fruits into yogurt.
- Try low-fat string cheese.
Food Provision

- Preexisting breakfast and snack program
  - Run by a community volunteer (past 20 years)
  - Vegetables or fruit, whole grains, protein sources, milk or milk alternatives
- Facilitated healthy eating
- Some nutrition education involved students preparing their own healthy food
Community involvement

- Healthy community feast emphasizing healthy food
  - Included traditional and market foods

- Students were involved in meal preparation

- Informative handouts and recipes were provided

Photo source: http://www.clipsahoy.com
Evaluation

- **Formative**
  - Program materials were evaluated for readability and cultural appropriateness by snack program coordinator

- **Process**
  - Program integrity, attendance

- **Outcome**
  - Knowledge, self-efficacy, intentions (adapted questionnaire)$^{17}$, dietary behavior (WEB-Q)$^{18}$
Methods: Participants

- Approval by the University of Waterloo Office of Research Ethics; conducted in collaboration with Peetabeck Academy

- Passive consent for participation was used by sending an information letter home to parents
  - Could opt-out at any time

- Student consented to questionnaires on first screen of Web-based Eating Behavior Questionnaire
Methods: Instruments

- Knowledge, Self-efficacy, and Intentions Questionnaire (KSIQ)\textsuperscript{17}
  - Adapted from the Pro-Children Project
  - Valid and reliable in diverse populations
  - Formative evaluation – culturally appropriate

- Waterloo Web-based Eating Behaviour Questionnaire (WEB-Q)\textsuperscript{18}
  - 24-h recall
  - Validated in a diverse population of Ontario youth, adapted for the community
Methods: Data Analysis

- Paired pre-post KSIQ scores
  - Wilcoxon signed-rank test (1-tailed)

- Nutrient and food group analysis
  - Canadian Nutrient File\textsuperscript{19}, Food Processor software
  - Canada’s Food Guide (CFG) for First Nations, Inuit and Métis\textsuperscript{2}
  - Comparison to Dietary Reference Intakes and Canadian Community Health Survey Cycle 2.2\textsuperscript{22}

- Pre-post nutrient and food group intakes
  - Mann-Whitney U test (2-tailed)
Results: Participant Characteristics

- 100% of students in attendance participated
- Effort was made to include students who were absent on the day of the assessments

---

**Table 1. Demographic Characteristics for Students Participating in the Pilot Comprehensive School Nutrition Program**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline WEB-Q</th>
<th>Baseline KSIQ</th>
<th>Postprogram WEB-Q</th>
<th>Postprogram KSIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>30</td>
<td>26</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Median age, y (range)</td>
<td>13 (11-15)</td>
<td>13 (10-14)</td>
<td>12 (11-13)</td>
<td>13 (11-15)</td>
</tr>
<tr>
<td>Sex, % male</td>
<td>33</td>
<td>54</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>% below minimum recommendations</td>
<td>86.7</td>
<td>-</td>
<td></td>
<td>80.0</td>
</tr>
</tbody>
</table>

KSIQ indicates Knowledge, Self-efficacy, and Intentions Questionnaire; WEB-Q, Web-based Eating Behavior Questionnaire. 


*Canada’s Food Guide recommends 3-4 servings of milk and milk alternatives per day for those 9-18 years of age.*
Results: KSIQ

- Significant improvement in knowledge \((p=0.05)\) and intentions \((p=0.01)\)

**Table 2. Knowledge, Self-Efficacy, and Intentions for Milk and Milk Alternatives Pre- and Post-Pilot Comprehensive School-based Program**

<table>
<thead>
<tr>
<th>Parameter Measured (maximum score)</th>
<th>Baseline (n = 16)</th>
<th>Postprogram (n = 16)</th>
<th>(P^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge (10)</td>
<td>6.0</td>
<td>6.0 ± 1.5</td>
<td>4.0-8.0</td>
</tr>
<tr>
<td>Intentions (18)</td>
<td>10.0</td>
<td>9.6 ± 4.4</td>
<td>2.0-17.0</td>
</tr>
<tr>
<td>Self-efficacy (26)</td>
<td>10.5</td>
<td>11.7 ± 5.6</td>
<td>3.0-23.0</td>
</tr>
<tr>
<td>Number of MMA tried (13)(^c)</td>
<td>9.0</td>
<td>11.4 ± 1.5</td>
<td>7.0-13.0</td>
</tr>
<tr>
<td>Number of MMA liked (13)(^c)</td>
<td>11.5</td>
<td>9.6 ± 1.9</td>
<td>9.0-13.0</td>
</tr>
</tbody>
</table>

MMA indicates milk and milk alternatives.

\(^a\)Each parameter included questions scored out of 1 (correct answer would receive 1 point, incorrect answer would receive 0 points). Therefore number of items is equivalent to the maximum score for each parameter; \(^b\)Change from baseline to post-program assessed using the Wilcoxon signed-rank test, significant at \(P \leq .05\); \(^c\)Items included in the questionnaire were as follows: 2% ultra-high-temperature milk, 2% fresh milk, whole fresh milk, evaporated milk, chocolate milk, cheese (regular), cheese (string), yogurt (regular), yogurt tubes, fruit smoothies with milk/yogurt, soup made with milk, pudding made with milk, soy beverage.
Results: Dietary Intakes

- 87% failed to meet CFG recommendations at baseline
- Intakes remained largely inadequate post-program

Table 3. Dietary Intakes of Milk and Milk Alternatives, Calcium, and Vitamin D Pre- and Post-Pilot Comprehensive School-based Program

<table>
<thead>
<tr>
<th>Food Group or Nutrient</th>
<th>Recommended Intake</th>
<th>Baseline (n = 30)</th>
<th>Postprogram (n = 10)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk and milk alternatives, servings</td>
<td>3-4</td>
<td>1.7</td>
<td>1.8 ± 1.1</td>
<td></td>
</tr>
<tr>
<td>Calcium, mg</td>
<td>1,300</td>
<td>682.4</td>
<td>785.4 ± 423.5</td>
<td></td>
</tr>
<tr>
<td>Vitamin D, µg</td>
<td>5</td>
<td>2.2</td>
<td>2.7 ± 2.4</td>
<td></td>
</tr>
</tbody>
</table>

*Change in intakes from baseline to postprogram assessed using the Mann-Whitney U test, significant at \( P \leq .05 \). \( P \) value is given for energy-adjusted intakes; *Canada’s Food Guide recommendations for children and youth aged 9-18 years; *Dietary Reference Intakes (Adequate Intake) for children and youth aged 9-18 years.*
Program Integrity

- Attendance ranged from 22% to 89% (lessons were mandatory)
  - Illness, personal commitments, traditional activities accounted for absences

- Modifications to P4B\(^{15}\) program
  - More interactive activities
  - Adapt to student ability levels (e.g., literacy, numeracy)
  - Eliminated use of computers
Discussion: Knowledge

- Though knowledge improved, scores remained relatively low (69% correct)
  - Inadequate dose of intervention
  - Only 2.5 hours of nutrition education was provided
  - Attendance was sometimes poor
  - Intensity of intervention may need to be increased
    - Greater parental involvement – currently this was mostly passive
Discussion: Self-efficacy, behavior

- Significant changes in self-efficacy and behavior were impeded by environmental barriers
  - Lack of availability and affordability were not addressed
  - Child’s behavior is not entirely in his/her control
  - Greater community and family involvement may be useful

Photo source: [http://www.clipsahoy.com](http://www.clipsahoy.com)
Intakes of milk and milk alternatives remain low; only 20% met CFG guidelines

- Similar to what is seen in other Canadian Aboriginal populations

In American Indian communities, it has been shown that addressing only the school environment is inadequate

- Community-level barriers can outweigh school-based facilitators
- Intervention needs high exposure via community leadership and policy
Implications for Research & Practice

- Lessons learned
  - Necessary support should be secured prior to program initiation to improve sustainability and impact
  - Supports include staff, time, funding, facilities
  - Environmental constraints existing beyond the school environment should be addressed concurrently to achieve measurable success
Acknowledgments

- We would like to thank:
  - Participants from Fort Albany and community-based collaborators
  - Dr. Dan McCarthy for help in data collection; Dr. Ian Martin for data analysis expertise
  - Dairy Farmers of Canada for the Power4Bones program and related workshop
  - Manuscript reviewers
Acknowledgments

Funding sources:

- Canadian Institutes of Health Research (CIHR)
- Canada’s Research-based Pharmaceutical Companies Health Research Foundation
- Heart and Stroke Foundation of Canada
- Health Canada’s First Nations and Inuit Health Branch
- Danone Institute of Canada
- Ontario Ministry of Research and Innovation
- CIHR Training Grant in Population Health Intervention for Chronic Disease Prevention (Grant #53893)
Thank you for attending!

- Questions, comments, discussion?
References

NOTE: All information in this presentation, including tables and figures, originally appear in the published research brief:


References


Don’t miss an issue of JNEB!

To sign up to receive the Table of Contents by email, go to http://www.jneb.org/user/alerts, or click on “Sign up for e-Alerts” under the Journal Info tab:
Become an SNEB member!

- **Benefits of membership**
  - Professional Member - $190 per year
  - Associate Member - $95 per year
  - Student Member - $60 per year
  - Subscription to the *Journal of Nutrition Education and Behavior*
  - Free access to live and recorded webinars
  - Deepest discount to attend the SNEB Annual Conference
  - Membership in an SNEB specialty division
  - Connection to other professionals through SNEB listserv
  - [www.sneb.org/join](http://www.sneb.org/join)