ENHANCING DAIRY INTAKE AMONG ADOLESCENTS AT AN ALTERNATIVE HIGH SCHOOL

By

TYSON SOHNS

A clinical project submitted in partial fulfillment of the requirements for the degree of

MASTER OF NURSING

WASHINGTON STATE UNIVERSITY
Intercollegiate College of Nursing

JULY 2007
To the Faculty of Washington State University:

The members of the Committee appointed to examine the clinical project of
TYSON SOHNS find it satisfactory and recommended that it be accepted.

Ruth C. Bradlee
Chair

Margaret A. Berge

Christina M. Riebe
ACKNOWLEDGEMENT

I would like to thank the following people who have kindly volunteered their time and knowledge with me. Thank you Ruth Bindler, the chair of my committee, who was responsible for developing the research project and who guided me with expertise and encouragement. To Margaret Bruya, who coordinated this research study with Ruth and also generously spent time mentoring me with wisdom and encouragement. To Chris Reibe, who graciously guided me through the editing process. To the Washington State Dairy Council and Linda Mendoza, for their support and assistance in educating the students. To the library staff, who assisted me with literature searches and APA formatting. To the faculty, staff, and students at Havermale Alternative High School, who volunteered their time and assistance to make this research study possible. To my mother, father, sister, and the VA medical center, without your understanding and assistance none of this would have been possible. To my beautiful wife, my cheerleader and unwavering supporter, I owe you everything. To my soon to be baby girl, this is for you.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>3</td>
</tr>
<tr>
<td>Obesity epidemic</td>
<td>3</td>
</tr>
<tr>
<td>Target population</td>
<td>3</td>
</tr>
<tr>
<td>Dairy project</td>
<td>3</td>
</tr>
<tr>
<td>Summary</td>
<td>3</td>
</tr>
<tr>
<td>Literature Review</td>
<td>4</td>
</tr>
<tr>
<td>Obesity in adolescents</td>
<td>4</td>
</tr>
<tr>
<td>Adolescent diets</td>
<td>5</td>
</tr>
<tr>
<td>Dairy intake and adolescents</td>
<td>6</td>
</tr>
<tr>
<td>Alternative high schools</td>
<td>7</td>
</tr>
<tr>
<td>Theoretical framework</td>
<td>8</td>
</tr>
<tr>
<td>Statement of the purpose</td>
<td>11</td>
</tr>
<tr>
<td>2. METHODS</td>
<td>11</td>
</tr>
<tr>
<td>Design</td>
<td>11</td>
</tr>
<tr>
<td>Sample</td>
<td>13</td>
</tr>
<tr>
<td>Setting</td>
<td>13</td>
</tr>
</tbody>
</table>
Methods of measurement .................................................. 14
Data collection ................................................................. 15
Data analysis ................................................................. 15

3. RESULTS ............................................................................. 16
Teaching strategies ............................................................. 17

4. DISCUSSION ........................................................................ 18
Implications ........................................................................ 19
Limitations ........................................................................ 20
Recommendations for further research .................................. 21
Conclusion ........................................................................... 21

REFERENCES .......................................................................... 22

APPENDIXES ........................................................................... 26

A. Informed consent (Parent/Guardian) .................................. 26
B. Informed assent ................................................................. 28
C. Informed consent (Student) .................................................. 30
LIST OF FIGURES

1. Bronfenbrenner bio-ecological theory ..................................................32
2. Cheese frequency ..................................................................................33
3. Yogurt frequency ..................................................................................34
4. Milk frequency ....................................................................................35
5. Pudding and non-dairy frequency ..........................................................36
6. Dairy food ratings ..................................................................................37
7. Milk vs. soda .........................................................................................38
LIST OF TABLES

1. Curriculum and timeline.................................................................39
2. Dairy product evaluation...............................................................40
3. Dairy product evaluation #2.........................................................41
Enhancing Dairy Intake among Adolescents at an Alternative High School

Tyson Sohns

Washington State University, Intercollegiate College of Nursing
Abstract

Dairy intake among adolescents is decreasing. Currently only 12% of U.S. females 12 to 19 years of age and 32% of males meet dietary guidelines for calcium intake. The purpose of this study was to evaluate teaching methods and dairy product choices of teens, and to enhance the dairy intake among adolescents at an alternative high school. Dairy product education was provided for approximately 90 alternative high school students during their scheduled health and nutrition class for 5 weeks, in the fall and spring terms. Students ranged from 14 to 18 years of age. Students were asked to taste and rate different dairy food products, descriptive statistics were used to measure foods tasted using a ratings scale. Adolescents in the study preferred in-class, self-prepared ice cream over a large variety of other dairy products provided during classes. These alternative school adolescents present a challenging dynamic because of poor diet practices, frequent school absences, financial considerations of food choices and difficulty reaching and educating parents. Most adolescents stated that they would choose dairy products over soft drinks if priced the same in a vending machine. Adolescents should be exposed to a variety of calcium rich foods to help them identify tasteful options and should be taught strategies for consuming calcium rich foods in discussion-based participatory learning environments.
Enhancing Dairy Intake among Adolescents at an Alternative High School

U.S. Surgeon General Richard Carmona called obesity the greatest threat to public health today. It kills more Americans every year than AIDS, all cancers and all accidents combined. Obesity is associated with and promoting health problems in children that were unthinkable 20 years ago. (American Medical Association [AMA], 2007a). There is no one factor that can be blamed for the childhood obesity epidemic; rather, many complementary changes have simultaneously increased youth's energy intake and decreased their energy expenditure. Among the changes that affect adolescent energy intake is the increasing availability of energy dense, high-calorie, low-nutrient drinks. The National Dairy Association (2007) has launched a public information campaign called “3 a day of dairy.” This campaign combined with the National Institute of Child Health and Human Developments (NICHHD, 2006) “Milk Matters” campaign, is alerting health care professionals and the public to the essential role of calcium in the diet and the importance of milk as a major source of this nutrient. A healthy diet combined with the added benefits of milk and other dairy products has been shown to improve hypertension, peak bone mass, and insulin resistance, as well as prevent osteoporosis, and metabolic syndrome, which directly contributes to cardiovascular disease and the emergence of type II diabetes (Pfeuffer & Schrezenmeir, 2005). Studies correlating dairy consumption and obesity are not entirely consistent. However, the majority of studies found that increased low-fat milk or dairy consumption is either associated with lower body weight or has a neutral effect on weight. It is safe to say that serious health outcomes are associated with inadequate calcium intake (Greer, Krebs & the Committee on Nutrition, 2006). This study helps to identify dairy preferences in adolescents attending an alternative high school as well as identifying successful teaching strategies to increase calcium in adolescent diets.
Literature Review

“Little research exists regarding the types of intervention programs and services available for students attending alternative high schools” (Grunbaum et al., 2000, p.16). To date, no studies have been carried out with minority and other high risk youth to measure dairy intake and to implement dairy programs designed for the unique needs of youth in alternative schools.

Obesity in Adolescents

America’s youth are more obese than ever. Children are defined as being overweight or obese if they have a body mass index (BMI) above given age- and gender-specific percentile cutoffs. Body mass index (BMI) is defined as weight in kilograms divided by height in meters squared (kg/m²). Individuals from the ages of 2 to 18 years, with a BMI ≥ 95th percentile for age and gender, should be considered obese. Individuals with BMI ≥ 85th percentile, but < 95th percentile for age and gender, should be considered overweight. (American Medical Association [AMA], 2007 b). Since 1980, adolescent overweight prevalence rates have more than tripled (Centers for Disease Control and Prevention [CDC], 2005). Results from the 2003-2004 National Health and Nutrition Examination Survey indicate that an estimated 17.1 percent of children and adolescents are overweight or obese. Specifically, child and adolescent female overweight increased from 13.8% in 1999-2000 to 16.0% in 2003-2004 and male overweight increased from 14.0% to 18.2% during that time period (Ogden et al., 2006, p.1549). Obese children are much more likely than normal weight children to become obese adults. More than half of children and adolescents with BMI values at the 75th percentile on the CDC BMI-for-age growth charts became overweight as adults. Children and adolescents with BMI values at the 95th percentile had a 62–98% likelihood of being overweight at 35 years of age (Guo, Wu,
Enhancing Dairy Intake

Chumlea, & Roche, 2002, p.656). Obesity in young adults has been shown to decrease life expectancy by 5–20 years (St-Onge & Heymsfield, 2003).

Adolescent diets

Adolescents are consuming more unhealthy foods today than ever before. Only 2% of children 2 to 19 years old met all of the recommendations set forth by the United States Department of Agriculture (USDA) food guide pyramid. Just 10% of this age group met recommendations for four or more of the food groups. Basically, adolescent diets can be described as an inverted food guide pyramid because they consume too much fat and sugar, too little fiber and not nearly enough calcium (McBean & Miller, 1999). Unhealthy diet practices in today’s youth have continued to rise despite our identification and previous attempts to intervene. Simply decreasing fat intake is not the answer. According to the Dietary Intervention Study in Children (DISC), children who consumed a low fat, low cholesterol diet were more likely to consume more simple sugars, and less likely to meet dietary recommendations for zinc, calcium, iron, magnesium, folic acid, and vitamin B₁₂ (McBean & Miller, 1999). It is well established that eating breakfast is associated with favorable nutrient intake. Despite the benefits of eating breakfast, it is the meal most often skipped and the numbers of those eating breakfast further decrease as adolescents grow older. Trend analysis of breakfast patterns among adolescents in the United States demonstrated that approximately one third of young women aged 15 to 18 years skipped breakfast on a frequent basis (Affenito et al., 2005). Students who skip breakfast do not meet two thirds of the RDA for vitamins A and D, calcium, magnesium, thiamin, riboflavin, and zinc. The odds of dietary inadequacy among young adults were 2 to 5 times higher for those who skipped breakfast (Nicklas, O'Neil, & Myers, 2004).
Dairy Intake and Adolescents

Some researchers believe the consumption of low-nutrient sweetened beverages contributes to the risk of obesity by displacing milk and specifically calcium in the diet (Think About Your Drink, 2003, 8). Milk is a major source of calcium for children and adolescents and has the highest concentration per serving of absorbable calcium (Harvard School of Public Health, 2007). Milk is the primary beverage source of several essential nutrients, including vitamin A, calcium, phosphorus, magnesium, potassium, protein and zinc (Think About Your Drink, 2003). Current recommendations (Food and Nutrition Board, Institute of Medicine, National Academics, 2004) are for adolescents 9-18 years of age to consume 1300 mg of calcium per day. This recommendation equates to 4 servings or 32 fluid ounces of milk. The most recent Centers for Disease Control and Prevention National Youth Risk Behavior Surveillance Survey (2003) found that only 11% of female adolescents and 23% of male adolescents were drinking three or more glasses of milk per day. According to Think About Your Drink (2003), mean consumption for males was only 8 fluid ounces of milk per day while consuming 28 ounces of sweetened beverages. Females also consumed 8 fluid ounces of milk and 12 fluid ounces of sweetened beverages. Sweetened beverages (including regular soft drinks, fruit drinks and presweetened teas) were the largest contributor of calories compared to other beverages. Specifically, regular soft drinks were the top beverage source of calories for all preteens, teenagers and adults 19-49 years old. For teenagers and adults up to age 50, the calories from regular soft drinks were typically double the calories from milk. Since the late 1970s, there has been a 123% increase in per capita soft drink consumption by 6-17 year-olds, with the estimate being the highest (196%) for teenage boys (Murphy & Douglass, 2006). Maintaining adequate calcium intake during adolescence is necessary for the development of peak bone mass, which is
important in reducing the risk of fractures and osteoporosis later in life (Greer & Krebs, 2006).

Milk intake during adolescence is associated with greater total body, spine, and radial bone mineral measures during development of peak bone mass (Teegarden, Lyle, Proulx, Johnston, & Weaver, 1999).

Many schools provide sweetened beverages in vending machines and few provide dairy product choices. These vending machine offerings provide a funding stream for student activities and sports expenses not covered by public education money. These drink choices generally lack calcium and provide "empty" calories that provide no nutritional value. It is therefore important to educate teens about good dietary choices and to evaluate the effectiveness of these educational approaches to impact behavioral choice.

Alternative High Schools

There are 10,900 alternative high schools and/or programs in the United States. According to the National Center for Education Statistics, there were 612,900 students enrolled in public alternative schools or programs for at-risk students nationwide in October 2000 (National Center for Education Statistics, 2001). Alternative schools represent a unique opportunity to access a large and growing number of ethnically and economically diverse teens known to engage in multiple health risk behaviors with serious and often life-threatening consequences (Kubik, Lytle, & Fulkerson, 2004). A study published by the American Dietetic Association stated adolescents from low income families are in particular need of interventions and nutrition education (Larson, Story, Wall, & Neumark-Sztainer, 2006). Adolescents who attend alternative high schools are more likely to engage in poor dietary practices than their non-alternative peers (Grunbaum, Lowry, & Kann, 2001). The socioeconomic status of these youth is generally lower than others in the community, and risk behaviors such as smoking are high.
According to the Youth Risk Behavior Surveillance (YRBS, 2005), 23% of regular high school students had smoked at least 1 cigarette in the 30 days preceding the survey. Over 64% of alternative students smoked at least 1 cigarette in the same time frame (Grunbaum et al., 2000). Adolescent smokers are significantly less likely to consume > 1 serving/day of milk or participate in physical activity than adolescent nonsmokers (Wilson et al., 2005). A significant number of students in alternative high schools are themselves parents, thus determining the dairy intake of very young children. "Students in alternative schools were significantly more likely to have been pregnant or gotten someone pregnant than students in mainstream schools (30% versus 6%)" (Denner, Coyle, Robin, & Banspach, 2005). Pregnancy places even more stress on the adolescent mothers' growing and maturing skeleton because the rate of bone loss during pregnancy and lactation is greater than the annual rate of loss in women after menopause. Low calcium intakes affect the growing fetus as well. Calcium supplementation during pregnancy is directly linked to increased bone density and bone length of neonates. Calcium supplementation has also been linked to decreasing heartburn, pregnancy induced hypertension, preterm delivery, infant blood pressure, fetal lead exposure, and increasing birth weight. (Thomas & Weisman, 2005). Despite these benefits, the knowledge base and behaviors of young pregnant females frequently does not support adequate calcium intake.

Theoretical Framework

The theoretical framework applied in this project was the bio-ecologic theory proposed by Urie Bronfenbrenner (Bronfenbrenner, 2005). The following explains each level of interaction. For the purpose of this study, the focus was the microsystem.

The ecology of human development is the scientific study of the progressive, mutual accommodation, throughout the life course, between an active, growing human being and the
changing properties of the immediate settings in which the developing persons lives, as this process is affected by relations between these settings, and by the larger contexts in which the settings are embedded (Bronfenbrenner, 2005, p. 107).

Bronfenbrenner (2005) proposed that each child has his or her own unique set of characteristics such as age, gender, genetics, and individual assets. These sets of characteristics influence a child’s interactions within the environment. There are levels of interaction within a child’s life, which are the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Figure 1).

The microsystem is “a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given setting with particular physical and material characteristics” (Bronfenbrenner, 2005, p. 147). The microsystem is comprised of the adolescent’s immediate environment, and these factors directly interact with the adolescent’s health. Diet and exercise are directly influenced by the microsystem. An example of a powerful microsystem influence is the school classroom where the intervention for this project was implemented. This setting provides direct face-to-face interaction between educator and student. The student is also able to interact with other students; this interaction facilitates learning.

The mesosystem “comprises the linkages and processes taking place between two or more settings containing the developing person” (Bronfenbrenner, 2005, p. 148). The mesosystem is the interaction between school and home, or other parts of the microsystem. Expanding our previous focus, incorporating home environment would allow further understanding of health influences. Teaching from school can be translated into real life via food choices made at home.
The exosystem "encompasses the linkages and processes taking place between two or more settings, at least one of which does not ordinarily contain the developing person but in which events occur that influence processes within the immediate setting that does contain that person" (Bronfenbrenner, 2005, p. 148). The exosystem includes a larger scope of influence such as community organizations such as the Women, Infants, and Children (WIC) Program, and the state's Department of Education. These factors indirectly affect the information and resources presented to the student. For example, school policies related to vending machine sales and provision of school lunch options directly influence the health of teens. While this system is important to consider in analysis of calcium intake, it was beyond the scope of this project.

The macrosystem includes beliefs, values, and behaviors expressed in the societal and cultural groups (Bronfenbrenner, 2005). The effects of the macrosystem have a cascading influence throughout the interactions of all other layers. An example is the cultural belief that the educational system is responsible for teaching a child diet practices. Youth in alternative schools may be more likely to need and rely on the educational system to provide dietary support and teaching that are often provided in family systems. Likewise accessibility to foods, public programs that provide food banks, and other social/political systems influence the health and dietary intake of youth.

The chronosystem takes into account the length of time a student is exposed to particular influences of the macrosystem. Longstanding habits/beliefs are more difficult to change. This system also considers the point in time when a person lives. This system can be external; for example, the present societal availability and choices regarding beverages directly influences the intake of adolescents. The system can also be internal, such as the physiologic changes that
occur during puberty. As children get older, they may react differently to environmental characteristics and may be more able to determine more fully how those characteristics will affect them. (Paquette & Ryan, 2001). Bronfenbrenner's bio-ecological model can assist healthcare providers to identify different levels of intervention that can be influential in modifying health behaviors in an adolescent’s life.

Purpose

This project was designed to enhance dairy intake in adolescent students attending an alternative high school. Specific objectives for the students were to:

1. State recommended amount of calcium intake.
2. Identify food sources of calcium.
3. Evaluate personal daily intake of calcium.
4. State potential relationships of dairy intake to future serious disease.

Further objectives were for educators to:

1. Compare dairy food evaluations to better understand adolescent food preferences.
2. Evaluate effectiveness of a wide variety of teaching resources in influencing adolescent dairy consumption patterns.
3. Test strategies for presentation of health material to youth in an alternative high school.

Methods

Design

Funding was received from the Washington State Dairy Council pending approval from the Washington State University Institutional Review Board. Permission was then obtained from the public alternative high school that served as the setting for the project. The activities to meet the objectives included a series of structured weekly classes presented by undergraduate and
graduate nursing students, under supervision of the nursing school faculty. Nutrition educators collaborated with research administrators to develop a specific curricula and materials appropriate for the target audience. Materials were from a variety of sources such as the National Dairy Council, Washington State Dairy Council, and the American Dairy Association. Following each class the students who delivered material, the classroom teacher, and a faculty member discussed the strategies used and the response of the students. Plans were then made for the future classes using the information learned. Classes were taught for five weeks in both fall and spring semesters (Table 1). Classes followed lesson plans on the following topics:

1. The role and function of calcium in the body
2. The role of calcium and prevention of osteoporosis and other associated diseases with calcium deficit
3. Food sources of calcium and tasting samples of these sources in each class; reading food labels and understanding the USDA’s MyPyramid Food Guide
4. Definition of lactose intolerance, food alternatives, and myths about lactose intolerance
5. Role of exercise in building strong bones

During each class, there was a strong component of participatory learning. For example, students completed a personal analysis of daily dairy intake, and then evaluated their diets in relation to the USDA recommendations. They reviewed the MyPyramid Food Guide, and then identified and discussed goals for appropriate changes in relation to their dietary intake. During one class the students traced their individual body outlines and subsequently diagrammed the effect of calcium on bodily functioning and potential diseases (cardiovascular, for example). The technique of using several teaching methods and presentations allowed students of varying
learning styles to be engaged with the content. These methods included discussions, lectures, games, food tasting, multimedia video, power-point presentations, and food preparation of ice cream and cheese in class. Nutrition educators also served as role models by eating the variety of calcium-rich foods provided with students during class.

Sample

Approximately 90 high school students currently enrolled in a health and nutrition class attended dairy/calcium-focused education during the 2006-2007 academic school year. Dairy/calcium education was provided once a week for 5 weeks during fall and spring terms. Classes lasted approximately 55 minutes. Students who attended classes represented a convenience sample. All teens who registered for the health and nutrition class received dairy/calcium education. Measurements were done during the same part of the day using the same instruments.

Setting

The setting for the study was the health and nutrition classroom at an urban alternative public school in the inland northwest. Approximately 450 students attend, with a majority from low-income backgrounds, and having experienced difficulty in traditional schools. Most classes are limited to 10-20 students in order to provide for individual attention. The health classes varied from 7-18 students; three health classes were taught on each given day with the same content addressed in each class. A consent form and information about the study was distributed in the students' classes. This addressed the ability to use the student's responses and dietary analysis. Parents signed consents (Appendix A) and teens under 18 years signed assents (Appendix B). A consent form was signed by participant teens who were 18 years of age or
older (Appendix C). A $5 gift card was given to the students who returned the parental consent
and adolescent assent.

Methods of Measurement

The primary tool for measurement was the dairy product evaluation questionnaire. The
questionnaire was developed from youth health researchers considered experts in the field of
adolescent research. Questions were written so that the student could understand them at a 6th
grade reading level. A total of 6 questions were included in the questionnaire (Table 2). On the
last day of class a modified questionnaire was presented and explained to the students (Table 3).
The second questionnaire included a final question that asked: “Of all the dairy foods tasted, rate
them from best (5) to worst (1).” They were then given yogurt, milk, cheese, ice cream, and
pudding as options. The last question asked: “If flavored milks were available next to the soda
machine for the same price, would you choose milk over soda?”

The second instrument used was a computer assisted diet recall. Laptop computers were
provided for each student willing to participate. Students were instructed to access the
www.eatsmart.org website where they accessed a link to a calcium calculator. The calcium
calculator was a 24-hour diet recall tool that used a multi-media computer-assisted self-
interviewing program (British Columbia Dairy Foundation, 2000). The program totaled calcium
intake for the previous day, and then allowed the student to choose attainable goals to increase
calcium in their diets. At the end of the program it allowed the student to print their personal
recall and review suggestions for increasing calcium in their diet. Computer administered 24-
hour dietary recall is useful in assessing intake of a population rather than assessing individual
intake because it only provides a small sample of individual intake. Dietary information
received from the recall was judged as unreliable due to lack of student motivation and excluded from further analysis.

**Data Collection**

Survey procedures were designed to protect the student’s privacy by allowing for anonymous and voluntary participation. Students completed the self administered questionnaire in the classroom during regular class period. The survey required approximately 10 minutes to complete. The adolescent’s record was kept separate from the consent forms in a locked file cabinet. Food was purchased and prepared by the investigators before each class and provided to each individual student in appropriate cups or plates. Each food was offered and was tasted by the student. They then chose which food they liked the most, and rated it on the questionnaire. The portion sizes were designed to provide a representative single serving of calcium each day. Additional calcium rich foods provided for that class demonstration and evaluation for that day were available for consumption by these participants upon request after the questionnaires were completed. No food was wasted.

**Data Analysis**

Data were analyzed using SPSS 14.0. Descriptive statistics summarized food tasting data from the dairy product evaluation questionnaire. A nominal score was placed on each food item for analysis. An ordinal value was placed on the student’s rating of the food item. Descriptive statistics were used to develop frequencies of food ratings.
Results

The first day of class students tasted and rated 6 different varieties of cheese, including cheddar, provolone, havarti, Swiss, pepper jack and mozzarella. Of the cheeses tasted cheddar was preferred over any other option, with 51% preferring cheddar cheese. Provolone was a distant second with 16% of the ratings (Figure 2).

The second day students tasted and rated 3 different types of yogurts. Thickened yogurt was designed to be pushed out of a sealed package. Strawberry and blueberry flavors were provided. Yogurt smoothies are thinned yogurts designed to be drank like milkshakes. Three different flavors including raspberry, blueberry, and organic strawberry were provided. The third food item was a traditional low-fat yogurt in three flavors; strawberry, blueberry, and peach. Students preferred the thickened yogurt more than any other receiving 56% of the positive ratings (Figure 3).

The third class tasting was an assortment of milk. Low-fat chocolate milk, low-fat strawberry milk, soy milk, eggnog, and 1% regular milk were tasted and rated. Strawberry milk was the favorite with 31% of the ratings followed closely by regular 1% milk with 25% (Figure 4).

The fourth tasting included pudding, and non-dairy alternatives rich in calcium. Fresh uncooked broccoli, sesame seed bagels, fresh oranges, and three pudding flavors (tapioca, chocolate, and espresso) were provided. Students preferred the sesame seed bagels with 43% of the ratings, followed by pudding with 36% (Figure 5). The fifth and final class day students were presented with an opportunity to make their own ice cream and observe the process of making cheese by a university dairy professor. Students used the adapted version of the dairy
product evaluation questionnaire. Of all the dairy foods tasted during the 5 week calcium/dairy education classes students preferred the in-class prepared ice cream to any other dairy food (Figure 6). Ice cream was chosen as the best dairy food 11 times followed by yogurt with 8 best votes. Students were also asked if flavored milks were available next to the soda machine for the same price, would they choose milk over soda. Results show that 53% of the students would choose flavored milk over soda while 41% would continue to choose soda over milk (Figure 7).

**Teaching Strategies**

Throughout the 5 week session, calcium/dairy educators worked closely with the classroom teacher, and two nursing professors to discuss successful and unsuccessful approaches to teaching. Students enrolled in this school traditionally do not take reading materials home and therefore rarely carried book bags. This proved to be a difficult barrier in attaining consent forms from the parents/legal guardians. Students did not sit in rows but rather, preferred a semi circle configuration where each student was visible to the other and the educator was placed in the center.

Students were not accustomed to guest speakers being present in their classrooms, and were uncomfortable with the more structured learning style of these guests. Traditional lecture and power-point presentations proved difficult to keep students engaged. Students did not react well to being “talked to”; rather, students preferred interacting as a group in a less structured atmosphere. Students did not respond well to competitive games unless in a group activity.

With the advent of mobile technology, students were often texting on cellular phones, playing games on portable devices, or had an mp3 device plugged into one ear. Working with laptop computers proved particularly difficult. Students had access to the internet and would often require redirection from e-mail and inappropriate internet sites. Using the computers proved
time consuming and error prone. The 2nd 24-hour diet recall was unable to print for several students. Students were frequently absent; some students were retaking the class for the second time as a result of frequent absences. There were also new students arriving throughout the session. Therefore, classes were adjusted to include a review session and handouts had to be present for students who were new or missed previous classes. Approximately 10 minutes was lost each day due to this inconvenience. Physical activity was identified as a particular problem during discussions. Lesson plans were therefore altered to include a specific section on physical fitness.

There were several promising and some unexpected findings with this population. Students became more engaged and interested in the subject matter when lesson plans shifted to participatory activities. Students enjoyed activities that were interactive and hands-on. Word searches, crossword puzzles, and a jeopardy style quiz game were created for the students and they received small rewards for completing them. Open discussions predominated class teachings. This interaction with students allowed a level of rapport that was unexpected by observers. Students enjoyed tasting and rating the foods. Many students looked forward to the class each week. One student in particular was disciplined for absences with in-school suspension but specifically asked to be allowed to attend his “calcium” class. Many students were from low socioeconomic backgrounds and were open to discussing barriers to consuming adequate levels of calcium. Most students were not afraid to comment on their poor diet practices and were open to new and interesting ways to improve their health.

Discussion

The purpose of this study was to compare dairy foods to better understand adolescent food preferences, and to evaluate different teaching strategies in influencing adolescent dairy
consumption. This study provides valuable insight into adolescent dairy preferences by tasting and rating multiple dairy products available in supermarkets. Students were fascinated by observation of the transformation of milk to cheese and had strong opinions about the texture and taste. The assortment of cheese was rated on the first day and the cheese making demonstration was the last day; therefore cheese produced in class was not included in the final data. Students took particular interest in sampling eggnog and soy milk. Both items drew strong opinions from students. Therefore data is inconclusive as to what milk is preferred in this study. According to Think About Your Drink (2007), 20% of teens prefer 1% milk over any other while 12% prefer flavored milks. Soy milk was preferred less than 1%. In this project, thickened yogurts were provided for students and were preferred over any other yogurt. However, most students preferred the yogurt after it had been frozen; this was not recorded in our data and suggests that when combined with ice cream, frozen dairy beverages may be preferred over any other dairy product. It was expected that students would prefer ice cream over any other dairy product. It was not expected that when they made ice cream themselves they would prefer this product over any other dairy food. This finding supports previous data that adolescents who take part in purchasing and preparing foods prefer them over fast food/pre-prepared foods (Larson et al., 2006).

During class discussions students stated they often like school provided breakfasts and lunches. Although these meals are served a la carte, it does provide some control over what they are eating. It was also discovered that many students stated that they would drink milk more often if it was offered in a vending machine. The lunch cafeteria is only open during meal time and the only other option for purchasing beverages is the vending machine. Schools that introduced milk vending reported 68% of students purchased vended milk, and of those, 30%
purchased milk at least once a week. “Milk sales in the school cafeteria are not affected by vending machine sales. Students purchase milk at the expense of a different vended beverage” (Wisconsin Dairy, 2007). This suggests that altering school vending options to include water and dairy products would provide healthier and well-accepted options for adolescents.

This study also provided useful information on teaching strategies for alternative high school students. Alternative high school students require flexible schedules, noncompetitive learning environments, and interactive, participatory activities to be successful. Frequent teaching method and presentation adjustments are necessary to provide the student with the greatest opportunity to learn. Alternative high school students present a challenging but rewarding population to evaluate teaching methods. Well-designed research is needed to identify the best methods for delivery of health messages to this population. Further, long-term behavioral change evaluation should be the focus of future research efforts.

Results provided support for the use of Bronfenbrenner’s bio-ecological model in the development of interventions. Factors independently associated with calcium intake represented all interacting domains of influence within bio-ecological theory; the microsystem included the student and the educator interaction. The mesosystem included school and family interaction. The exosystem demonstrated the collaboration of the Washington Dairy Council, the state university and college of nursing, and the alternative high school. The macrosystem included cultural and societal biases, and the chronosystem, including the specific point in the adolescent’s life as well as the length of time exposed to the teaching model.

Limitations to this study include a small sample size, convenience sampling, and a short intervention length. Alternative high schools have transient populations with a number of students beginning or ending in the program throughout the academic year. The health and
nutrition class is offered primarily to freshman and sophomore students. These years tend to be
the most difficult for alternative students since they are adjusting to their new settings and testing
behaviors in the school. Adolescents often have established poor dietary eating habits while
sharing the teen perspective of invulnerability regarding unfavorable outcomes related to
behaviors. Students in alternative schools have limited access to dairy products, both because of
living in areas without adequate grocery stores and having a low expendable income. Because
research was limited to one school, results are not generalizable to other schools. Data collection
for this study was entirely dependent on the ability and willingness of students to participate.

Nutrition education can help students to develop strategies to choose calcium-rich foods
at home and in social situations. Schools can support the nutritional health of their students by
placing milk vending machines in halls, and serving breakfasts and lunches with calcium-rich
foods. Schools should continue to develop interventions that address barriers to calcium-rich
food intake among families with limited incomes. Future research should consider longitudinal
models and attempt to measure calcium intakes before and after a calcium/nutrition education
classes.
References


from

http://www.iom.edu/Object.File/Master/21/372/DRI%20Tables%20after%20electrolytes%20plus%20micro-macroEAR_2.pdf


http://www.pediatrics.org/cgi/content/full/117/2/578


http://www.hsph.harvard.edu/nutritionsource/calcium.html


Appendix A

WASHINGTON STATE UNIVERSITY

STUDY: ENHANCING DAIRY INTAKE AMONG ADOLESCENTS

Study Leaders:
Ruth Bindler, RNC, PhD, Professor, 324-7242
Margaret Bruya, DNSc, ARNP, FAAN, Professor, 324-7273
Affiliation: Washington State University College of Nursing/Intercollegiate College of Nursing, Spokane, WA

INFORMED CONSENT FOR PARENT/GUARDIAN

Introduction and Invitation to Participate
Your adolescent is being invited to participate in a research project designed to learn about teen’s diets and how they rate taste of dairy foods. The project is being conducted by Ruth Bindler, RNC, PhD, and Margaret Bruya, DNSc, ARNP who are nursing faculty members at Washington State University. It is hoped that the information learned will assist nurses learn how to encourage healthy diets by teens.

Purpose of the Study
This study will collect information that can help to learn information about teen diets and to apply teaching about dairy product intake. Improvements in diet are known to be influential in decreasing risks of obesity, cardiovascular disease and type 2 diabetes, major problems in the U.S. today. You are being asked to participate since you are a parent or guardian of a teen who is enrolled in the Health or Foods classes at Havermale High School. Information will be collected in the 2006-2007 academic year in classes at the school, students will receive teaching and have the opportunity to taste dairy products.

Procedures
If you agree to have your adolescent participate in the study, you will sign this consent form. The study will be explained to your adolescent at school and if he/she agrees to participate, an “adolescent assent” will be read and signed. If you both agree to take part in the study, your adolescent will state the foods they ate in a 24-hours period, will have a student nurse talk with them about the strengths and weaknesses of their diet, will have class content once weekly about dairy and calcium intake, and will have the opportunity to taste and rate dairy products, such as milk, cheese, and yogurt. While all students in the class will take part in the activities, the diet information and ratings of foods will be kept only for those who have signed consents.

Potential Risks and Discomforts
Your child may feel embarrassed about answering questions concerning foods eaten. The questions will be asked and results shared with teens in a private setting at the school. The teen may not like the taste of foods provided; they will not be required to eat any of the foods.

Potential Benefits to Participants
Your teen may benefit from knowing strengths and weaknesses of their diets and from discussion about this with the student nurses. Since the classroom information will be presented to all students and should enable everyone to increase knowledge about food choices that promote healthy living.

Alternative Treatments
If you choose not to participate in the study, your adolescent will receive usual school classes. You and your teen will not be treated differently at the school if you decide not to participate.
Participant Costs/Payments
There is no additional cost to you or payment for participation in this study.

Confidentiality
Information obtained as a part of this study will be strictly private and confidential. The information will be used only for research. All participating youth will be assigned code numbers and their names will be filed separately from the study data. Their names will not be maintained in the data files. Once the semester is over, the file with youth names will be destroyed so that only identification numbers are available. The completed study information will be kept in a locked file. At no time will any youth’s study number and personal information be available to anyone other than the research team. Study results will be reported only as part of the whole group.

Participant Rights
You may contact Ruth Bindler (509-324-7242) or Margaret Bruya (509-324-7273) at the WSU College of Nursing to get information or ask questions you may have about this study or your rights at any time. If you have further questions about your rights, you may call the Washington State University (WSU) Institutional Review Board at (509) 335-9661.

Your agreement for your adolescent to take part in this study is voluntary. If you agree to take part, you or your teen may choose to stop and withdraw this consent at any time. Your withdrawal or nonparticipation will not influence the progress of your adolescent in school or the care given at the Peoples Clinic site located at Havermale High School.

Informed Consent
I, as shown by my signature below, have had the study goals, procedures and risks that go along with taking part in the study explained to me.

I, as shown by my signature below, understand that taking part in this study is of my own free will and that I may stop at any time.

I, as shown by my signature below, give permission to the research team to use and get rid of the information and findings from this study. I understand that the investigators agree to protect the privacy and confidentiality of the information gathered in the study.

I, as shown by my signature below, agree to my child’s participation in the study.
I have read or had read to me the above information. I have been informed that I may call Ruth Bindler (509-324-7242) or Margaret Bruya (509-324-7273) with questions or concerns about the study. I have had the chance to ask questions about the study and the methods used to collect the study information. These questions have been answered to my satisfaction. I have received a copy of this consent form.

_________________________  _______________________
Signature of Parent/Guardian   Date

_________________________  _______________________
Signature of Investigator or Designate   Date

_________________________  _______________________
Signature of Witness   Date
Appendix B

WASHINGTON STATE UNIVERSITY

STUDY: ENHANCING DAIRY INTAKE AMONG ADOLESCENTS

Study Leaders:
Ruth Bindler, RNC, PhD, Professor, 324-7242
Margaret Bruya, DNSc, ARNP, FAAN, Professor, 324-7273
Affiliation: Washington State University College of Nursing/Intercollegiate College of Nursing, Spokane, WA

INFORMED ASSENT FOR ADOLESCENT UNDER 18YEARS

Our names are Ruth Bindler and Margaret Bruya. We are registered nurses, we teach nursing students, and study health. You and your parent or legal guardian are being asked to help with a study to see how we can help teens in school learn about healthy ways to eat. Havermale School is site of this study to help students be healthy because they have nursing students involved in the school and because the Peoples Clinic outreach site is at the school.

If you decide to take part in the study, you will answer some questions about the foods you eat and nursing students will use the computer to tell you about these foods. You will have Health or Foods classes about once a week about the uses of milk and calcium in the body. On each of these class days you will be able to taste a milk product such as milk, cheese or yogurt and will be asked to rate how much you like or dislike the product. We will use the information to find out more about what teens eat and how they rate dairy products.

All of the activities will take place in your Health or Foods class. Classmates or teachers will not know the results of your food intake. If you choose not to be part of the study you will still be in the class on dairy products and can taste the foods provided but the information you provide about what you eat and your opinion on dairy foods you taste will not be used in the research study. If you participate in the study, we hope you learn some things that will help you to be very healthy as well as maintain the very best health possible for you.

A number and not your name will be used to record the information about the foods you eat and your rating of dairy products. Only people working on the study will see your information. When the study is talked or written about in reports later, no names of those participating will be used. All the adolescents as a group will be talked about and not you as one person.

If you have any questions at any time, feel free to contact either Ruth Bindler at 324-7242 or Margaret Bruya at 324-7273. You can also contact the Washington State University Board that approved this research study at 509-335-9661.

Whether you decide to be a part of this study is up to you and your parent or guardian. You may choose to stop being in the study at any time, or you may choose to not do anything that you do not want to do. If you decide to quit being in the study, your school grades or health care provided at the clinic will not change.

I have read or have had read to me all the things about the study. All of my questions have been answered ok for me. In case of emergency I will call Ruth Bindler or Margaret Bruya at the numbers listed above. This form is being signed by me to show that I want to be in the study. I will get a copy of this form.

Signature of Adolescent __________________________ Date __________________________
Signature of Investigator or Designate  

Date

Signature of Witness  

Date
Appendix C

WASHINGTON STATE UNIVERSITY

STUDY: ENHANCING DAIRY INTAKE AMONG ADOLESCENTS

Study Leaders:
Ruth Bindler, RNC, PhD, Professor, 324-7242
Margaret Bruya, DNSc, ARNP, FAAN, Professor, 324-7273
Affiliation: Washington State University College of Nursing/Intercollegiate College of Nursing, Spokane, WA

INFORMED CONSENT FOR ADOLESCENT OVER 18 YEARS

Introduction and Invitation to Participate
You are being invited to participate in a research project designed to learn about teen’s diets and how they rate taste of dairy foods. The project is being conducted by Ruth Bindler, RNC, PhD, and Margaret Bruya, DNSc, ARNP who are nursing faculty members at Washington State University. It is hoped that the information learned will assist nurses learn how to encourage healthy diets by teens.

Purpose of the Study
This study will collect information that can help to learn information about teen diets and to apply teaching about dairy product intake. Improvements in diet are known to be influential in decreasing risks of obesity, cardiovascular disease and type 2 diabetes, major problems in the U.S. today. You are being asked to participate since you are a teen who is enrolled in the Health or Foods classes at Havermale High School. Information will be collected in the 2006-2007 academic year in classes at the school. Students will receive teaching and have the opportunity to taste dairy products.

Procedures
If you agree to participate in the study, you will sign this consent form. You will be asked to list the foods you ate in a 24-hour period, will have a student nurse talk with you about the strengths and weaknesses of your food intake, will have class content once weekly about dairy and calcium intake, and will have the opportunity to taste and rate dairy products, such as milk, cheese, and yogurt. While all students in the class will take part in the activities, the diet information and ratings of foods will be kept only for those who have signed consents.

Potential Risks and Discomforts
You may feel embarrassed about answering questions concerning foods eaten. The questions will be asked and results shared with each student in a private setting at the school. You may not like the taste of foods provided; you will not be required to eat any of the foods.

Potential Benefits to Participants
You may benefit from knowing strengths and weaknesses of your diets and from discussion about this food intake with the student nurses. Since the classroom information will be presented to all students and should enable everyone to increase knowledge about food choices that promote healthy living.

Alternative Treatments
If you choose not to participate in the study, you will still attend usual school classes. You will not be treated differently at the school if you decide not to participate.

Participant Costs/Payments
There is no additional cost to you or payment for participation in this study.
Confidentiality
Information obtained as a part of this study will be strictly private and confidential. The information will be used only for research. All participating teens will be assigned code numbers and their names will be filed separately from the study data. Their names will not be maintained in the data files. Once the semester is over, the file with teen names will be destroyed so that only identification numbers are available. The completed study information will be kept in a locked file. At no time will any teen’s study number and personal information be available to anyone other than the research team. Study results will be reported only as part of the whole group.

Participant Rights
You may contact Ruth Bindler (509-324-7242) or Margaret Bruya (509-324-7273) at the WSU College of Nursing to get information or ask questions you may have about this study or your rights at any time. If you have further questions about your rights, you may call the Washington State University (WSU) Institutional Review Board at (509) 335-9661.

Your to take part in this study is voluntary. If you agree to take part, you may choose to stop and withdraw this consent at any time. Your withdrawal or nonparticipation will not influence your progress in school or the care given at the Peoples Clinic site located at Havermale High School.

Informed Consent
I, as shown by my signature below, have had the study goals, procedures and risks that go along with taking part in the study explained to me.

I, as shown by my signature below, understand that taking part in this study is of my own free will and that I may stop at any time.

I, as shown by my signature below, give permission to the research team to use and get rid of the information and findings from this study. I understand that the investigators agree to protect the privacy and confidentiality of the information gathered in the study.

I, as shown by my signature below, agree to my participation in the study.

I have read or had read to me the above information. I have been informed that I may call Ruth Bindler (509-324-7242) or Margaret Bruya (509-324-7273) with questions or concerns about the study. I have had the chance to ask questions about the study and the methods used to collect the study information. These questions have been answered to my satisfaction. I have received a copy of this consent form.

Signature of Student ____________________________ Date ____________

Signature of Investigator or Designate ____________________________ Date ____________

Signature of Witness ____________________________ Date ____________
Figure 2.

**Favorite Cheese Frequency**

![Pie chart showing favorite cheeses]

- Provolone: 16%
- Swiss: 14%
- Cheddar: 11%
- Mozzarella: 5%
- Pepper Jack: 3%
- Havarti: 51%
Figure 3.

**Favorite Yogurt Frequency**

![Pie Chart showing favorite yogurt frequencies: 56% for Thickened Yogurt, 33% for Smoothies, and 11% for Regular Yogurt.](image)
Figure 4.

Favorite Milk Frequency

- Chocolate: 19%
- Strawberry: 25%
- Eggnog: 14%
- 1%: 11%
- Soy: 31%
Figure 5.

Favorite Pudding and Non Dairy Frequency

- Broccoli
- Sesame Bagels
- Pudding
- Orange
Figure 6. Dairy Food Ratings (Best to Worst)
Figure 7.

Would you choose milk over soda?

- Yes: 53%
- No: 41%
- No answer: 6%
Table 1.

CURRICULUM and TIMELINE

The curriculum was repeated two times during the academic year, each time with a new cohort of students. The curriculum takes place over five weeks, with once class weekly in nutrition and health classes devoted entirely to dairy consumption concepts.

Week 1 –
Introduction and statement of purpose to students. Background information on dairy products. 24-hour recall completed online. Work with students to analyze results using the eatsmart.org website. Review recommended levels of dairy consumption and compare them with their own results.
A selection of cheeses was served and rated.

Week 2 –
Review week one. Role of calcium and Vitamin D in the body. Explanation of portion sizes. Food Labels (Handout). Food label Game. Alternative Calcium Sources Game. Exercise power-point. Relationships between low calcium intake and particular diseases are presented.
A selection of yogurts was served and rated.

Week 3 –
Dairy farm video. Calcium function in the body exercise. Diseases associated with low calcium intake. Discussion focuses on barriers to achieving dietary goals, such as limited neighborhood, school, and family access, patterns of smoking, and others identified by students.
A selection of milk was served and rated.

Week 4 –
Alternatives to dairy were discussed. Lactose Intolerance power-point. Calcium Quiz. Importance of breakfast meal emphasized.
A selection of calcium rich alternatives to dairy was served and rated.

Week 5 –
Students completed another 24-hour diet recall accessed from eatsmart.org. Review results with students. Guest speakers from a local university discuss how cheese and ice cream are made as well as instructing students how to make their own cheese or ice cream. Cheese and ice cream were then prepared by the students, served, and rated.
Table 2.

Washington State University
Intercollegiate College of Nursing
Healthy Choices for Life
Washington Dairy Council

Dairy Product Evaluation

Name ___________________________ Date ____________
ID Number ________________________

Food tasted today _______________________

1. Before you taste this food, what do you think of it?
   a. I’ve tried this before, and I like it.
   b. I’ve tried this before, and I don’t like it.
   c. I never tried this before, but I do like it.
   d. I never tried this before, and I don’t like it.

2. How do you rate the taste of the food? Place a line across the horizontal line to indicate your rating.

            Great                             OK                             Awful

3. What did you like?
   _____ Taste
   _____ Texture
   _____ Color

4. What did you dislike?
   _____ Taste
   _____ Texture
   _____ Color

5. Would you eat this food again?
   _____ Yes
   _____ No
   _____ Maybe

6. Of the foods tasted today, which is your favorite?
Table 3.

Washington State University
Intercollegiate College of Nursing
Healthy Choices for Life
Washington Dairy Council

Name ______________________________

Of the foods tasted today what was your favorite? ________________________________

Rate the following on a scale from 0 – 5 (0 = horrible, 5 = great).

Taste ______
Texture ______
Color ______

Of all the dairy foods tasted, rate them from best (5) to worst (1). If you remember write in the details of the foods you tried.

Yogurt ________ ________________________________
Milk ________ ________________________________
Cheese ________ ________________________________
Ice Cream ________ ________________________________
Pudding ________ ________________________________

Did you like the class today?
Yes No

What did you like about this class?

What would you change about this class?

If flavored milks were available next to the soda machine for the same price, would you choose milk over a soda?

Yes No