2014

Flavored Milk and the National School Lunch Program

Ellen Hutchins
University of Kentucky

STUDENT AGREEMENT:

I represent that my capstone and abstract are my original work. Proper attribution has been given to all outside sources. I understand that I am solely responsible for obtaining any needed copyright permissions. I have obtained needed written permission statement(s) from the owner(s) of each third-party copyrighted matter to be included in my work, allowing electronic distribution (if such use is not permitted by the fair use doctrine) which will be submitted to UKnowledge as Additional File.

I hereby grant to The University of Kentucky and its agents the irrevocable, non-exclusive, and royalty-free license to archive and make accessible my work in whole or in part in all forms of media, now or hereafter known. I agree that the document mentioned above may be made available immediately for worldwide access unless an embargo applies.

I retain all other ownership rights to the copyright of my work. I also retain the right to use in future works (such as articles or books) all or part of my work. I understand that I am free to register the copyright to my work.

REVIEW, APPROVAL AND ACCEPTANCE

The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's capstone including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Ellen Hutchins, Student

Mark Swanson, Ph.D., Committee Chair

Dr. William Pfeifle, Director of Graduate Studies

Flavored Milk and the National School Lunch Program

Capstone Project Paper

A paper submitted in partial fulfillment of the
requirements for the degree of
Master of Public Health
in the
University of Kentucky College of Public Health
By
Ellen Hutchins
Little Rock, Arkansas

Lexington, Kentucky
April 23, 2014

Mark Swanson, PhD., Chair

Corinne Williams, PhD.

Christina Studts, PhD.

Introduction

According to the National Health and Nutrition Examination Survey (NHANES) nearly 17% of children nineteen years of age and younger are obese.[1] Obese children face many health ailments similar to those of obese adults including sleep apnea, asthma, hypertension, and early onset of type 2-diabetes.[2] These problems continue into adulthood when additional risks such as cancer and cardiomyopathy begin to develop.[2] Furthermore, obese children are at increased risk of adult obesity.[3] Addressing the childhood obesity challenge has become a national priority, with significant initiatives from the White House, USDA, CDC, and other national health organizations as well as numerous intervention research studies. [4-8] The national initiatives include Let's Move, National Farm-To-School, and My Plate. [9-11]

After the home environment, the elementary school is arguably one of the most influential on a child's lifelong habits, and it is an ideal place to begin obesity prevention.[12,13] Kids spend more than half the year in school, and consume up to two meals and a snack a day at school.[14] Examples of successful school interventions are the CATCH study, Chef Initiative, and the implementation of salad bars.[15-17] All three of these initiatives made simple changes to the school day such as having a chef present or a salad bar available during lunchtime in order to improve the health of their students. One such easy change that could be made is the removal of flavored milk from school meals.

Milk is an important and significant source of nutrients and calories in school meals. It provides nutrients such as calcium, vitamin A, vitamin D, and potassium. However, There is increasing concern about the dietary implications of the widespread use of flavored milks to meet the national school lunch program (NSLP) requirement.

This is because the flavored milk that is offered is full of sugar.[18] In 2009 the American Heart Association released a report stating that school aged children should only consume about 12g of added sugar per day. The NSLP strives to offer at least ⅓ of each day's recommended daily allowances.[19] Following this rule, students should only consume about 4g of added sugar per school lunch. Flavored milk alone has at least 6g of added sugar. This leads to an unnecessary increase in consumption of calories and sugar, and it may affect the consumption of other important low calorie, nutrient dense foods offered in the meal.[18,20] Students filling up on unnecessary sugars from flavored milk may not choose to eat nutrient dense items, and thus may not eat a balanced school meal. One argument against the removal of flavored milk from school meals is the lack of calcium that students will consume, but as seen in a study by the Yale Rudd Center for Policy and Obesity involving schools that removed flavored milk, consumption rates are similar in when looking at flavored versus white. Furthermore this study points out that calcium and added sugar can be received from other sources in the meal.[18]

Moreover, the data on how flavored milk affects the school lunch is of limited quality, relying mostly on self-reported twenty-four hour dietary recall. [21,22] Twenty-four hour recall is not particularly useful when dealing with young children or when needing actual serving sizes consumed.[23] This study provides needed information about how flavored milk consumption shapes the dietary habits of students during the school lunch hour.

This study uses objective, rather than self-reported, data to test the association between consumption of flavored milk and overall nutritional intake of school lunches. It is a cross-sectional study building upon previous research by looking at the school lunch

food and milk consumption through the examination of photos taken before and after school lunch and the weighing of milk cartons after lunch to measure consumption. The amount of nutrients from food eaten is expected to be lower when flavored milk is chosen over white milk because it is believed that students will fill up on milk and not eat the food. Additionally there is expected to be a difference in the amount of total nutrients consumed (food and milk) between students that consumed flavored milk versus students that consumed white milk. We aim to determine whether there is an association between type of milk chosen and the amount of food consumed, and the amount of total nutrients consumed between the types of milk chosen in order to better guide the discussion on the removal of flavored milk from school meals.

Methods

Subjects

Data for this study come from several independent studies all using digital photographic plate waste analysis. Lunch data from six elementary schools in five rural counties are used to explore the relationship between milk types and dietary intake. These rural counties were all located on the border on within the Appalachian region of Kentucky. An area with low incomes and high lunch participation rates in the NSLP. Data were collected on three separate occasions for each of the ten schools, and it was collected for all students in kindergarten through fifth grade each data collection period. However numbers from day to day vary because of absences or field trips[24].

Photographs of individual student lunches are included in this study, however, no identifying personal information was taken, and no there is no way to identify a particular

student based on the picture of their lunch. This study was approved by the Institutional Review Board at the University of Kentucky as well as the Superintendent and Food Service Director of each district.[24]

Procedure

Dr. Mark Swanson and four research assistants obtained data for this study. Before the start of each lunch period trays were marked with unique identifying tags that were color coded for each grade. Then at the start of the lunch period a before picture of each student's tray was taken. During the lunch period each student's milk carton was labeled with the tray number, and then finally at the end of each lunch period an after picture was taken of each tray and all milk cartons were weighed.

Two separate research assistants later examined each photograph. The assistants estimated the amount of each food item consumed to the nearest 10%, and then their results were averaged. Finally all data from the weighed milk cartons was entered into a spreadsheet and labeled as grams consumed. For more detail on the digital photographic plate waste method see, Swanson 2008.[23]

Measures

For this study, the independent variable milk consumption was measured by taking the weight of individual milk cartons at the end of each lunch period. The weight of an empty milk carton was used each time to tare the scale, and then each milk carton was weighed after lunch. Each weight was recorded as well as the type of milk -- chocolate, strawberry, or white – next to the corresponding tray number listed. This weight was then subtracted from total grams in a milk carton (246g for flavored milk and 244g for white milk) to get the grams that were consumed. This variable will be

compared to the dependent variable of other nutrients consumed during the lunch period. This variable was analyzed as described above in the procedures section, and then the nutrition information for each food item was calculated using data provided by the Fayette County School District, a larger school district in Kentucky that served similar food items, or a general calorie counting website when necessary.[25] Additionally a moderating variable that was collected include grade level. Figure 1 provides a visual model of the study.

Analytic Section

Analyses were conducted in four stages. In the first stage the analysis examined the relationship between the independent and dependent variables using a Pearson correlation. The second stage involved performing two one-sample t-tests to compare the flavored milk drinkers total nutrients consumed to the NSLP standards and then the white milk drinkers total nutrients consumed to the NSLP.[19] The third stage consisted of two independent t-tests using the dichotomous variable, flavored or not, to compare the amount of nutrients consumed from food between the two groups in one t-test and the amount total nutrients consumed between the two groups in the other. The second stage of analysis involved performing an ANOVA for the moderating variable, grade level. Only data from food that was served as part of the NSLP were analyzed. All analyses were done using version 21 of SPSS.[26]

Results

A total 1,190 students participated in the study, but as the data was collected between one and three times at each school, a total of 3,430 trays were examined. Of the 1,190 students, 15.3% were in kindergarten, 25.4% in first grade, 19% in second grade, 19.4% in third grade, 16.7% in fourth grade, and 4.2% in fifth grade. Also of the 3,430 trays examined 73.1% chose flavored milk while 16.7% chose white milk, and then 10.2% of the trays examined were missing milk (Table 1).

In the univariate analyses to compare nutrient intake to the NSLP standards, the mean for total nutrients consumed by flavored milk drinkers was statistically significantly lower for all the nutrients except vitamin C, protein, and added sugar which were statistically significantly higher (Table 2.2). The same was true for white milk drinkers (Table 2.3).

In the bivariate Pearson correlation analysis the amount of flavored milk consumed showed a moderate to strong correlation (.407, $p < .05$) to the amount of added sugar consumed. The amount of white milk consumed showed a weak (.109, $p<.05$) correlation to calories consumed. As well as a weak (.107, $p < .001$) correlation to the amount vitamin A consumed, and a weak correlation (.116, $p < .05$) to the amount of added sugar consumed (Table 2.1). In the other bivariate calculations when considering only nutrients consumed for food there was a statistically significant difference between the means of flavored milk drinkers and white milk drinkers for vitamin A (Table 2.4) with flavored milk drinkers consuming 37.1 grams less, but when nutrients consumed from food and milk were considered there were statistically significant differences for percent calories from fat, percent calories from saturated fat, vitamin A, calcium, and

added sugar (Table 2.5) with flavored milk drinkers consuming with flavored milk drinkers consuming less fat, saturated fat, and vitamin A and more calories, calcium, and added sugar.

Finally the one-way ANOVA showed a statistically significant difference between the amounts of flavored milk consumed by grade level (Table 3). A Tukey Post-Hoc test revealed a statistically significant difference between first and second graders (149.2 ± 100.3 to 169.8 ± 98.0, $p < .05$) and between first and fourth graders (149.2 ± 100.3 to 176.5 ± 106.7). However there was no significant difference between the amounts of white milk consumed by grade level.

Discussion

This study examined if there was a relationship between the amount and type of milk of consumed and the amount of nutrients consumed during a school lunch period. Results indicated that differences do exist between flavored milk drinkers and white milk drinkers when comparing them to the NSLP standards, as well as to each other especially when looking at the amount of added sugar consumed. There were some correlations found between the amount of milk, flavored or white, consumed and the amount of other nutrients consumed from food only. In addition the amount of milk consumed by grade level did not follow a consistent pattern.

This study rejected the hypothesis that the greater the consumption of flavored milk the less the consumption of nutrients consumed from food only would occur. Rather it found that there were mostly positive correlations between the two. The strongest correlation found was between flavored milk consumed and added sugar consumed from food. Additionally flavored milk drinkers showed a slight negative correlation to the

amount of calcium consumed from food. Furthermore the white milk drinkers had three positive correlations, calories, vitamin A, and vitamin C that were stronger than the flavored milk drinkers. Both groups showed a positive correlation to added sugar, but the white milk drinkers correlation was weaker. It is an important to note these differences because if students choosing flavored milk are also choosing other foods high in added sugar, they are certain to go over the lunchtime recommended amount of 4g as flavored milk already has at least 6g of added sugar. This is a point that many studies fail to account for, and a point that others have stated could occur and should be accounted for during meal planning.[18,27]

Several previous studies have also stated that flavored milk is a valuable part of the school meal because it provides significant amounts of necessary nutrients such as calcium, vitamin A, vitamin C, while only minimally contributing to the amount of added sugar consumed that a child consumes.[21,22,28] However in this study, when looking at the type of milk consumed, flavored or white, versus the NSLP standards, both the flavored milk drinkers and the white milk drinkers met or exceeded the minimum requirements for protein and vitamin c. In addition both groups were above the amount of recommended added sugar. White For all other nutrients: calories, percent calories from fat, percent calories from saturated fat, vitamin A, calcium, and iron, both groups means were statistically significantly lower than the standard (Tables 2.2 and 2.3). The amount of added sugar is the most alarming, and where this study most differs from previous literature.[22] The flavored milk drinkers on average consumed 5g more added sugar (approximately 9g total) during the school lunch period than the recommended amount of 4g, while the white milk drinkers only consumed an extra .4 grams. In this case flavored

milk seems to contribute more than minimally to the amount of added sugar consumed. It is also important to note that white milk drinkers are closer to the NSLP standard for fat, but at least some of this may be attributed to the fact that white milk in school lunches is one percent while flavored is fat free.

This study agrees that milk can be an important contributor to essential nutrients throughout the school lunch period and the day, but it did not find that flavored milk was necessary to meet the NSLP standards. In other words the consumption of any kind milk during lunch helped students get closer NSLP goals, as can be noted by the differences in means in Tables 2.4 and 2.5, but flavored milk drinkers only consumed significantly more of one nutrient compared to the white milk drinkers. As Table 2.5 shows, white milk consumers consumed statistically significantly more vitamin c, fat, and saturated fat. Moreover they consumed less sugar all while the flavored drinkers consumed statistically significant more calcium. The flavored milk drinkers consumed on average 9.3mg more. However as previously stated, neither group was able reach the NSLP standard of 286mg, so the question is now whether or not 9.3mg really matters. This study argues that 9.3mg does not really matter because though it is five percent difference when taking into account the obesity epidemic and the extra sugar and calories flavored milk adds to the school meal, 9.3mg because a small amount. Furthermore there has been at least one study that effectively changed students' behaviors in choosing white milk over flavored milk without changing overall consumption totals, and another has found that children will consume white milk if it is the only option.[29,30]

Finally while significance was found between some grade levels and the amount of milk consumed, the results were random, and it was not felt that it contributed to the

study. Additionally the grades are not truly comparable because not every school had every grade. The fifth grade sample was too small because only two of the six schools had fifth grade.

In conclusion while there is little to no association between the amounts of flavored milk consumed and the amount of other nutrients from consumed there is an association between flavored milk consumption and too much added sugar, and there is not a strong association between the type of milk chosen and whether or not the NSLP standards are met.

Limitations

This study has several limitations. The first of which is that it is cross-sectional. This does not allow for any causal conclusions, and it only provides a small snapshot into the school year. With this is also that the NSLP standards are averages for an entire school week or five days, and as the sample for this study each tray individually it really only looks at one school day. Additionally this study failed to take into account any condiments or a la carte items that were consumed during the lunch period. It also fails to account for any sharing or trading of food items that may occur during the lunch period. These two issues can cause either underestimation or an overestimation of what was actually consumed. Finally this study is limited in generalizability. This is not only because it is cross-sectional, but also because the population selected is not truly representative.

Implications

This study helped show the relationship between the type of milk consumed and the type and amount of nutrients consumed during the school lunch. It showed that

flavored milk is associated with increased intake of added sugar during the school lunch period especially when other foods with added sugar are consumed. Moreover this study provides a springboard for other studies. Other studies can use similar techniques for measuring food and beverage consumption, but they can also use a more rigorous study design. Lastly this study could be used in arguments regarding flavored milk offerings during the NSLP.

References

1. Centers for Disease Control and Prevention NCHS. National Health and Nutrtion Examination Survey. Hyattsville, MD: U.S. Department of Health and Human Services; 2010-2011.
2. Dietz WH. Health consequences of obesity in youth: Childhood. *Pediatrics.* 1998;101(3):518.
3. Singh AS, Mulder C, Twisk JW, van Mechelen W, Chinapaw MJ. Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obesity reviews : an official journal of the International Association for the Study of Obesity.* Sep 2008;9(5):474-488.
4. Agriculture USDo. National School Lunch Program. 2012.
5. Wu Y, Lau BD, Bleich S, et al. AHRQ Comparative Effectiveness Reviews. *Future Research Needs for Childhood Obesity Prevention Programs: Identification of Future Research Needs From Comparative Effectiveness Review No. 115*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2013.
6. Turner L, Slater SJ, Chaloupka FJ. Support for school-based obesity prevention efforts: attitudes among administrators at nationally representative samples of US elementary schools. *Childhood obesity (Print).* Aug 2013;9(4):311-318.
7. Elder JP, Crespo NC, Corder K, et al. Childhood obesity prevention and control in city recreation centres and family homes: the MOVE/me Muevo Project. *Pediatric obesity.* Jun 11 2013.
8. Showell NN, Fawole O, Segal J, et al. A systematic review of home-based childhood obesity prevention studies. *Pediatrics.* Jul 2013;132(1):e193-200.
9. Let's Move. 2014; http://www.letsmove.gov/.
10. National Farm To School Network. 2014; http://www.farmtoschool.org/.
11. Choose My Plate. 2014; http://www.choosemyplate.gov/.
12. Story M, Kaphingst KM, French S. The Role of Schools in Obesity Prevention. *The Future of Children.* 2006;16(1):109-142.
13. Cohen JF, Rimm EB, Bryn Austin S, Hyatt RR, Kraak VI, Economos CD. A food service intervention improves whole grain access at lunch in rural elementary schools. *The Journal of school health.* Mar 2014;84(3):212-219.
14. Phillips M, Raczynski J, West D, Pulley L, Bursac Z, Leviton L. The Evaluation of Arkansas Act 1220 of 2003 to Reduce Childhood Obesity: Conceptualization, Design, and Special Challenges. *Am J Community Psychol.* 2013/03/01 2013;51(1-2):289-298.
15. Nader PR, Stone EJ, Lytle LA, et al. Three-year maintenance of improved diet and physical activity: the CATCH cohort. Child and Adolescent Trial for Cardiovascular Health. *Archives of pediatrics & adolescent medicine.* Jul 1999;153(7):695-704.
16. Cohen JF, Smit LA, Parker E, et al. Long-term impact of a chef on school lunch consumption: findings from a 2-year pilot study in Boston middle schools. *Journal of the Academy of Nutrition and Dietetics.* Jun 2012;112(6):927-933.

17. Slusser WM, Cumberland WG, Browdy BL, Lange L, Neumann C. A school salad bar increases frequency of fruit and vegetable consumption among children living in low-income households. *Public health nutrition.* Dec 2007;10(12):1490-1496.
18. Read M. Milk Consumption in Schools Offering Plain versus Schools Offering Plain and Flavored Milk. 2011.
19. National School Lunch Program and School Breakfast Program: School Meals Initiative for Healthy Children. In: Agriculture USDo, ed. Vol 601995.
20. Poti JM, Slining MM, Popkin BM. Solid fat and added sugar intake among U.S. children: The role of stores, schools, and fast food, 1994-2010. *Am J Prev Med.* Nov 2013;45(5):551-559.
21. Briefel RR, Wilson A, Cabili C, Hedley Dodd A. Reducing calories and added sugars by improving children's beverage choices. *Journal of the Academy of Nutrition and Dietetics.* Feb 2013;113(2):269-275.
22. Murphy MM, Douglass JS, Johnson RK, Spence LA. Drinking flavored or plain milk is positively associated with nutrient intake and is not associated with adverse effects on weight status in US children and adolescents. *J Am Diet Assoc.* Apr 2008;108(4):631-639.
23. Swanson M. Digital photography as a tool to measure school cafeteria consumption. *The Journal of school health.* Aug 2008;78(8):432-437.
24. Swanson M. Digital Photography as a Tool to Measure School Cafeteria Consumption. *Journal of School Health.* 2008;78(8):432-437.
25. http://caloriecount.about.com/.
26. *IBM SPSS Statistics* [computer program]. 2012.
27. Nestle M. Chocolate Milk Redux: Nutrifluff vs. Policy. *Food Politics*2009.
28. Flavored Milk in Perspective. 2005; http://www.nationaldairycouncil.org/SiteCollectionDocuments/child_nutrition/health_kit/FMD09177_FlavoredMilk_V13.pdf.
29. Pittman DW, Parker JS, Getz BR, et al. Cost-free and sustainable incentive increases healthy eating decisions during elementary school lunch. *International journal of obesity (2005).* Jan 2012;36(1):76-79.
30. Schwartz MB. Clarifying the Chocolate Milk Controversy. *Blog Post for: Marlene B. Schwartz, PhD*2009.

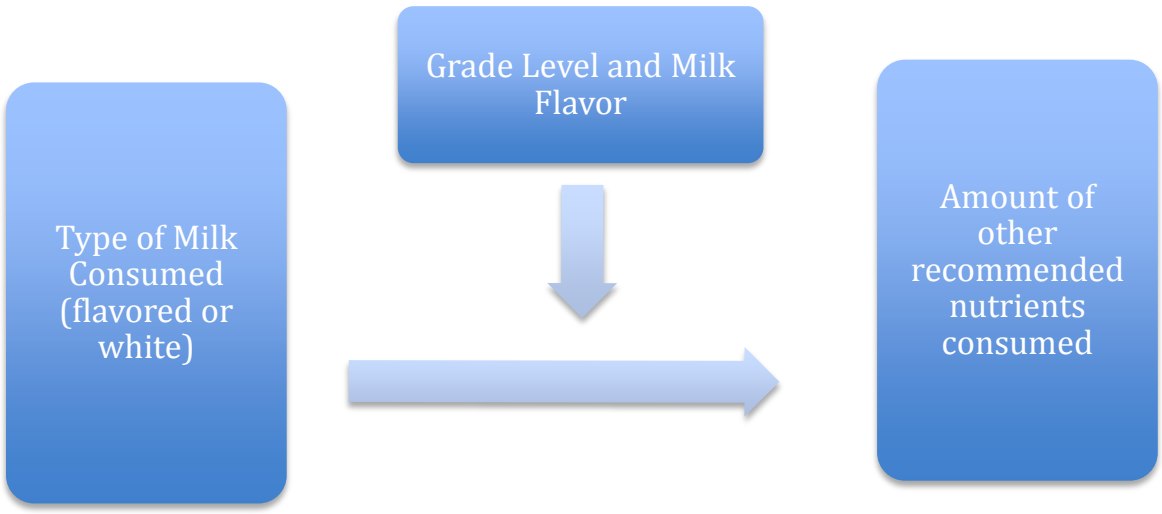

Figure 1: Conceptual Model

Table 1: Population Characteristics

Variable	Number (%)
Grade	
Kindergarten	182 (15.3)
First	302 (25.4)
Second	226 (19.0)
Third	231 (19.4)
Fourth	199 (16.7)
Fifth	50 (4.2)
Total	1,190
Milk Consumption	
Flavored	2,508 (73.1)
White	573 (16.7)
Missing	349 (10.2)
Total	3,430

Table 2.1: Bivariate Correlations Food Nutrient Consumption vs. Milk Consumption

Nutrient	Flavored Milk Consumption	White Milk Consumption
Calories	.066 *	.109 **
% Fat	-.006	-.032
% Saturated Fat	.017	.059
Protein (g)	.058 *	.113
Vitamin A (RE)	.033	.107 **
Vitamin C (mg)	.084 *	.093 **
Calcium (mg)	-.041 **	.064
Iron (mg)	.018	.016
Added Sugar (g)	**.407 ***	**.116 ***

Note: Correlations marked with * and ** were significant at p< .05 and p < .001 respectively

Table 2.2: One Sample T-test NSLP Lunch Standards Vs. Nutrients Consumed
(Flavored Milk)

Nutrient	Standard	Mean	Mean Difference	Sig.
Calories	664	382.4	-281.6	.0005
% Fat	30	26.2	-3.8	.0005
% Sat Fat	10	7.6	-2.4	.0005
Protein (g)	10	18.2	8.2	.0005
Vit A	224	124.4	-99.6	.0005
Vit C	15	17.0	2.0	.002
Calcium	286	197.9	-88.1	.0005
Iron	3.5	2.4	-1.1	.0005
Added Sugar	4	9.4	5.4	.0005

Table 2.3: One Sample T-test NSLP Lunch Standards Vs. Nutrients Consumed
(White Milk)

Nutrient	Standard	Mean	Mean Difference	Sig.
Calories	664	371.6	-292.4	.0005
% Fat	30	29.9	-.05	.0005
% Sat Fat	10	9.3	-.71	.0005
Protein	10	18.2	8.2	.0005
Vit A	224	153.6	-70.4	.0005
Vit C	15	20.3	5.3	.012
Calcium	286	188.2	-97.8	.001
Iron	3.5	2.3	-1.2	.0005
Added Sugar	4	4.4	.403	.019

Table 2.4: Independent T-test for Nutrients from Food Only

Nutrient	Flavored Milk Mean	White Milk Mean	Difference	Sig
Calories	297.8	289.9	7.9	.241
% Fat	31.99	31.63	.4	.505
% Sat Fat	8.53	8.83	-.3	.149
Protein	12.62	13.14	-.5	.314
Vitamin A	85.8	122.9	-37.1	.007
Vitamin C	16.5	18.6	-2.1	.140
Calcium	107.6	104.5	3.1	.592
Iron	2.1	2.2	.1	.166
Added Sugar	5.6	5.4	.2	-.737

Table 2.5: Independent T-test for Nutrients Consumed from Food and Milk

Nutrient	Flavored Milk Mean	White Milk Mean	Difference	Sig
Calories	382.4	376.1	10.8	.189
% Fat	23.41	30.76	-7.4	.0005
% Sat Fat	6.82	8.76	-1.9	.0005
Protein	18.2	18.2	0	.931
Vitamin A	123.8	154.1	-30.3	.843
Vitamin C	17	19.2	-2.2	.140
Calcium	197.7	188.4	9.3	.0005
Iron	2.1	2.2	-.1	.576
Added Sugar	9.7	4.4	5.3	.0005

Table 3: Mean Milk Consumed by Grade Level

Variable	Grade	Mean (Std. Dev)	Standard Error	F Statistic (P)
Total Flavored Milk Consumed				.0005
	Kindergarten	162.5 (98.0)	5.0	
	First	149.2 (100.3)	3.8	
	Second	169.8 (98.0)	4.6	
	Third	159.6 (159.6)	4.5	
	Fourth	176.1 (176.5)	9.2	
	Fifth	176.1 (93.8)	9.2	
Total White Milk Consumed				.579
	Kindergarten	152.3 (76.9)	7.5	
	First	142.9 (82.7)	7.2	
	Second	153.3 (101.7)	9.4	
	Third	154.3 (83.4)	8.2	
	Fourth	166.1 (92.5)	9.6	
	Fifth	155.0 (94.9)	17.9	