

1 Title: **“Evaluation of effectiveness of class-based nutrition intervention on changes in**
2 **soft drink and milk consumption among young adults.”**

3
4
5 Eun-Jeong. Ha^{1§}, Natalie Caine-Bish¹, Christopher Holloman², Karen Gordon¹.

6
7 ¹Family and Consumer Studies, Kent State University, 100 Nixson Hall, Kent, OH
8 44242, USA

9 ²Department of Statistics, the Ohio State University, 1958 Neil Ave, Columbus, Oh
10 43210, USA

11
12
13 [§]Corresponding Author

14 Email addresses:

15
16 EH: eha@kent.edu

17
18 NC: ncaine@kent.edu

19
20 CH: holloman@stat.osu.edu

21
22 KL: klowry@kent.edu
23
24
25
26
27
28
29
30
31

32 **Abstract**

33 **Background**

34 During last few decades, soft drink consumption has steadily increased while milk intake
35 has decreased. Excess consumption of soft drinks and low milk intake may pose risks of
36 several diseases such as dental caries, obesity and osteoporosis. Although beverage
37 consumption habits form during young adulthood having a strong impact on beverage
38 choices in later life, nutrition education programs for improving the nutritional quality of
39 beverages are scarce in this population. The purpose of this investigation was (1) to
40 assess soft drink and milk consumption and (2) to evaluate the effectiveness of 15-week
41 class-based nutrition intervention in changing beverage choices among college students.

42 **Methods**

43 A total of 80 college students aged 18 to 24 years who were enrolled in basic nutrition
44 class participated in the study. Three-day dietary records were collected, verified, and
45 analyzed before and after the intervention. Class lectures focused on healthful dietary
46 choices related to prevention of chronic diseases and were combined with interactive
47 hands on activities and dietary feedback.

48 **Results**

49 Class-based nutrition intervention combining traditional lecture and interactive activities
50 was successful in decreasing soft drink consumption. Total milk consumption,
51 specifically fat free milk, increased in females. Meantime, male students changed milk
52 choice favoring skim milk over low fat milk. (1% and 2%). Class-based intervention in a
53 general nutrition course may be an effective approach to motivate changes in eating
54 behaviors in the college setting.

55 **Conclusion**

56 Class-based nutrition education focusing on prevention of chronic diseases can be an
57 effective strategy in improving both male and female college students' beverage choices.
58 Using this type of intervention in a general nutrition course may be an effective approach
59 to motivate changes in eating behaviors in a college setting.

60

61 **Background**

62 In the USA, carbonated soft drinks and milk are the two most popular non-
63 alcoholic beverages, accounting for 39.1% of total beverage consumption [1]. Soft drink
64 consumption has exploded over the past three decades [2] showing that per capita
65 availability increased from 22 gallons to 52 gallons [3,4]. Sugar sweetened soft drinks
66 became a major source of added sugar in the American diet [5,6] and have been linked to
67 adverse nutritional and health consequences such as dental caries and obesity [5,7-12].
68 Furthermore, evidence also supports an association between soft drink consumption and
69 decreased bone mineral density (BMD) [8,13,14].

70 Milk and other dairy products are the major source of dietary calcium
71 contributing to about 70 % of the calcium in the U.S. food supply[13]. Sixty years ago,
72 Americans drank more than four times more milk as compared to soft drinks, but 2 1/3
73 times more soft drinks were consumed than milk by 1998 [3]. This trend demonstrates a
74 possible displacement of milk intake [15]. In addition, data showed that between age 6
75 and 19 years, age is positively associated with soft drink consumption and negatively
76 with milk intake [16]. This relationship is most prevalent in adolescents and young adults
77 [13]. Sufficient intake of calcium, especially during adolescence and young adulthood, is

78 important to maximize peak bone mass (PBM). Failure to achieve PBM increases the
79 incidence of osteoporotic fracture later in life [18].

80 Young adulthood is a unique period whereby youth obtain independence from
81 their parents. People in this age group are vulnerable to develop unhealthy behaviors [19,
82 20], which will predispose them to chronic diseases later in life [21]. A longitudinal
83 study tracking soft drink intake from early adolescence to later adulthood demonstrated
84 that soft drink consumption from young adulthood remained stable [17]. This data
85 indicates beverage consumption habits formed during young adulthood may have a
86 strong impact on beverage choices in later life. In addition, since milk intake decreases
87 with age after childhood, there is an urgent need for tailored nutrition intervention
88 targeting the young adults to improve their beverage choices.

89 The purpose of this investigation was two-fold: 1. to assess soft drink and milk
90 consumption 2. and to evaluate the effectiveness of 15-week class-based nutrition
91 intervention in changing beverage choices among college students.

92

93 **Methods**

94 During spring 2006, ninety healthy college students, between the ages of 18 and
95 24 years, enrolled in a basic sophomore level nutrition class at a Midwest University
96 participated in the study. This research was approved by the University Institutional
97 Review Board and informed consent was obtained from each participant before
98 enrollment in the project.

99 The present study used a pre-post test design. Data were collected during the first
100 two weeks and the last week of spring semester in 2006. Body weight was measured in

101 kilograms to the nearest 0.1kilogram on an electronic scale in light clothing without
102 shoes. Standing height was recorded without shoes on a portable stadiometer to the
103 nearest 0.1 centimeter with mandible plane parallel to the floor. Each subject's BMI was
104 calculated as weight (kg)/ height ²(m).

105 Dietary intake was assessed using 3-day dietary records for two typical weekdays
106 and one weekend day. A variety of tools were used to obtain reliable data. Food models,
107 measuring cups and spoons, household utensils, and tableware were used to illustrate
108 proper portion sizes. Participants were asked to collect and bring all the food labels of
109 products they consumed during data collection period. To obtain the most accurate
110 dietary data, research associates visited local restaurants and campus cafeterias where the
111 majority of participants ate to gain accurate information about ingredients and portion
112 sizes. Foods were purchased if needed. Dietary analysis was performed by the same
113 individual using NutriBase IV Clinical (Cyber Soft Inc, Arizona).

114 The class met three times per week for 50 minutes per session. Class lectures
115 specifically emphasized 1) the importance of nutrition related to prevention of chronic
116 diseases, 2) increasing consumption of fruits, vegetable and whole grain products, 3)
117 encouraging low fat dairy product consumption, 4) discouraging over reliance on dietary
118 supplements and 5) promoting active lifestyle. In addition to the traditional approach by
119 lectures, video-tape watching and various hands-on activities were integrated. Hands-on
120 activities were designed to enable students to translate lecture materials into real life
121 application. For example, after lectures of lipid and calcium, students assessed their risks
122 for heart disease and osteoporosis, by completing risk assessment forms. These activities
123 helped students identify risk factors and realize that they are not free of chronic disease

124 risks just because they are young or currently disease free. In addition, students
125 completed “Happy Body Log” and listed good things that they did for their body in a
126 daily log. The key of this activity was to start with small behavior changes such as: not
127 eating while watching T.V., reducing portions of single condiments, choosing skim milk
128 over 2% milk. Another approach to encourage dietary behavior change included returning
129 the results of dietary analysis to the students. They were asked to bring their returned
130 results to every class. During lectures, students compared their actual intakes to dietary
131 recommendations (i.e. MyPyramid and Dietary Recommended Intake), which allowed
132 them to realize the strengths and weaknesses of their diet.

133 Descriptive statistics were presented as means and standard errors. Repeated
134 measures ANOVA with gender as a between-subjects factor and time as a within-subjects
135 factor was used to compare consumption of total soft drink, regular soft drink, diet soft
136 drink, total milk, low fat milk and fat free milk before and after the intervention. Because
137 there were many more females than males in the class, paired t-tests would be heavily
138 biased toward the females. Therefore, the estimated marginal means obtained from a
139 repeated measures linear model were provided for the pre- and post-test, weighting males
140 and females equally. Estimated marginal means were chosen to represent the total effect
141 since the population of interest includes all college students. Among college students,
142 males and females are represented more evenly than in our sample, so such a summary is
143 justified. Significance tests for the marginal means draw power from the full sample,
144 while the effect size is a compromise between the effect sizes for males and females. As
145 a result, it is possible to have non-significant effects for each gender alone, but significant
146 effects for the marginal means. In addition to the values in the table, total calcium intake

147 and calcium intake from milk at pre- and posttest were calculated. Spearman correlations
148 were calculated to quantify correlations among variables before and after the
149 intervention. Correlations were calculated among change scores. Significance was set a
150 priori at $P \leq 0.05$. All analyses were performed using SPSS for Windows (version 15.5,
151 2007, SPSS, Chicago, Ill). The result of this study is limited to beverage consumption
152 and the results from other data from the food records have been published elsewhere (22).

153

154 **Results**

155 Among ninety students enrolled in a sophomore level general nutrition course, 80
156 students completed the study. Participants were mainly females (87.5 %) and white
157 (89.7%). Average BMI of the participants was $26.3 \pm 5.63 \text{ kg/m}^2$. Average age of the
158 participants was 20.15 ± 1.38 years.

159 Table 1 summarizes the data and statistical tests on change in beverage
160 consumption as a result of the intervention.

161 Total soft drink consumption significantly decreased from baseline ($P < 0.05$),
162 although there was insufficient evidence to declare a significant difference for either
163 gender alone. There was marginal evidence that regular soft drink consumption at
164 posttest decreased from the baseline. No change in the consumption of diet soft drink was
165 demonstrated.

166 For total milk, combining results across genders, no significant change was
167 observed. However, the average change in total milk consumption was significantly
168 increased from baseline ($P < 0.05$) for females but not for males. Whole milk consumption
169 at baseline did not change after the intervention in either gender. Low fat milk

170 consumption decreased significantly ($P<0.05$) due to a significant change in males.
171 Whereas, there was a significant increase in fat free milk intake after the intervention
172 ($P<0.01$). This effect was observed to be significant in females ($P<0.05$) and marginally
173 significant in males.

174 Total calcium intake at pretest was 813.18 ± 501.48 mg and 858.21 ± 373.11 mg at
175 posttest, respectively. Calcium intake contributed by milk consumption was 156.75 mg at
176 the pretest and 233.0 mg after the intervention.

177 Correlation coefficients between milk and soft drink consumption were not
178 significant at baseline, which remained the same after the intervention. In addition,
179 changes in consumption for each type of drink were not correlated with each other except
180 for an observed negative correlation between the change in fat free milk intake and the
181 change in low fat milk consumption whereby as fat free milk consumption increased low
182 fat milk consumption decreased ($r=-0.317$, $P<0.05$). In addition, there was a positive
183 correlation between milk consumption and dietary calcium intake ($r=0.578$, $P<0.001$) at
184 baseline, which further increased after the intervention ($r=.689$, $p<0.001$).

185

186 **Discussion**

187 The results of this study provided evidence that the class-based nutrition
188 education was a viable mechanism to use to help college students make positive changes
189 in soft drink and milk consumption. Previous literature has demonstrated that there have
190 been several studies using college nutrition courses to motivate overall dietary changes
191 (23,24). Results of this research indicated that nutrition courses increased nutrition
192 knowledge but did not promote dietary changes. On the other hand, a study using a

193 college nutrition science course to prevent weight gain in freshmen revealed that class-
194 based nutrition education may help college students translate nutrition knowledge into
195 dietary changes (25). Overall, prior research on interventions targeting college students'
196 dietary behaviors suggest a need to develop curriculums targeting specific nutrition
197 behaviors in college students

198 After the intervention, overall total soft drink consumption had significantly
199 decreased from baseline. The decrease in total soft drink consumption was mainly due to
200 the reduction in regular soft drink consumption because diet soft drink intake did not
201 decrease as a result of the intervention. The general nutrition class designed to increase
202 the awareness of importance of nutrition in prevention of chronic disease through the
203 combination of traditional lecture with interactive activities may have encouraged the
204 students to reduce soft drink consumption as a part of healthy eating practice. Although it
205 is still debated whether soft drink consumption is associated with increasing obesity rates
206 or decreased milk consumption, it is evident that soft drink consumption has been linked
207 to some negative life style and dietary patterns [26-29]. In a cluster study, Kvaavik et al.
208 found that soft drink consumption could be a marker of unhealthy eating behaviors [16]
209 indicating that reduced intake of soft drink in the current investigation may reflect
210 increased overall diet quality by class-based nutrition intervention.

211 It should be noted that the amount of soft drinks consumed before the intervention
212 was lower than the results reported by other researchers [30,31] who reported daily soft
213 drink intake of young adults between 11 and 14.4 ounces. There are several reasons to
214 explain this discrepancy. In a study of adolescents, Bere et al. [32] reported that the
215 participants who planned to receive college education showed lower odds of drinking soft

216 drink. Cullen et al. [33] also found that lower parental education was associated with
217 higher consumption of soft drinks. This data perhaps suggests that lower soft drink
218 consumption in the current study may have been due to the higher education level of the
219 participants, college students, compared to the study population, a mixture of both
220 college students and young adults not enrolled in college, used in the previous studies
221 [31].

222 A second positive finding of this study is that, although total milk consumption did not
223 increase significantly between the genders, females increased their total milk
224 consumption by increasing fat free milk intake while maintaining their low fat milk
225 intake at the same level. Daily calcium intake contributed by milk consumption in
226 females was 156.75 mg at the pretest and 233.0 mg after the intervention. This indicates
227 that only 19 % of total calcium intake was coming from milk before intervention and
228 25% after intervention. This is an encouraging finding because females are at an
229 increased risk to develop osteoporosis in later life if calcium intake is compromised
230 during adolescence and young adulthood. Meanwhile, males switched their milk choices
231 from low fat milk to fat free milk since their total milk consumption did not change,
232 which may demonstrate males may not recognize osteoporosis as an immediate danger
233 due to a broad notion that osteoporosis an “old woman’s disease” [28]. It may be that the
234 males chose fat free milk over low fat milk in an attempt to reduce fat intake, which was
235 an important educational component in the classroom lectures and projects. However, it
236 should be noted that, even after the intervention, milk and calcium intake was still much
237 lower than the recommended levels, 3 cups per day by MyPyramid (34) or 1000 mg (35)
238 for both genders at pre- or post-test, although total milk consumption increased in

239 females after the intervention. This finding underscores the necessity of nutrition
240 intervention specifically designed to increase calcium intake in college students.

241 The positive correlation between dietary calcium and milk intake supports the
242 idea that increasing milk consumption is a desirable way to encourage calcium intake to
243 promote adequate bone health.

244 Over the last two decades, several researchers have reported that a reduction in
245 milk intake coincides with an increased consumption of soft drinks consumption and
246 hypothesized that soft drink has displaced milk [6,15]. However, in agreement with the
247 previous finding by Storey et al. [36], the current study revealed no association between
248 soft drink consumption and milk intake at either baseline or posttest, perhaps suggesting
249 that soft drink consumption did not displace milk consumption in this population. This
250 finding may imply that educating individuals to decrease soft drink consumption is not
251 going to directing increase dairy consumption and that further dairy education needs to be
252 addressed to ensure an adequate consumption of dairy products other than milk.

253 A limitation of this study is that a convenience sample without a control group
254 was used. Therefore, the study population may not represent traditional college students.
255 In addition, possible confounding factors, such as seasonal variation in beverage
256 consumption, were not controlled for.

257 In conclusion, class-based nutrition education intervention which focused on the
258 prevention of chronic diseases has the potential in college students to reduce soft drink
259 consumption and to increase milk consumption, specifically fat free milk, in female
260 students and to alter milk choice in males from low fat milk to skim milk. Using this type
261 of intervention in a general nutrition course may be an effective approach to motivate

262 changes in eating behaviors in a college setting. Considering gender differences in
263 changes in milk intake, future intervention programs may require different strategies for
264 males emphasizing osteoporosis risk in men and the importance of osteoporosis
265 prevention at earlier stages of life.

266 **Competing interests**

267 The authors declare that they have no competing interests.

268 **Authors' contributions**

269 EH designed the study. EH and NC were responsible for data collection. EH and CH
270 conducted data analysis. EH, NC, CH and KG interpreted the analysis contributed to
271 writing and revising the manuscript.

272

273 **References**

- 274 1. American Beverage Association. What America drinks, 2008.
275 [http://www.ameribev.org/all-about-beverage-products-manufacturing--](http://www.ameribev.org/all-about-beverage-products-manufacturing-marketing--consumption/what-america-drinks/index.aspx)
276 [consumption/what-america-drinks/index.aspx](http://www.ameribev.org/all-about-beverage-products-manufacturing-marketing--consumption/what-america-drinks/index.aspx)
- 277 2. Nielsen SJ, Popkin BM: **Changes in Beverage Intake between 1977 and 2001**. *Am J*
278 *Prev Med* 2004, **27**: 205-210.
- 279 3. Gerrior S, Putnam J, Bente L: **Milk and milk products: their importance in the**
280 **American diet**. *Food Rev* 1998, **May-Aug** 29-37.
- 281 4. Jacobson M: *Liquid candy*, 2nd ed., Washington, DC: Center for Science in the Public
282 Interest; 2005.

- 283 5. Bray GA, Nielsen SJ, Popkin BM: **Consumption of high-fructose corn syrup in**
284 **beverages may play a role in the epidemic of obesity.** *Am J Clin Nutr* 2004,**79**: 537-
285 543.
- 286 6. Gurthrie JF, Morton JF: **Food sources of added sweeteners in the diets of**
287 **Americans.** *J Am Diet Assoc* 2000, **100**: 43-51.
- 288 7. Heller K, Burt BA, Eklund SA: **Sugared soda consumption and dental caries in the**
289 **United States.** *J Dent Res* 2001, **80**:1949-1953.
- 290 8. Ma D, Jones G: **Soft drink and milk consumption , physical activity, bone mass,**
291 **and upper limb fractures in children: A population-based case-control study.** *Calcif*
292 *Tissue Int* 2004, **75**:286-291.
- 293 9. Ludwig DS, Peterson KE, Gortmaker SL: **Relation between consumption of sugar-**
294 **sweetened drinks and childhood obesity: a prospective, observational analysis.**
295 *Lancet* 2001, **357**: 505-508.
- 296 10. Tam CS, Garnett SP, Cowell CT, Campbell K, Gabrera, Baur LA: **Soft drink**
297 **consumption and excess weight gain in Australian school students: results from the**
298 **Nepean study.** *Int J Obesity* 2006, **30**: 1091-1093.
- 299 11. Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Willett WC, Hu
300 FB: **Sugar-sweetened beverages, weight Gain, and incidence of Type 2 diabetes in**
301 **young and middle-aged women.** *JAMA* 2004, **292**: 927-934.
- 302 12. Raben A, Vasilaras TH, Moller AC, Astrup A: **Sucrose compared with artificial**
303 **sweeteners: different effects on ad libitum food intake and body weight after 10 wk**
304 **of supplementation in overweight subjects.** *Am J Clin Nutr* 2002,**76**: 721-729.

- 305 13. Wyshak G: **Teenaged girls, carbonated beverage consumption and bone**
306 **fractures.** *Arch Pediatr Adolesc Med* 2000, **154**: 610-613.
- 307 14. McGartland C, Robson PJ, Murray L, Cran G, Savage MJ, Watkins D, Rooney M,
308 Boreham C: **Carbonated soft drink consumption and bone mineral density in**
309 **adolescence: the Northern Ireland Young Hearts project.** *J Bone Miner Res* 2003,18:
310 1563-1569.
- 311 15. Rampersaud GC, Bailey LB, Kauwell GP: **National survey beverage consumption**
312 **data for children and adolescents indicate the need to encourage a shift toward**
313 **more nutritive beverages.** *J Am Diet Assoc* 2003, **103**: 97-100.
- 314 16. Forshee RA & Storey ML: Total beverage consumption and beverage choices among
315 children and adolescents. *Int J Food Sci Nutr* 2003, **54**:297-307
- 316 17. Kvaavik E, Andersen LF, Klepp K: **The stability of soft drinks intake from**
317 **adolescence to adult age and the association between long-term consumption of soft**
318 **drinks and lifestyle factors and body weight.** *Pub Health Nutr* 2005,**8**: 149-157.
- 319 18. Matkovic V, Kostial K, Simonovic I, Buzina R, Brodarec A, Nordin BEC: **Bone**
320 **status and fracture rates in two regions of Yugoslavia.** *Am J Clin Nutr* 1979,**32**:540 –
321 549.
- 322 19. Huang YL, Song WO, Schemmel RA, Hoerr SM: **What do college students eat?**
323 **Food selection and meal pattern.** *Nutr Res* 1994, **14**:1143-1153.
- 324 20. Hubert HB, Eaker ED, Garrison RT, Castelli WO: **Lifestyle correlates of risk factor**
325 **change in young adults: an eight-year study of coronary heart disease risk factors in**
326 **the Framingham offspring.** *Am J Epidem* 1987, **125**:812-831.

- 327 21. Winkleby MA, Cubbin C: **Changing patterns in health behaviors and risk factor**
328 **related to chronic diseases, 1990-2000.** *Am J Health Promt* 2004,**19**:19-27.
- 329 22. Ha EJ, Caine-Bish N: **Effect of nutrition intervention using a general nutrition**
330 **course for promoting fruit and vegetable consumption among college students.** *J*
331 *Nutr Educ Behav*,2009, **41**: 103-109.
- 332 23. Skinner JD. **Change in students' dietary behavior during a college nutrition**
333 **course.** *J Nutr Educ*, 1991;**23**:72-75.
- 334 24. Amstutz MK, Dixon DL. **Dietary change resulting from the expanded food and**
335 **nutrition education program.** *J Nutr Educ*, 1986;**18**:55-69.
- 336 25. Matvienko O, Lewis DS, Schafer E. **A college nutrition science course as an**
337 **intervention to prevent weight gain in female college freshmen.** *J Nutr Educ*.
338 2001;**33**:95-101.
- 339 26. Pereira MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs DR Jr,
340 Ludwig DS: **Fast-food habits, weight gain, and insulin resistance (the CARDIA**
341 **study): 15-year prospective analysis.** *Lancet* 2005, **365**: 36-42.
- 342 27. Hu FB, Li TY, Colditz GA, Willett WC, Manson JE: **Television watching and other**
343 **sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in**
344 **women.** *JAMA* 2003, **289**:1785-1791.
- 345 28. Taylor A, Gill T, Phillips P, Leach G: **A population perspective of osteoporosis.**
346 **How common? What impact? How modifiable?** *Health Prom J Australia* 2003, **14**:61-
347 65.
- 348 29. Forshee RA, Storey ML: **Total beverage consumption and beverage choices**
349 **among children and adolescents.** *Int J Food Sci Nutr* 2003, **54**:297-307.

- 350 30. West DS, Bursac Z, Quimby D, Preweitt TE, Spatz T, Nash C, Mays G, Eddings K:
351 **Self-reported sugar-sweetened beverage intake among college students.** *Obesity*
352 2006,**14**: 1825-1831.
- 353 31. Storey ML, Forshee RA, Anderson PA: **Beverage consumption in the US**
354 **population.** *J Am Diet Assoc* 2006,**106**: 1992-2000.
355
- 356 32. Bere E, Glomnes ES, Velde SJ, Klepp K: **Determinants of adolescents' soft drink**
357 **consumption** *Pub Health Nutr* 2007,**11**: 49-56.
- 358 33. Cullen KW, Ash DM, Warneke C, Moor C: **Intake of soft drinks, fruit-flavored**
359 **beverages, and fruits and vegetables by children in grades 4 through 6.** *Am J Public*
360 *Health* 2002,**92**: 1475–1477.
- 361 34. United States Department of Agriculture. My pyramid: A steps to a healthier you.
362 <http://www.mypyramid.gov>.
- 363 35. National Academy of Sciences. Institute of Medicine. Food and Nutrition Board, 1997
364 http://www.nal.usda.gov/fnic/DRI//DRI_Calcium/71-145.pdf
- 365 36. Storey ML, Forshee RA, Anderson PA: **Associations of adequate intake of calcium**
366 **with diet, beverage consumption, and demographic characteristics among children**
367 **and adolescents.** *J Am Coll Nutr* 2004,**23**: 18-33.
368

368 Table 1. Pre- & Posttest Daily Intake of Beverage by Gender (Means \pm Standard Errors,
 369 Repeated Measures Analysis)

Gender (n)	Pretest (fl.oz) Mean (SE)	Posttest (fl.oz) Mean (SE)	p-value
Total soft drink			
Male (9)	8.53 (3.29)	4.74 (2.27)	0.093
Female (70)	4.94 (0.84)	3.62 (0.62)	0.100
Estimated Marginal Mean	6.73 (1.30)	4.18 (0.95)	0.033*
Regular soft drink			
Male (8)	5.33 (3.36)	2.96 (2.28)	0.145
Female (70)	2.11 (0.45)	1.28 (0.41)	0.072
Estimated Marginal Mean	3.72 (0.86)	2.30 (0.72)	0.051
Diet soft drink			
Male (9)	3.79 (2.31)	1.78 (1.35)	0.346
Female (70)	2.83 (0.74)	2.30 (0.54)	0.490
Estimated Marginal Mean	3.31 (1.11)	2.04 (0.79)	0.263
Total milk			
Male (9)	6.62 (2.32)	6.63 (2.41)	0.997
Female (70)	4.18 (0.71)	6.23 (0.85)	0.022*
Estimated Marginal Mean	5.40 (1.07)	6.43 (1.26)	0.433
Whole milk			
Male (9)	0.00	0.00	1.000
Female (69)	0.58 (0.31)	0.13 (0.13)	0.149
Estimated Marginal Mean	0.29 (0.44)	0.07 (0.19)	0.621
Low fat milk			
Male (9)	6.18 (2.42)	1.70 (1.11)	0.020*
Female (69)	2.16 (0.52)	2.09 (0.54)	0.918
Estimated Marginal Mean	4.17 (0.84)	1.90 (0.77)	0.027*
Fat free milk			
Male (9)	0.44 (1.33)	4.93 (7.75)	0.052

Female (69)	1.67 (0.51)	3.54 (0.78)	0.026*
Estimated Marginal Mean	1.06 (0.71)	4.23 (1.18)	0.010*

370 *demonstrates significant difference $P \leq 0.05$

371

Additional files provided with this submission:

Additional file 1: Responded to Reviewer1.doc, 29K

<http://www.nutritionj.com/imedia/1476002386311290/supp1.doc>

Additional file 2: Responded to Reviewer 4.doc, 20K

<http://www.nutritionj.com/imedia/1030642793311288/supp2.doc>