



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

À la Carte Offerings Effects on the Selection of Healthy National School Lunch

Program Meal Components

Gabrielle Ferro
Ph.D. Student, Food and Resource Economics Department
University of Florida
Gainesville, FL 32611-0240
Email: gferro@ufl.edu

Jaclyn D. Kropp
Assistant Professor, Food and Resource Economics Department
University of Florida
Gainesville, FL 32611-0240

Sonam Gupta
Research Associate, Impaq International
Columbia, MD 21044-3533

Kelly Grogan
Assistant Professor, Food and Resource Economics Department
University of Florida
Gainesville, FL 32611-0240

Anne Mathews
Assistant Professor, Food Science and Human Nutrition
University of Florida
Gainesville, FL 32611-0240

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2014 AAEA Annual Meeting, Minneapolis, MN, July 27-29, 2014

Copyright 2014 by Gabrielle Ferro, Jaclyn D. Kropp, Sonam Gupta, Kelly Grogan, and Anne Mathews. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

ABSTRACT

Using data from an Alachua County, Florida elementary school, we analyze how intermittently offered à la carte items, such as ice cream and other desserts, affect the selection of more healthful National School Lunch Program (NSLP) lunch components (fruits and low-fat dairy). We find NSLP participants are more likely to select the fruit component on days à la carte items are offered; however, NSLP participants who purchase à la carte items, when available, are less likely to select a fruit. If students consume all of the foods that they select, this substitution effect reduces micronutrients consumed and increases caloric intake. Such a substitution over the long term could have implications for childhood obesity as well as overall health. Our results have implications for the on-going debate pertaining to competitive foods sold in school lunchrooms.

I. INTRODUCTION

Childhood obesity has recently become a prevailing health concern because it is associated with health complications such as diabetes, cardiovascular diseases and high cholesterol (Ebbeling et al. 2002). In addition, obesity in children tends to continue into adulthood (Ebbeling et al. 2002). The American Heart Association reports that one in three adolescents are considered overweight or obese; and this rate has tripled since the 1960s (AHA 2013). Factors contributing to the rise in obesity rates include changes in eating behaviors such as the increased consumption of sugar-sweetened drinks and unhealthy food items being offered in the school lunchroom and at home (Ludwig et al. 2001).

Data taken from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) show that 99.9% of adolescents between ages 12 to 18 consume fruits and vegetables, but only 0.9% meet the USDA recommended amounts of fruits and vegetables consumption (Kimmons et al. 2009). Inadequate consumption of fruits and vegetables has been linked to an increase in obesity and obesity-related diseases, such as cardiovascular problems and diabetes (Bowman et al. 2004). It has been found that, on average, National School Lunch Program (NSLP) participants consume 40% of their daily calorie intake in the school cafeteria, making it extremely important that these meals are well balanced and that students select and consume the healthful foods being offered (Briefel et al. 2009).

As a result, there is an on-going debate over the availability of competitive foods in schools. Competitive foods are defined as any food sold outside of the NSLP meal components, and may include ice cream, beverages, and other snack items. In 2010 the

implementation of the Healthy, Hunger-Free Kids Act (HHFKA) required schools to only sell competitive foods that meet set standards. These standards state that competitive foods items may not contain more than 35% of their calories from fat, no more than 35% of their weight can come from total sugar, and they must contain zero grams of trans fat (CDC 2014). The program promoting snacks meeting these standards is referred to as “smart snacks in the school”. Schools have the ability to set more stringent requirements but the snacks must at least meet the HHFKA standards (CDC 2014). The new standards also restrict the types of products that can be sold to specific grades. For example, schools cannot offer flavored water to students in primary grades. The changes to the standards are in response to increasing rates of childhood obesity and a concern for healthy food items in the lunchroom. The à la carte items considered in this paper meet the HHFKA standards, but in general, are less nutritious than the NSLP meal components.

The objective of our research is to determine if intermittent availability of à la carte items, such as ice cream, brownies, and cookies, affects the selection of more healthful NSLP lunch components, namely fruits and low-fat dairy. Our study employs point of sale purchase data from May 6, 2013 to May 30, 2013 from an elementary school that offers certain à la carte items only on specific days of the week to children in grades kindergarten to four. To the best of our knowledge, the effects of intermittently offered à la carte items on NSLP participants’ selection of healthful lunch components has not been previously addressed in the literature. This distinction allows us to use students as their own controls since they only receive the “treatment” on certain days. Previous work has had to compare selection across grades to estimate the effect of à la carte offerings on selection of more healthful meal components. Our results show that selection of à la

carte items, fruit, and dairy vary by grade, so this cross-grade comparison by previous researchers may lead to in biased results. Our results do not suffer from such bias. We find NSLP participants who purchase ice cream or dessert, when available, are less likely to select the fruit lunch component, indicating that à la carte items may be both increasing total calories consumed and decreasing the selection of nutritious foods.

The remainder of this paper is organized as follows. Section II introduces the National School Lunch Program and discusses childhood obesity, the evolution of eating habits in adolescents, and à la carte items in the lunchroom. Section III, discusses the theoretical model. Section IV describes the econometric model, data collection and presents the results. Section V provides the conclusions and discusses policy implications.

II. NATIONAL SCHOOL LUNCH PROGRAM AND OBESITY

The NSLP was established in 1946 to encourage domestic consumption of agricultural commodities while improving the nutrition of school age children. Participating schools are tasked with providing nutritious lunches that are subsidized by the government (Gunderson 2013). Each day school cafeterias participating in the NSLP must offer five meal components: meat/meat alternative, starch/grain, vegetable, fruit, and dairy. Students must select three of the five components for the meal to be subsidized by the government.

Students can qualify for free or reduced-price lunches based on their guardian's income level. The NSLP guidelines indicate that to qualify for free or reduced price lunches the student's guardian's household income level must be less than 130% and 185% percent of the federal poverty level, respectively (USDA 2012). In 2013, 52.96% of students in Alachua County received free or reduced price

lunches (FLDOE 2013). Students who do not qualify for free or reduced-price lunches may purchase lunches at the “full” price (paid lunches), where the full price paid by the student is less than the cost of the meal due additional subsidies awarded to the school. All subsidized meals (free, reduced, and paid) are required to meet certain nutritional guidelines set forth by the United States Department of Agriculture (USDA) that coincide with the Dietary Guidelines for Americans.

While most cafeterias sell NSLP-subsidized meals they also have the option of offering à la carte items such as pizza, chicken sandwiches, ice cream, and chips. These à la carte items are used to supplement school lunchroom revenues (Pogash 2008).

In the 2005-2006 school year, a small number of schools earned over \$50,000 in à la carte sales with the majority making between \$1,000 to \$9,999 (Datar and Nicosia 2009). These sales add revenue to a shrinking school lunch budget and in most areas are encouraged by the school districts. The purchase of à la carte item provides additional revenue to the lunchroom while possibly detracting from the nutritional intake of the student. À la carte items are typically higher in fat and kilocalories than individual items from the reimbursable school lunch meals (Gordon et al. 2007).

The rate of childhood obesity in the United States has tripled from 1980 to 2002 (Ogden 2006). Furthermore, statistics from the NHANES show that in 2003-2004 17.1% of adolescents and children were considered overweight (Ogden et al. 2006). In addition, 18.2% of males aged two to nineteen were considered overweight, while only 16% of females in this age category were (Ogden et al. 2006). Lack of physical activity and limited accessibility to healthy foods are two suggested reasons for the increase in childhood obesity described above (Ebbeling et al. 2002). While childhood obesity is an

increasing problem for all children in the U.S., the rate of obesity in minority and socioeconomically disadvantage groups has increased faster than that of their Caucasian counterparts (Ebbeling et al. 2002). The implementation of HHFKA is due in part to concerns that à la carte offerings in the school lunchroom are contributing to the increase in obesity in children.

III. LITERATURE REVIEW

À la Carte Offerings

Limited research has considered the effects of à la carte offerings on the consumption of fruits and vegetables and total calories consumed. Cullen et al. (2000) assessed the impact of à la carte items on consumption decisions made by fifth grade students compared to students in fourth grade who did not have the à la carte options. They find that fifth graders consumed less fruits, juice, and vegetables than the fourth graders but do not consider whether substitution of NSLP meal components and à la carte offerings is occurring. Additionally, if consumption of fruits, juice, and vegetables varies by grade, the analysis cannot distinguish this effect from the effect of à la carte offerings.

Hartstein et al. (2008) studied the impact of increasing the availability of nutrient rich food and decreasing sizes of à la carte items on total calories of selected items by students in schools across multiple states. The size of sugar sweetened beverages and chips were decreased while the availability of water and reduced fat chip options was increased. In Texas, they found that they were able to reduce total kilocalories selected by 61 kcal, while others states did not have changes that were as large but were still statistically significant. Inferences on consumption cannot be made, as consumption was not recorded in this study.

Other research has investigated the impact of à la carte across schools with and without à la carte offerings and finds that à la carte offerings reduce intake of fruit for students in seventh grade (Kubik et al. 2003). Further, using a multivariate analysis they found that students in schools without à la carte offerings consumed 0.5 more servings of fruit per day than students in schools with à la carte offerings. However, there may be unobservable factors that affect consumption of fruits across schools that are also correlated with à la carte offerings. For example, schools may sell à la carte items if they are financially constrained, and these same schools may also offer lower quality fruit to save money. If so, the effect attributed to à la carte offerings also includes the effect of less appealing fruit.

Using data from students in grades one through twelve, Fox et al. (2009) find that 40% students of consume at least one à la carte item. Further, they find that students who purchase a NSLP lunch are less likely to purchase an à la carte item than a student who does not purchase an NSLP lunch. These results confirm earlier findings using data from 1998-1999, which show that higher NSLP participation correlates with lower à la carte sales (Fox et al. 2000).

In addition to NSLP participation predicting à la carte sales, the timing of the lunch period can influence sales. In a survey of students and food service directors from 271 high schools in Pennsylvania, Probart et al. (2006) find that lunch periods that began before 10:30 a.m. had higher à la carte sales than those that began after 10:30 a.m. They also find that students who received NSLP free or reduced price lunches are less likely to purchase the à la carte items, most likely due to financial constraints.

This research builds upon previous research on à la carte sales and selection of healthy lunch components by utilizing the fact that à la carte items are only offered on certain days of the week. Unlike Cullen et al. (2000) who needed to compare across grades and Kubik et al. (2003) who needed to compare across schools to determine the effect of offerings on selection of healthy items, this study compares across days. This is preferable since students in different grades or schools may have different selection behaviors, leading to imperfect estimation of the effect of offerings on selection. We analyze which students are more likely to select à la carte items, and how the offering of à la carte items affects student selection of fruits and low-fat dairy. The results have implications for the design of à la carte programs, if school lunch programs are going to be used to combat the obesity epidemic.

IV. THEORETICAL MODEL

The analysis focuses on two categories of à la carte items: ice cream and other desserts, which include cookies, muffins, and brownies.¹ Considering these two categories of à la carte items, the analysis addresses two main questions. First, which students are more likely to select the à la carte items? Second, how does the offering of these à la carte items affect students' selection of fruit and low-fat dairy? This analysis does not consider the effects of à la carte offering on vegetable selection because of the plating process used in the school that was studied. At this school, vegetables were often plated with the entrée and thus the students did not always have a choice of selecting the vegetable. One such example is the plating of fried chicken and mashed potatoes together.

¹ Brownies, cookies, and other snack items were combined due to the low selection of each individual item, these items were all available every Tuesday of the observation period.

For this reason, we analyze only the effect of à la carte offerings on the selection of the fruit and dairy lunch components.

When selecting meal components, students choose items that will maximize their utility subject to their budget constraint, a minimum item constraint, and a maximum volume of food consumed constraint. A student receiving a reimbursable meal must select at least three of the five components discussed earlier to qualify for a free, reduced, or paid NSLP lunch². The student can refuse any of the five components except for the entrée, which has to be taken, as long as three components are taken. This implies that once the student has selected three meal components, the marginal cost of selecting the fourth and/or fifth components is zero. The student may also select à la carte items to purchase at the register. These items may include: cookies, ice cream, and brownies. The marginal cost of these à la carte items is their price which ranges from \$0.50 to \$1.00. We assume the student only selects one à la carte item.³ The student's utility is a function of the à la carte item purchased, x_a , and the subsidized lunch, x_{lunch} , consisting of the chosen components, x_f , x_v , x_g , x_m , and x_d , where f , v , g , m , and d indicate fruit, vegetable, grain, meat/meat alternative, and dairy, respectively. If any item $i \in \{a, f, v, g, m, d\}$ is not chosen, x_i equals zero, and the student receives no utility from it, otherwise x_i equals one.

$$U = U(x_a, x_f, x_v, x_g, x_m, x_d) \tag{1}$$

In Alachua County schools, each student has an account used for conducting transactions in the school lunch room in which his/her guardian(s) deposit money. These accounts

² Students that select a lunch that does not contain at least three of the five components are charged à la carte regardless of their NSLP status. These students are not included in the analysis that follows.

³ This assumption is consistent with the data used for the empirical analysis.

work as a declining balance account; as long as there is money in the account the student is able to purchase items. We assume that the student and his/her guardian(s) determine the student's budget per meal even though there is no explicit dollar limit per meal.

Student k 's per meal budget constraint can be written as:

$$P_a x_a + (P_{lunch} x_{lunch}(x_f, x_v, x_g, x_m, x_d)) \leq I \quad (2)$$

where P_{lunch} is the price of the school lunch paid by the child. This price could be full price, reduced price, or zero, depending on the student's NSLP status. P_a is the price of the specific à la carte item available that day. I is the student's budget for the meal.

The minimum item constraint can be written as:

$$\sum_{j \in \{f, v, g, m, d\}} x_j \geq 3 \quad (3)$$

We will assume that this constraint will not bind since students are accustomed to choosing three items.

Finally, a student has some maximum amount of food volume, Vol , that they can consume in one lunch. This may be his/her perception or an actual physical constraint.

This constraint can be written as:

$$\sum_{i \in \{a, f, v, g, m, d\}} \delta_i x_i \leq Vol \quad (4)$$

where δ_i is a coefficient that translates the item chosen into its respective volume.

From these equations we can construct the Lagrangian of the constrained optimization problem:

$$\begin{aligned} Max(\mathcal{L}) = & \\ & U(x_a, x_{lunch}(x_f, x_v, x_g, x_m, x_d)) + \lambda [I - P_a - (P_{lunch} x_{lunch}(x_f, x_v, x_g, x_m, x_d))] + \\ & \rho [Vol - \sum_{i \in \{a, f, v, g, m, d\}} \delta_i x_i] \end{aligned} \quad (5)$$

For an interior solution, the first order conditions are:

$$\frac{\partial \mathcal{L}}{\partial x_{alacarte}} = \frac{\partial U}{\partial x_{alacarte}} - \lambda P_{alacarte} - \rho \delta_{alacarte} = 0 \quad (6)$$

$$\frac{\partial \mathcal{L}}{\partial x_j} = \frac{\partial U}{\partial x_j} + \lambda P_{lunch} \frac{\partial x_{lunch}}{\partial x_j} - \rho \delta_j = 0, \quad j \in \{f, v, g, m, d\} \quad (7)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = I - P_a x_a - (P_{lunch} x_{lunch}) = 0 \quad (8)$$

$$\frac{\partial \mathcal{L}}{\partial \rho} = Vol - \sum_{i \in \{a, f, v, g, m, d\}} \delta_i x_i = 0 \quad (9)$$

It is important to note that if the student has selected at least three components,

$\frac{\partial x_{lunch}}{\partial x_j} = 0$ in (7); the selection of item j does not affect whether or not the student

purchases a lunch. Thus, items such as fruits and dairy have zero monetary marginal cost and will be selected when the marginal utility obtained from selecting the lunch components exceeds the utility cost of taking up a portion of the student's food volume constraint. For à la carte items, the marginal utility obtained from selecting the item must meet or exceed the monetary and volume constraint costs. For items such as ice cream, the marginal utility is likely to be high for some students. If the volume constraint binds, the choice between items like ice cream and fruits will be driven by the relative magnitudes of the marginal benefits, and some students may choose ice cream instead of the fruit or dairy lunch component, despite the zero monetary marginal cost of the additional lunch component.

V. ECONOMETRIC MODEL, DATA, AND RESULTS

Econometric Model:

We model utility as a function of observed and unobserved variables, following a random utility model. Student k 's utility from lunch selection can be written as:

$$U_k = V_k + \varepsilon_k \quad (10)$$

The student will choose an à la carte item if $U_{k1} \geq U_{k2}$, where U_{k1} is the student's utility

from choosing an à la carte item with his or her meal and U_{k2} is the student's utility from not choosing an à la carte item. Students are deciding whether or not to purchase an à la carte item based on their marginal benefit-marginal cost calculations. A student's utility is defined by equation (10) where V_k is determined by factors that we can observe, X_k .

$$V_k = X_k' \beta \quad (11)$$

These observed factors include a vector of dummy variables for race where Caucasian is the excluded category, gender where female is the excluded category, entrée where hot entrée is the excluded category and a dummy variable for NSLP participation status which corresponds to the students' categorization as free/reduced-price or paid, where free/reduced is the excluded category.⁴ A student's NSLP participation status is likely correlated with their lunch budget. Age and gender may be correlated with the student's food volume constraint. There are two registers in this school for grades kindergarten to four, and ice cream types sometimes varied across registers. Additionally, the kinds of prompts given to students by lunch line staff varied, for example: you should take a fruit or the apple is especially good today. The excluded category is register one. Entrée is included to account for varying tastes; a student may want to select ice cream with a sandwich but not a salad. Entrée corresponds to the type of meal the student selected that day, they have a choice of sandwich, hot entrée, or salad, and these three items are offered every day.

We assume that our error term has a normal distribution with a mean of 0. We only observe whether or not a student selects the ice cream or desserts. The student will select an à la carte item when $U_{k1} \geq U_{k2}$. Students with a more constraining budget

⁴ Participation status is reduced to free/reduced and paid due to the small number of students who are considered reduced in this school.

constraint will be less likely to select à la carte items. We can determine the probability of à la carte selection, where:

$$\Pr(Y_a = 1) = \Pr(U_{k1} \geq U_{k2}) \quad (12)$$

We observe:

$$Y_a = \begin{cases} 1 & \text{if food item } a \text{ is selected} \\ 0 & \text{otherwise} \end{cases}, a \in \text{ice cream or dessert} \quad (13)$$

We estimate equation (13) separately for ice cream selection and dessert selections to determine the factors that affect whether or not a student purchases these à la carte items. We model observed selection as:

$$Y_a = \beta_0 + X'_k \beta_n + \varepsilon \quad (14)$$

To determine the factors affecting the selection of ice cream, equation (14) is estimated using only data from the days when ice cream is offered; to determine the factors affecting the selection of desserts, equation (14) is estimated using only data from the days when desserts are offered. The covariates in X'_i are as defined above.

Returning to equation (10), the student will choose a fruit and/or low-fat dairy if $U_{k3} \geq U_{k4}$, where U_{k3} is his or her utility from selecting the healthy item as part of the meal and U_{k4} is his or her utility from not selecting all the healthy components. The student may not select fruit and/or low-fat dairy if the student wants to select an à la carte item and his or her food volume constraint binds. Again we only observe whether or not the student selects the fruit or low-fat dairy meal component. Therefore:

$$\Pr(Y_i = 1) = \Pr(U_{k3} \geq U_{k4}) \quad (15)$$

$$Y_m = \begin{cases} 1 & \text{if food item } m \text{ is selected} \\ 0 & \text{otherwise} \end{cases}, m \in \text{fruits, dairy} \quad (16)$$

The student's utility function is still determined by (10), but now we consider both days on which à la carte items are offered and days on which they are not offered.

To determine the effect of ice cream and dessert offerings on selection of the fruit and low-fat dairy lunch components we estimate the following equation:

$$Y_m = \beta_0 + \beta_1 \text{Icecreamoffered} + \beta_2 \text{dessertoffered} + \beta_3 \text{Icecreamoffered} * \text{icecreamselected}_k + \beta_4 \text{dessertoffered} * \text{dessertselected}_k + X'_k \beta_n + \varepsilon \quad (17)$$

Equation (17) is estimated separately for the selection of the fruit lunch component and selection of the dairy lunch component. *Icecreamoffered_k* and *dessertoffered_k* are given a value of 1 on Thursdays and Tuesdays, respectively, and zero otherwise.⁵ The variables *Icecreamoffered* * *icecreamselected_k* and *dessertoffered* * *dessertselected_k* take the value of 1 when student *k* selects ice cream or dessert when offered, respectively. This allows us to determine the impact of à la carte selection on the selection of fruit and dairy lunch components. *X'ik* includes the same covariates discussed above.

Data Collection

The data for this paper were collected at a school in Alachua County, Florida from May 6, 2013 to May 30, 2013, after receiving Institutional Review Board approval. The Alachua County School Food and Nutrition Services (FNS) compiles information at point of sale on entrée and purchased à la carte items in their purchase logs. To compile a more complete record of items selected, cameras were set up to record all components of the NSLP meal selected by the students. The video recordings were matched to purchase logs to create a database of meal components and à la carte items purchased by every child who ate in the cafeteria during the study period. Student meal component selections were categorized according to the NSLP guidelines. Individual students were tracked

⁵ The models were estimated to allow for the effects of selection to vary by race, gender, and status but the results were statistically insignificant. This model better allows estimation of the effect of à la carte items but does not allow us to compare across covariates.

across days via their Personal Identification Numbers (PIN) used to complete transactions in the lunchroom. PIN numbers, race, gender and grade level information were provided by FNS. There were two registers in this school. A different cashier staffed each register and the cashier did not change during the duration of the data collection. In total there are 3,403 student-meal observations over 18 days. Our analysis is limited to NSLP lunch purchases; observations in which students only purchased of à la carte offerings are not considered.

Schools in Alachua County, Florida offer at least four different entrée selections, two vegetable selections, two low-fat dairy options, and two different types of fruit daily. For a student's selections to be considered a qualifying lunch and thus subsidized under the program, the student must select at least three of the five components; if the student selects less than three components, the student is charged for each component separately.

In total, 311 students in grades kindergarten through fourth were observed over the study period. Table 1 presents the demographic characteristics of the NSLP lunch participants within the sample. More than 70% of the NSLP participants in the sample are Caucasian, approximately 15% are black, approximately 7% are Hispanic, and approximately 8% are other races.⁶ These race demographics are representative of Alachua County, Florida. Roughly half of the sample receives free or reduced price lunches, and the majority of the same is male. Grades kindergarten through fourth are approximately equally represented in the sample.

Table 2 compares the proportion of NSLP meals in the sample that contained a fruit and/or dairy component on days when à la carte items were offered to when à la

⁶ Race labels are consistent with language used by the school data.

carte items were not offered.⁷ Without controlling for other factors, on days when ice cream was offered, the selection of fruit decreases, while the selection of milk increases. However, these differences are not statistically significant. Table 3 compares the percentage of meals that contained the fruit and/or dairy component when à la carte items were selected to when à la carte items were not selected. Only considering the respective days on which the à la carte items were offered, 48.28% of meals that contained ice cream also contained fruit, while 62.33% of the meals that did not contain ice cream contained fruit.

While ice cream was only offered on Thursdays, other dessert items such as cookies, muffins, and brownies were only available for purchase on Tuesdays. Without controlling for other factors, when dessert was offered, the selection of fruit was higher while the selection of milk was lower, but these differences are not statistically significant. Again, if we only consider days when desserts were offered (Tuesdays), 27.19% of those meals that contained dessert also contained fruit, while 63.65% of the meals that did not contain dessert contained fruit.

These summary statistics highlights the difference between the content of the meals that included the à la carte items in comparison to the meals that did not contain the additional items. Table 4 outlines the characteristics of students who purchased à la carte items by gender, race, and NSLP status. On days when ice cream was offered, 61.43% of the paid student meals included an ice cream, while only 30.97% of free/reduced price meals included an ice cream. In addition, 75.1% of the paid student meals included a dessert, while 48.2% of the free/reduced price meals included a dessert.

⁷ The analysis only considers NSLP qualifying lunch purchases (i.e., not NSLP components purchased as à la carte items).

This suggests that students who purchase full price lunches purchase à la carte items more than the free/reduced students, possibly due to the income constraint. On days when ice cream was offered 43.07% of the meals chosen by the male students included an ice cream, while only 36.71% of the meals chosen by females included an ice cream. In addition, 8.86% of the meals chosen by the male students included a dessert, while 13.85% of the meals chosen by female students included a dessert. Suggesting that females prefer dessert to ice cream. In addition, 47.10% of meals chosen by Caucasian students contained an ice cream while 27.45% of meals chosen by black students contained an ice cream; approximately 8% of meals chosen by Hispanics and other races contain ice cream. On days when desserts are available, 15.22% of the meals chosen by other races contained a dessert, while 13.86% of the meals chosen by Caucasians contained a dessert.

Results:

Table 5 presents the coefficients and marginal effects for equation (14), which determines which factors affect the selection of ice cream and desserts. These results indicate that Caucasian students are more likely to select an ice cream; black students are 9.89% less likely to select an ice cream than their Caucasian counterparts. Furthermore, students whose NSLP status is free/reduced are 25.82% less likely to select ice cream than students who pay full price. Students in kindergarten are more likely to select an ice cream than students in second, third, or fourth grade. The register at which the child purchased his/her lunch does not significantly affect the selection of an ice cream.

With respect to dessert selection some of the results are similar. Caucasian students are more likely to select dessert and black students are 5.37% less likely to select

dessert than their Caucasian counterparts. Further, students whose NSLP status is free/reduced are 11.56% less likely to select a dessert than students who pay full price for their meals. Unlike ice cream selection, males are 4.65% more likely to select dessert than females. Again, the register at which the child purchased his/her lunch does not significantly affect the selection of a dessert. In general, Caucasian male students who pay for their lunches are most likely to select ice cream or dessert.

Table 6 reports the coefficients and marginal effects for equation (17) for the selection of the fruit and dairy lunch components. In terms of fruit selection, on days when ice cream is offered, students are 5.39% more likely to select the fruit component; conversely, when dessert is offered, students are 4.33% less likely to select a fruit. Students who select an ice cream when ice cream is offered are 15.24% less likely to select a fruit than students who do not select an ice cream when offered. Additionally, students who select a dessert when offered are 34.86% less likely to select a fruit than the students who do not select a dessert. This indicates that the selection of a sweet item lowers the probability of a student selecting fruit.

With regards to other explanatory factors, kindergarten students are more likely to select the fruit lunch component than students in first through fourth grade. Furthermore, black students are 12.11% more likely to select a fruit than Caucasian students. Male students are 5.00% less likely to select a fruit than female students.

Table 6 also reports the coefficients and marginal effects for equation (17) for the selection of the dairy lunch component. The offering of à la carte items has no significant effect on the selection of low-fat dairy products. However, students in kindergarten are more likely to select the low-fat dairy component of the lunch than students in higher

grades. Males are 2.32% more likely to select the low-fat dairy than their female counterparts. In addition, students whose NSLP status is free/reduced are 6.07% more likely to take the low-fat dairy lunch component than students that pay full price for their meal. Additionally, the register at which the student purchased his/her meal is statistically significant.

These results show that selection of ice cream has a larger negative effect on the selection of fruit than the selection of other dessert items. Future revisions of HHFKA may want to include limits on ice cream offerings in order to encourage higher consumption of fruit.

VI. CONCLUSIONS

The school analyzed in this study allowed students in grades kindergarten through fourth to purchase ice cream and desserts on certain days of the week. This research provides insight into the characteristics of students that are more likely to purchase ice cream and desserts when they are offered intermittently. We find that students who pay full price for their lunch are more likely to purchase ice cream or desserts than students who receive a free or reduced price NSLP lunch. Caucasian students are more likely to select ice cream than any of the other race categories and more likely to select dessert than black students. We also find that selection of both ice cream and desserts varies by grade.

In general, when a student selects an ice cream or dessert, the student is less likely to select the fruit component of the school lunch, and this substitution is more likely to occur when ice cream is selected. Policy makers looking to increase selection of fruit in the school may consider eliminating opportunities for children in grades kindergarten

through fourth to purchase ice cream and dessert. These results also indicate that males are more likely to choose ice cream and substitute ice cream for fruit. Recent data suggest that male children are more likely to be overweight than female children, indicating another potential reason to eliminate ice cream offerings (Ogden et al. 2006).

Further research should consider the possible explanations for the statistically significant effects of the register at which the student purchased his or her lunch on the selection of the dairy lunch component. Certain placements or kinds of verbal prompts could be affecting selection, and implementing these changes at all registers would be a relatively easy and low-cost way to change selection behavior. Additionally, future research should analyze the effect of à la carte offerings on the consumption behavior of students as well as their total caloric and nutritional intake.

VII. REFERENCES

American Heart Association. 2013. *Overweight in Children*.

http://www.heart.org/HEARTORG/GettingHealthy/Overweight-in-Children_UCM_304054_Article.jsp

Bowman, S. A., S. L. Gortmaker, C. B. Ebbeling, M. A. Pereira, and D. S. Ludwig. 2004.

“Effects of Fast-Food Consumption on Energy Intake and Diet Quality Among Children in a National Household Survey.” *Pediatrics*. 112(1):112-118.

Burger, J. M., H. Bell, K. Harvey, J. Johnson, C. Stewart, K. Dorian, and M. Swedroe.

2010. “Nutritious or Delicious? The Effect of Descriptive Norm Information on Food Choice.” *Journal of Social and Clinical Psychology*. 29(2):228-242.

Centers for Disease Control. 2014. *Competitive Foods in Schools*.

<http://www.cdc.gov/healthyyouth/nutrition/standards.htm>

- Cullen, K. W., J. Eagan, T. Baranowski, E. Own, and C. de Moor. 2000. "Effect of À la Carte and Snack Bar Foods at School on Children's Lunchtime Intake of Fruits and Vegetables." *Journal of the American Dietetic Association*. 100(12):1482-1486.
- Datar, A. and N. Nicosia. 2009. "Junk Food in Schools and Childhood Obesity: Much Ado About Nothing?" Working Paper. RAND Labor and Population.
- Ebbeling, C.B, D.B. Pawlak, and D.S. Ludwig. 2002. "Childhood Obesity: Public-Health Crisis, Common Sense Cure." *The Lancet*. 360(9331):473-482.
- Florida Department of Education. 2013. *Data Publication and Reports*.
<http://www.fldoe.org/eias/eiaspubs/pubstudent.asp>
- Fox, M.K., A. Gordon, R. Nogales, and A. Wilson. 2009. "Availability and Consumption of Competitive Foods in US Public Schools." *Journal of the American Dietetic Association*. 109(2): S57-S66.
- Fox M.K., M. K. Crespisek, P. Connor, and M. Battaglia. 2000. "School nutrition dietary assessment study II: summary of findings." U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation. <http://www.fns.usda.gov/oane>
- Gordon, Anne, M. K. Crepinsek, R. Nogales, and E. Condon. 2007. "School Nutrition Dietary Assessment Study-III: Volume II: Student Participation and Dietary Intakes, Report No. CN-07-SNDA-III." Washington DC, November 2007.
<http://www.fns.usda.gov/Ora/menu/Published/CNP/FILES/SNDIII-Vol2.pdf>

- Gunderson, G. W. 2013. "The National School Lunch Program Background and Development." *National School Lunch Program*. United States Department of Agriculture, Washington DC, January 2013.
- Hanks, A., D. R. Just, and B. Wansink. 2013. "Smarter Lunchrooms Can Address New School Lunchroom Guidelines and Childhood Obesity." *The Journal of Pediatrics*. 162(4):867-869.
- Hartstein, J., K. W. Cullen, K. D. Reynolds, J. Harrell, K. Resnicow, and P. Kennel. 2008. "Impact of Portion-Size Control for School À la Carte Items: Changes in Kilocalories and Macronutrients Purchased by Middle School Students." *Journal of American Dietetic Association*. 108(1):140-144.
- Kimmons J., C. Gillespie, J. Seymour, M. Serdula, and H.M. Blanck. 2009. "Fruit and vegetable intake among adolescents and adults in the United States: percentage meeting individualized recommendations." *Medscape Journal of Medicine* 11(1):11-26.
- Kubik, M.Y., L. A. Lytle, P.J. Hannan, C. L. Perry, and M. Story. 2003. "The Association of the School Food Environment with Dietary Behaviors of Young Adolescents." *American Journal of Public Health*. 93(7):1168-1173.
- Ludwig, D. S., K. E. Peterson, and S. L. Gortmaker. 2001. "Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis." *The Lancet*. 357(9255):505-508.
- Neumark-Sztainer, D. M. Wall, C. Perry and M. Story. 2004. "Correlates of Fruit and Vegetable Intake Among Adolescents: Findings from Project EAT." *Preventative Medicine*. 37(3):198-208.

- Nicklas T. A., C. C. Johnson, R. Farris, R. Rice, L. Lyon, and R. Shi. 1997.
“Development of a School-based Nutrition Intervention for High School Students:
Gimme 5.” *American Journal of Health Promotion*. 11(5):315-322.
- Ogden, C. L., M. D. Carroll, L. R. Curtin, M. A. McDowell, C. J. Tabak, and K. M.
Flegal. 2006. “Prevalence of Overweight and Obesity in the United States, 1999-
2004.” *The Journal of the American Medical Association*. ” 295(13):1549-1555.
- Pogash, C. 2008. “Free Lunch Isn’t Cool, So Some Students Go Hungry.” *New York
Times*, March 1, 2008. http://www.columbia.org/pdf_files/chezpanisse16.pdf
- Probart, C., E. McDonnell, T. Hartman, J.E. Weirich, and L. Bailey-Davis. 2006.
“Factors Associated with the Offering and Sale of Competitive Foods and School
Lunch Participation.” *Journal of the American Dietetic Association*. 106(2): 242-
247.
- St-Onge, M. P., K. L. Keller, and S. B. Heymsfield. 2003. “Changes in Childhood Food
Consumption Patterns: A Cause For Concern in Light of Increasing Body
Weights.” *The American Journal of Clinical Nutrition*. 78(6):1068-1073.
- U.S. Department of Agriculture, Food and Nutrition Service. 2012. *Agency Information
Collection Activities: Proposed Collection; Comment Request—Supplemental
Nutrition Assistance Program, Administrative Review Requirements— Food
Retailers and Wholesalers*. Washington DC, March 2012.
- U.S. Department of Agriculture. 2013. “Food Groups.”
<http://www.choosemyplate.gov/food-groups/>

Table 1: Demographic Characteristics

	Percentage
NSLP Status	
Free	45.34%
Reduced	7.72%
Paid	46.95%
Race	
White	70.10%
Black	15.11%
Other	7.07%
Hispanic	7.72%
Gender	
Male	54.02%
Female	45.98%
Grade	
Kindergarten	18.65%
First	19.29%
Second	22.83%
Third	20.26%
Fourth	18.97%
Observations	311

Table 2: Selection of the Fruit and Dairy Lunch Component by À La Carte Availability

	Ice Cream			Dessert		
	Offered	Not Offered	Test Statistic	Offered	Not Offered	Test Statistic
Fruit	56.67% (0.0185)	57.29% (0.0095)	0.2985 [0.7653]	59.05% (0.0184)	56.55% (0.0095)	-1.1476 [0.2511]
Dairy	87.36% (0.0124)	85.87% (0.0067)	-1.0269 [0.3045]	85.41% (0.0132)	86.39% (0.0066)	0.6745 [0.5000]
Observations	720	2683		713	2690	

Note: Standard errors in (), p-values in []. Data were collected at an Alachua County School. Standard errors are in parentheses.

Table 3: Selection of Fruit or Dairy Lunch Component by À La Carte Selection

	Ice Cream			Dessert		
	Selected	Not Selected	Test Statistic	Selected	Not Selected	Test Statistic
Fruit	48.28% (0.0293)	57.98% (0.0088)	3.1949 [0.0014]	27.19% (0.0417)	58.19% (0.0086)	6.5759 [0.0000]
Dairy	89.31% (0.0181)	85.90% (0.0062)	-1.611 [0.1072]	74.56% (0.0408)	86.59% (0.0059)	4.6157 [0.0000]
Observations	114	3289		290	3113	

Note: Standard errors in (), p-values in []. Data were collected at an Alachua County School.

Table 4: Selection À La Carte Items by Race, Gender, and NSLP Status

	Ice Cream	Dessert
NSLP		
Free/Reduced	61.43%	21.50%
Paid	30.97%	7.79%
Gender		
Male	43.07%	8.86%
Female	36.71%	13.85%
Race		
White	47.10%	13.86%
Black	37.45%	5.33%
Other	28.85%	15.22%
Hispanic	28.00%	10.34%
Observations	290	83

Note: Data were collected at an Alachua County School.

Table 5: Coefficients and Marginal Effects for Estimation of Factors that determine Ice Cream and Dessert Selection

	Ice Cream		Dessert	
	Coefficients	Marginal Effects	Coefficients	Marginal Effects
Race				
Black	-0.2825** (0.1338)	-0.0989** (0.0463)	-0.3272* (0.1883)	-0.0538* (0.0279)
Other	-0.5224*** (0.1960)	-0.1757*** (0.0605)	0.1178 (0.2428)	0.0248 (0.0537)
Hispanic	-0.5655*** (0.2117)	-0.1886*** (0.0637)	-0.1064 (0.2435)	-0.0199 (0.0434)
Grade				
First	-0.0919 (0.1628)	-0.0334 (0.0589)	0.0202 (0.2047)	0.0041 (0.0419)
Second	-0.5553*** (0.1484)	-0.1960*** (0.0510)	-0.2323 (0.1978)	-0.0415 (0.0358)
Third	-0.5402*** (0.1538)	-0.1910*** (0.0530)	-0.0909 (0.2127)	-0.0176 (0.0409)
Fourth	-0.5430*** (0.1872)	-0.1919*** (0.0642)	-0.1425 (0.2260)	-0.0268 (0.0418)
Male	0.2221** (0.1027)	0.0761** (0.0349)	0.2595* (0.1353)	0.0466* (0.0237)
Free/Reduced	-0.7007*** (0.1145)	-0.2582*** (0.0420)	-0.5550*** (0.1428)	-0.1156*** (0.0331)
Register	-0.1793 (0.1107)	-0.0617 (0.0381)	0.0010 (0.1586)	0.0002 (0.0291)
Intercept	0.6497*** (0.1530)		-0.8437*** (0.1917)	
Observations	720	720	713	713
Log Likelihood	-433.633		-239.606	

Note: Asterisk (*), double asterisk (**), and triple asterisk (***) denote 10, 5, and 1 percent significance levels, respectively. Data were collected at an Alachua County School. Standard errors in ().

Table 6: Coefficients and Marginal Effects for Estimation of Factors that determine Fruit and Dairy Selection

	Fruit		Dairy	
	Coefficients	Marginal Effects	Coefficients	Marginal Effects
Dessert Offered	0.1239** (0.0620)	0.0433** (0.0215)	0.0039 (0.0739)	0.0008 (0.0155)
Ice Cream Offered	0.1549** (0.0709)	0.0539** (0.0243)	-0.0617 (0.0860)	-0.0132 (0.0187)
Dessert Selected	-1.018*** (0.1686)	-0.3486*** (0.0479)	-0.0189 (0.1845)	-0.0040 (0.0394)
Ice Cream Selected	-0.4240*** (0.0997)	-0.1524*** (0.0356)	0.1865 (0.1289)	0.0360 (0.0228)
Grade				
First	-0.1055 (0.0761)	-0.0364 (0.0263)	-0.4484*** (0.1018)	-0.0798*** (0.0183)
Second	-0.1507** (0.0697)	-0.0522** (0.0241)	-0.3586*** (0.0933)	-0.0602*** (0.0151)
Third	-0.1911*** (0.0739)	-0.0666*** (0.0257)	-0.3781*** (0.1016)	-0.0643*** (0.0172)
Fourth	-0.3256*** (0.0815)	-0.1149*** (0.0286)	-0.7336*** (0.1001)	-0.1541*** (0.0220)
Race				
Black	0.3497*** (0.0615)	0.1211*** (0.0206)	-0.0582 (0.0743)	-0.0127 (0.0164)
Other	0.0945 (0.0910)	0.0339 (0.0323)	0.2665** (0.1253)	0.0488** (0.0201)
Hispanic	0.0022 (0.0883)	0.0008 (0.0319)	0.0416 (0.1106)	0.0086 (0.0225)
Male	-0.1419*** (0.0466)	-0.0500*** (0.0164)	0.1098* (0.0568)	0.0232* (0.0121)
Free/Reduced	0.0226 (0.0530)	0.0080 (0.0187)	0.2752*** (0.0644)	0.0607*** (0.0149)
Register	0.0462 (0.0551)	0.0163 (0.0194)	-0.2493*** (0.0671)	-0.0540*** (0.0150)

Table 6: Continued

	Fruit		Dairy	
	Coefficients	Marginal Effects	Coefficients	Marginal Effects
Entrée				
Salad	-1.579*** (0.0988)	-0.5315*** (0.0228)	-0.0252 (0.1001)	-0.0057 (0.0229)
Sandwich	-0.3596*** (0.0482)	-0.1330*** (0.0177)	0.1715*** (0.0608)	0.0353*** (0.0123)
Intercept	0.5712*** (0.0774)		1.2738*** (0.1016)	
Observations	3043	3043	3043	3043
Log Likelihood	-2103.07		-1299.48	

Note: Asterisk (*), double asterisk (**), and triple asterisk (***) denote 10, 5, and 1

percent significance levels, respectively. Data were collected at an Alachua County

School. Standard errors are in parentheses.