M^3 Challenge Sixth Place Team
First Honorable Mention Team Prize: $2,500

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Problem: Lunch Crunch: Can Nutritious Be Affordable and Delicious?

****Note: This cover sheet has been added by SIAM to identify the winning team after judging was completed. Any identifying information other than team # on an M^3 Challenge submission is a rules violation.*

Lunch Crunch: Can Nutritious Be Affordable and Delicious?

Summary

For many students, a reliance on school lunches is an integral part of daily life. Having to provide a school lunch that is healthy, supplies students with enough calories to get them through the day, and yet is still tasty enough to remain edible has been a problem that national lunch programs and independent school districts have struggled with throughout their existences. Students desperately need a strong, nutritious lunch in order to sustain them through the afternoon and to fill any deficiencies they might have in the food they receive from home.
Our consulting firm was tasked initially to develop a mathematical model that inputs students' attributes and then outputs the number of calories the student needs to consume at lunch. Our first priority was to determine the number of calories a student burns throughout the day. We accomplished this by utilizing the Harris–Benedict equation ("Revised Harris Benedict equation- Determination of the BMR") to determine necessary sedentary caloric intake, as well as using other factors such as breakfast calorie intake and daily physical activity to determine how many calories students need for school.

Second, we were tasked with analyzing what percentage of all American students' caloric needs were met by the average school lunch in the United States. We were able to accomplish this by using statistical data to approximate the attributes of students. We used a Python program to randomly generate 10,000 "students" in each grade range and then determined, using our caloric intake model, what proportion of these students have their caloric needs met by the national standard school lunch.

Our third task was to develop a lunch plan based on a budget of $7.00 a week per student that meets nutritional standards and appeals to students, as well as to determine what would happen if that budget were changed to $6.00 a week per student. This was accomplished first by choosing five beverages, ten entrees, and ten sides to work with. We then assigned variables of calories, price per serving, taste, and nutritional value based on research and used these four variables to set up a program that picked the five best combinations of one drink, one entree, and two sides that maximized all four variables. Each variable was assigned a weight of equal importance. We then ran this program again with the new limit of $6.00 a week per student, and we found that the results were dissimilar, which resulted in slight menu changes with a smaller maximization of calories, price per serving, taste, and nutritional value.

Our final task was to determine the applicability of our model to other socioeconomic and geographic regions. While our model is very sound when looking at the United States of America, many factors such as availability of certain foods, dietary habits of certain religions, and the need to use culturally relevant foods in certain geographic regions, make our lunch plan unusable in geographic areas that differ significantly from that of the United States. In other first world countries our model for the amount of calories needed to be consumed by students at lunch would work perfectly with a few slight alterations in the obesity rates and physical activities for students in those respective nations. In third world countries and areas outside of the United States where the socio-economic difference is significant, the model will not work due to disparities in distance traveled to school and the average weight and height of the students. We are confident this model will work anywhere in the United States and in the majority of areas in all first world countries.

Our analysis shows that while students in elementary school are fed enough food at a similar rate in both programs, 7.9% more middle school students are fed enough calories and 6.6% more high school students are fed enough calories with our revised program.

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Introduction

School lunches have always been a source of angst for students and their school administration. Students want high-quality food with good taste, while school administrator's focus lies solely on cost efficiency. Now, the United States government has begun an initiative to promote lifelong eating habits. This initiative, led by First Lady Michelle Obama, led to the passage of the Healthy, Hunger-Free Kids Act of 2010. While this act does take a strong step toward authorizing refinement of the implementation of the National School Lunch Program, it has been met with declining user numbers and higher lunch prices for some school districts. While some would argue this to be a necessity to serve children healthier and more nutritious food, others would say that the money is just not there to be sacrificing large costs for small improvements in nutrition.

The National School Lunch Program (NSLP) has been around since 1946. Today it serves over 100,000 schools and serves 31 million children free or reduced-price lunches each day ("Final Rule Nutrition Standards in the National School Lunch and School Breakfast Programs"). This service mainly operates in public schools and schools with low-income students. Despite having been vastly improved since its 1946 initiation, the NSLP still lacks consistent, nutritious, cost effective, and tasty service to all age ranges of students.

Restatement of the Problem

Our consulting firm was asked to:

I. Develop a mathematical model that takes as input a student's individual attributes, and outputs the number of calories that a student with those attributes should eat at lunch.

II. Create a model to determine the distribution of U.S. high school students among each of these categories, and determine what percentage of students will have their caloric needs met by the national standard lunch.

III. Leverage math modeling to develop a lunch plan (using food categories) that stays within the $7.00 budget per student per week, meets the nutritional standards, and appeals to students. Also determine what changes you would make if your budget was decreased by $1.00.

IV. Take into account how this model could be applied to other geographic and socio-economic regions.

Global Assumptions

1. We will assume the number of calories burned each day is normally distributed by each age and sex.
2. We will assume a normal day for the students, no special events or activities.
3. We will assume physically healthy students. The number of physically disabled students is not a large enough number to be considered significant.
4. Lunch time is at noon.
5. Students eat a dinner meal at 6:00 p.m.
6. The average lunch today is equivalent to the maximum calories served by the National School Lunch Programs (“Final Rule Nutrition Standards in the National School Lunch and School Breakfast Programs”).
7. Every recess is for kids grades K–6 and is 20 minutes, and the calories burned is equivalent to 20 minutes of swinging on a swing.
8. Half of school age children are male, and the other half are female.
9. Equal number of kids in each grade.
10. Assume biking to school is the equivalent to walking to school and assume a walking speed of 3 mph.
11. Assume the Harris–Benedict equation is applicable for solving for the basal metabolic rate for students, which counts for sedentary calorie usage by the body throughout the day.
12. Assume grade level is age minus five.
13. Assume elementary school is grades K–6, middle school is 7–8, and high school is 9–12.
14. Assume middle and high school students wake up at 6:00 and elementary age kids wake up at 7:00.
15. Assume lunch has to make up for calories not accounted for by breakfast.
16. Assume the amount of calories consumed at breakfast is normally distributed around a mean number ("Healthy Habits Healthy Kids") and that 8–12% of 5–11-year-old children don't eat breakfast and 20–30% of 12–17-year-old teenagers do not eat breakfast ("The Case for Eating Breakfast").
17. Assume all students intake 200 calories of snacks throughout the day ("Learn The Facts")
18. Assume negligible cost in meal preparation from the raw food.
19. Assume the $7.00 a week is equivalent to a maximum of $1.40 ($7/5 days a week) a day.

Part I - You Are What You Eat

The necessary caloric input for a student from their school lunch depends on a variety of factors. These factors include gender of the student, their age, their height, their body mass, what the student eats for breakfast, their mode of transportation to school, how much the student eats for a snack during school, and the amount of exercise the student gets a day.

G - Gender: Either male or female, this can be treated as a Boolean value. We will call male a true value and female a false value.
A - Age: An integer from 5 to 17 years. We are making the assumption that all school children are aged 5 to 17.

H - Height: The height of the student in centimeters.

M - Mass: The body mass of the student in kilograms.

B - Breakfast: The number of calories the student acquires from eating breakfast.

T - Transportation: The distance the student walks to school. We are assuming that if students do not go to school in a vehicle they walk to school. This variable is the distance walked to school in kilometers.

S - Snack: The number of calories the student acquires from consuming snacks they have throughout the school day.

E - Exercise: the number of calories the student burns from exercise during the school day.

C - The number of calories needed for school lunch:

$$C = bmr\left(G, M, H, A\right) + w(M, T) + E$$

$bmr(G, M, H, A)$ is a function for determining the basal metabolic rate by using the Harris–Benedict equation ("Revised Harris Benedict equation - Determination of the BMR").
For our purposes we are going to make the assumption that the Harris–Benedict equation is applicable for people under the age of 18. If the gender is male (G is true), the basal metabolic rate (b) is

$$b = 88.362 + (13.397M) + (4.799H) - (5.667A),$$

and the basal metabolic rate for females is

$$b = 447.593 + (9.247M) + (3.098H) - (4.33A).$$

We also made the assumption that a high school student wakes up at 6 am and the school day ended at 6 pm, for a total of 12 hours of sedentary calorie burning to consider. We also made the assumption that all other students wake up at 7 am and end at 6 pm for a total of 11 hours. Because we are only accounting for calories provided by school lunch we can multiply the b value by the number of hours that student spends at school to determine the number of basal calories burnt throughout the school day. We have to make the assumption that the grade level of a student can be determined by their age in order to know the grade of a student based on the value of the variable A. $w(M, T)$ is a function for determining the calories burned by walking to school.

We are making the assumption that all students walk to school at the same speed, a speed of 4.824 kilometers per hour. We will call this speed s. This variable s was determined by assuming the walking speed to school of a typical student is 3 m/s.

We used the following equation to determine the relationship between speed of walking to school, mass of the walker, and time spent walking ("Walking Calorie Burn Calculator"):

$$w(M,T) = \left(0.0215s^3 - 0.1765s^2 + 0.871s + 1.4577\right) M \cdot t \ ,$$

where t is the time spent walking, which is easily determined because we know how far the walker walks (T) and they rate at which they are walking (s):

$$t = \frac{T}{s} \ .$$

Therefore,

$$w(M,T) = \left(0.0215s^3 - 0.1765s^2 + 0.871s + 1.4577\right) \frac{M \cdot T}{s} \ .$$

An important note to make about this model is that the required caloric intake *can* be negative. If the required caloric intake (C) is negative, then there was an excess of calories due to snacks and breakfast. This is possible, for example, if a student has a large snack and a large breakfast but doesn't do any physical activity the entire school day.

PART II – One Size Doesn't Necessarily Fit All

For the purposes of determining how many students meet their caloric needs we used a Python function to generate attributes of a "random" student. Because the caloric needs of a student depend on gender, age, height, mass, calories from breakfast, their mode of transport to school, how much snacks they eat throughout the day, and how much exercise they do, we had to randomly generate all of these values.

Gender

For our purposes we made the assumption that the probabilities of a random student being either gender are equal. This means

$$P(\text{male}) = P(\text{female}) = 0.5.$$

The output of a Python function gave a random decimal number between 0 and 1. If the number was less than 0.5, then the student was determined to be male, and if the number was greater than 0.5, the student was determined to be female.

Age

For determining age we made the assumption that the probability of a student being in each grade is equal. The age was selected by a Python function that produced a random integer within a certain range. We made the assumption that all school children are within the age range of 5 to 17 years. The age had an equal probability of being any integer from 5 to 17.

Height

The height of the random student in cm was determined by the age and gender of that student. We made the assumption that the height of the random student was equal to the population average of a student in that age and gender. We used a table to determine those values ("Average Height to Weight Chart - Babies to Teenagers").

Weight

The weights (in kilograms) of the students were assumed to be a normally distributed random variable for each age and gender. The mean of the normal distribution was assumed to be the population average of a student with a given age and gender ("Average Height to Weight Chart - Babies to Teenagers"). We also assumed that all these normal distributions have the same standard deviation ("2 to 20 years: Girls Stature-per-age and Weight-per-age percentiles").

Because we have a mean and standard deviation, we can use a normal curve to generate weighted random values (no pun intended). We used a NumPy function to generate random weights in kilograms for these normal curves.

Mode of Transport

For the mode of transport we made the assumption that students either walked to school or didn't walk to school. Only about 13% of students walk to school ("Quick Facts"). Thus, P(walking) = .13. We used a Python function to generate a random decimal number between 0 and 1. If that number was less than .13, then it was determined the student did walk to school. Otherwise it was determined that the student didn't walk to school, meaning that their distance walked was 0 km. If the student was one of the 13% that did walk, then we assumed that the distance walked to school was .8 km, the average distanced walked to school by students (Young).

Calories from Breakfast

Based on our sources we determined that 10% of children ages 5 to 12 don't eat breakfast and 25% of students age 13 to 17 don't eat breakfast ("The Case for Eating Breakfast"). We used a Python function to generate a random decimal number between 0 and 1. That random number corresponded to the probability of a student in a particular age range eating breakfast. For those students who did eat breakfast the amount of calorie intake was assumed to be a normally distributed random variable, with a specific mean and standard deviation for boys and girls (Warren, Henry, and Simonite).

If the student did indeed eat breakfast, then we used a NumPy function for producing normally random numbers based on the mean and standard deviation for boys or girls. This number would be the number of calories gained from breakfast by the random student. If the student was determined to have not eaten breakfast, than the number of calories gained from eating breakfast was simply 0.

Snackage

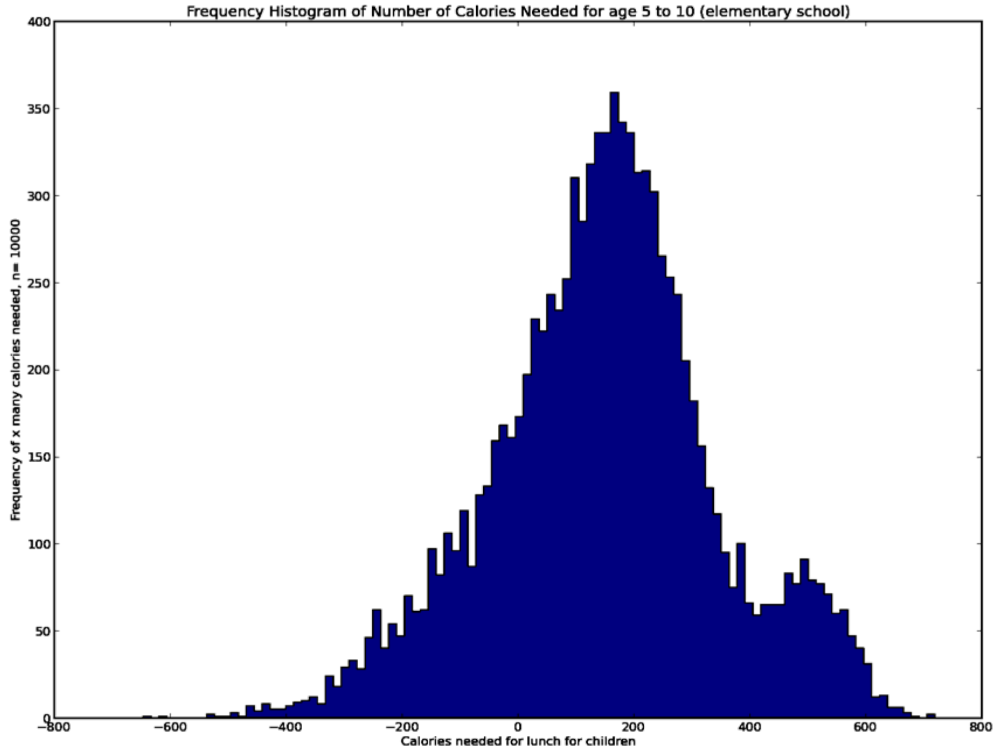
We assumed that each student gained, on average, 200 calories a day from eating snacks ("Learn the Facts").

Exercise

For determining the amount of calories needed due to exercise we determined the average obesity rate of students. We made the assumption that obese students do not burn calories due to exercise. Each age group of students had a corresponding proportion of the population of that age was obese ("Childhood Obesity Facts").

We used a Python function to generate a random number between 0 and 1. If the proportion of obese students in that particular age group was less than the randomly generated number, then that student was determined to be obese. If the student was determined to be obese, then the necessary caloric intake due to exercise was assumed to be 0. If the student did indeed exercise, the amount of necessary caloric intake due to exercise then the amount was considered to be a normally distributed random variable. The mean of the normally distribution was determined by the average calories burned during exercise for different particular age ranges ("Childhood Obesity Facts").

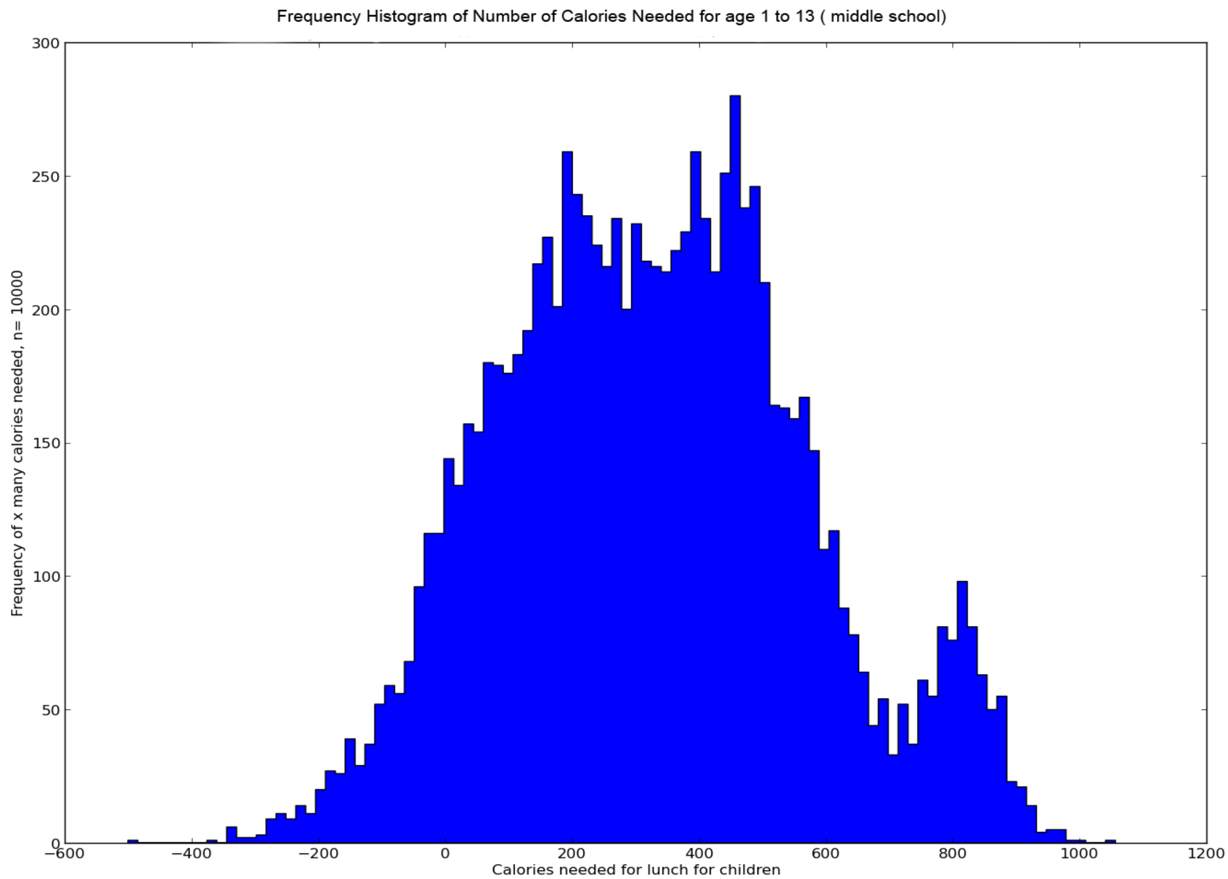
The standard deviation of the normal distribution was determined by the standard deviation of the number of calories burned during an hour of doing various physical activities ("Calories Burned by Sports").



Histogram 1
percentage fed: 99.33%
mean of sample: 149.42564936
standard deviation of sample: 195.58487576

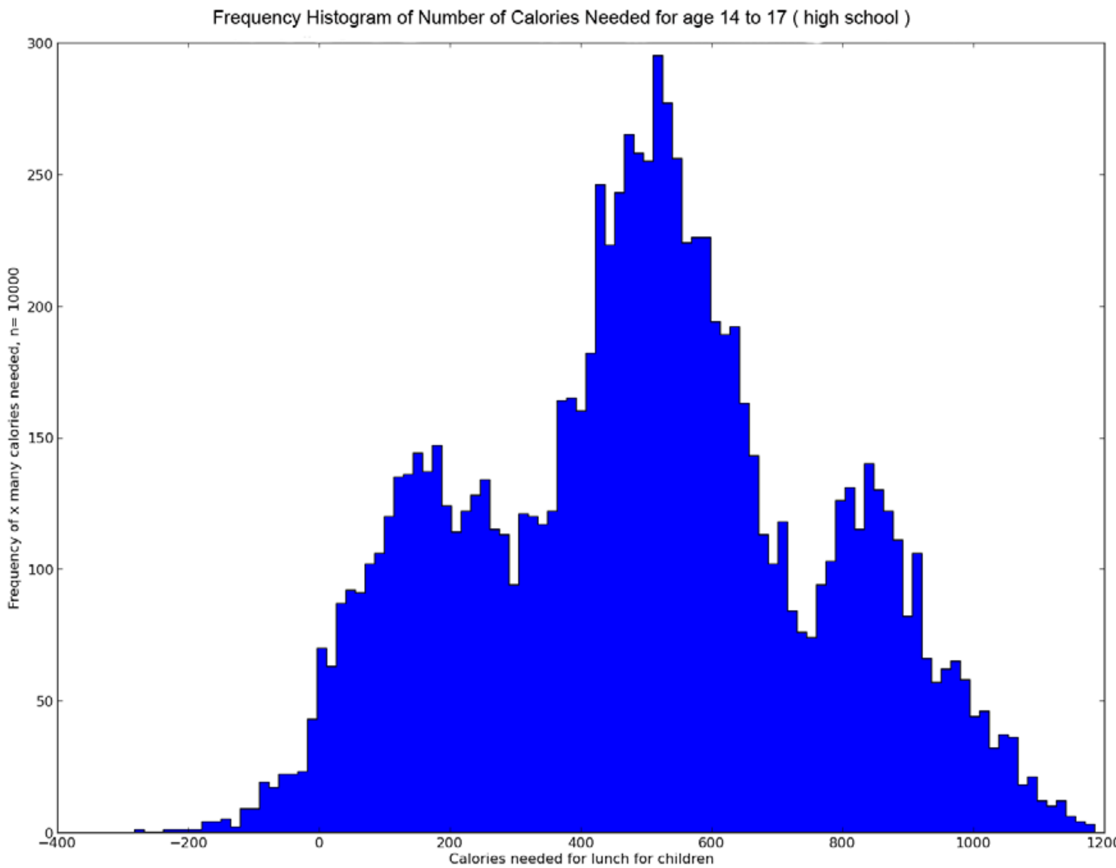
Histogram 1 represents the frequency of necessary caloric intake for 10,000 randomly generated elementary school students. We assumed that all children in the elementary school are in grades kindergarten through 5 and are ages 5 through 10. Of the 10000 randomly generated elementary students, 9,933 of those students required a caloric intake of less than 600 calories. This means that if we assume that the standard school lunch for elementary schoolers provides 600 calories, then based on this sample 99.33% of elementary school students receive the necessary caloric intake from school lunch. In other words 9,933 students needed less than 600 calories.

The mean of the sample is 149 calories. This means that, on average, elementary schoolers required 149 calories for lunch. The standard deviation of the sample is 196, indicating a somewhat large spread of data. The calories needed for elementary schoolers varies; however, the majority of the students are fed. This can be attributed to the fact that elementary schoolers are smaller and require fewer calories to keep their bodies functioning. Elementary schoolers also participate in less vigorous physical activities than older students, meaning that they require fewer calories.



Histogram 2
percentage fed: 90.14%
mean of sample: 329.578205526
standard deviation of sample: 243.893798322

Histogram 2 represents the frequency of necessary caloric intake for randomly generated 10000 middle school students. We assumed that all children in middle school are in the 7th grade and 8th grade and are of ages 12 and 13. Of the 10000 random middle school students generated, 9,104 of those students required a caloric intake of less that 650 calories. This means that if we assume that the standard school lunch for middle schoolers provides 650 calories, then based on this sample 91.04% of middle schoolers receive the necessary caloric intake from school lunch. In other words 869 or 8.96% (which is 10000 – 9104) students needed more than 650 calories. The mean of the sample is 329 calories, which means that based on our model the average middle schooler requires about 329 calories from their school lunch. This is roughly twice as much as the average value we determined for elementary students. Middle schoolers are in a stage of growth in their lives and will naturally need a higher caloric input than elementary students. Based on our model and the assumption that the standard middle school lunch is 650 calories, then only 90% of students meet their caloric needs. This means 10% of students *aren't* meeting their caloric needs.



Histogram 3
percentage fed: 84.4%
mean of sample: 493.522265051
standard deviation of sample: 267.633939514

Histogram 3 represents the frequency of necessary caloric intake for 10000 randomly generated high school students. We assumed that all children in high school are in grades 9 through 12 and are of the ages 14 through 17. Of the 10000 random high school students generated, 8,440 of those students required a caloric intake of less than 800 calories. This means that if we assume that the standard school lunch for high schoolers provides 800 calories, then based on this sample 84.4% of high schoolers receive the necessary caloric intake from school lunch. In other words, 1560 (which is 10000 – 8440) students, or 15.6%, needed more than 800 calories.

PART III - There's No Such Thing As A Free Lunch

Assumptions

We assumed our taste to be that of the average school lunch–consuming student.
We assumed a 20% discount for buying in mass quantities.
We assumed the amount of food to be eaten per child to be one serving size.
We assumed the $7 a week to be solely for food and not for the preparation of the food.
We assumed that $7 a week is the equivalent to the maximum of $1.40 used a day.

To develop a lunch plan we first had to decide what a lunch would consist of. In this case lunch consists of a drink, an entree, and two sides. There were four drink options, ten entree options and ten side options to choose from. To create a model, numeric values were assigned to each attribute pertinent to our budget ($7 a week), a nutrition value, and how each food or drink appealed to students.

To come up with a price we found the price of each serving of the foods and drinks that are ingredients in each drink/entree/side. We then multiplied the net price by 80%, or 0.8, to get the price we actually plan on spending. The prices used came from Sam's Club's official website (Sam’s Club).

For the nutritional value we found the calories per serving of each drink, entree, or side. Because the nutrition value of foods is not solely based on their quantity of calories we had to use something else in addition to the calories to determine the nutrition value of each food. In our case we used a nutrition data rating, which is scored out of 5 ("Nutrition Facts Help"). This number is determined by the nutrition density of the food, which boils down to how many nutrients there are per calorie. Also the nutrition data rating takes into account frequently overconsumed nutrients such as salt, saturated fats, and cholesterol.

Finally to find the appeal of the foods to a student we created a scale from 1 to 3, based on the opinion of taste of each of the foods, 1 being a food that tastes below average, 2 being a food with an average taste, and 3 being a food that tastes above average. To determine a rating we based the taste of each food on our personal preferences and assumed that our preference was that of the average. After factoring in each of these attributes we come up with a chart that looks like the following.

Drinks	Cals	Price	Taste	Nutrition		Fullness
Water	0	0.04	2	4.5		1.4
Skim Milk	86	0.14	2	4.2		3.2
Reduced Fat Chocolate Millk	157	0.18	3	3.1		3.1
Fruit Smoothie	321	0.16	3	2.5		2.9

Entree	Cals	Price	Taste	Nutrition		Fullness
Rice w/Chicken	428	0.65	2	2.4		2.3
Grilled Chicken Sandwich	419	0.48	2	2.3		2.4
Baked Potato	278	0.17	1	4		2.5
Pizza-Pepperoni	298	0.47	3	2.3		2
Mac n Cheese	200	0.22	3	2.4		2.7
Chicken Nuggets	251	0.32	3	1.4		2
Salad w/low fat dressing	110	0.64	1	2.8		4.2
Taco	571	0.83	2	2.3		2.2
Hamburger	438	0.61	3	1.7		2.2
Grilled Cheese	320	0.24	2	1.6		1.9

Side	Cals	Price	Taste	Nutrition		Fullness
Broccoli	19	0.29	1	5		4.5
Baby Carrots	5	0.12	1	4.4		4.1
Cheese Sticks	71	0.05	2	2		2.6
Applesauce	102	0.23	3	2.7		3.7
Yogurt	250	0.39	3	2.1		2.5
Apple	65	0.54	2	2.7		3.3
Orange	85	0.34	2	3.8		3.5
Bananas	200	0.15	2	2.8		2.5
Green Beans	35	0.61	1	5		4.5
Mashed Potatoes	212	0.2	2	3.6		1.8

To effectively use this data we developed a formula to tell us the sum of the amount of calories, the amount of taste, and the amount of nutrition based on every possible combination of drink, entree, and two sides:

$$Z = \frac{C_{sum}}{C_{\max}} + \frac{T_{sum}}{T_{\max}} + \frac{N_{sum}}{N_{\max}},$$

where Z is the sum of each attribute, C_{sum} is the amount of calories used in one particular group of food and drink choices, $C_{\max}$ is the maximum amount of calories possible out of all combinations, T_{sum} is the sum of the taste score used in one particular group of food and drink choices, and $T_{\max}$ is the maximum taste value possible out of all combinations. As one could probably guess, N_{sum} is the amount of nutrition used in one particular group of food and drink choices, and $N_{\max}$ is the maximum nutritional value possible out of all combinations.

Now as long as the price of the entire meal is less than \$1.40 (\$7 divided by 5), which can be written as

$$D_{price} + S_{price} + E_{price} \leq \$1.40,$$

D_{price} is the price of the drink, S_{price} is the price of the sum of the prices of the sides, and E_{price} is the price of the entree.

To come up with a menu we ran each entree with each of the possible drink and two side options using a computer for the iterations to see which options work best with each entree. Then we chose the five entrees (due to there being five days in a school week) that maximized our *Z* value. Those five options are as follows:

	Entree	Z	Drink	Side 1	Side 2	Calories	Price	Taste	Nutrition
Day 1	Grilled Chicken Sandwhich	2.606	Fruit Smoothie	Yogurt	Broccoli	1009	1.32	9	11.9
Day 2	Chicken Nuggets	2.487	Skim Milk	Applesauce	yogurt	689	1.08	11	10.4
Day 3	Taco	2.384	Skim Milk	Orange	Cheese Sticks	813	1.36	8	12.3
Day 4	Rice with Chicken	2.59	Fruit Smoothie	Mashed Potatoes	Broccoli	980	1.3	8	13.5
Day 5	Hamburger	2.69	Fruit Smoothie	Orange	Apple Sauce	946	1.34	11	10.1

If we run the same simulation but with the maximum net price being $1.20 we get three out of five of the same entrees, and two of those three entrees have at least one of the same sides. The net price in this case is $5.26 (87% of allotted money).

	Entree	Z	Drink	Side 1	Side 2	Calories	Price	Taste	Nutrition
Day 1	Grilled Chicken Sandwhich	2.55883	Water	Mashed Potatoes	Yogurt	881	1.11	9	12.5
Day 2	Mac N Cheese	2.53649	Chocolate Milk	Orange	Mased Potatoes	654	0.94	10	12.9
Day 3	Pizza Pep	2.472	Fruit Smoothie	Orange	Baby Carrots	709	1.09	9	13
Day 4	Taco	2.39259	Skim Milk	Bananas	Cheese Sticks	928	1.17	8	11.3
Day 5	Hamburger	2.3637	Skim Milk	Bananas	Cheese Sticks	795	0.95	9	10.7

We can compare our method of food distribution with that of the current system:

	Entree	Drink	Side 1	Side 2	Calories	Elementary	Middle	High
Day 1	Grilled Chicken Sandwhich	Fruit Smoothie	Yogurt	Broccoli	1009	100	99.733	97.295
Day 2	Chicken Nuggets	Skim Milk	Applesauce	yogurt	689	99.710	92.972	76.742
Day 3	Taco	Skim Milk	Orange	Cheese Sticks	813	99.965	97.627	88.37
Day 4	Rice with Chicken	Fruit Smoothie	Mashed Potatoes	Broccoli	980	100	99.98	96.71
Day 5	Hamburger	Fruit Smoothie	Orange	Apple Sauce	946	100	99.88	95.98
Average						99.935	98.0384	91.0194

The percentage of children fed daily are given in the last three columns and the average of all the days is the final row. Compared to the values using the current methods (99.33% for elementary school, 90.14% for middle school, and 84.4% for high school) our method substantially outperforms that of the current method.

Part IV - Model Applications

Two models have been created in this report: a model for how many calories students need to consume at lunch and a model for the optimal lunch plan to efficiently and effectively feed students. The question is whether or not these models are applicable to different geographic and socioeconomic regions.

The model for how many calories students need to consume at lunch. This model is very good when you look at first world countries such as the United States and the United Kingdom. Some of the small variables such as obesity rates and distance traveled to school could be altered slightly to form a better model for individual countries, but on the whole the model works great. Now, when you begin to look at different geographic regions we begin to see some slight differences. For instance, in more mountainous regions students will burn substantially more calories walking to school, and physical activities will burn more calories due to the high altitude. For this reason, this model will not work very well in regions that have significantly different climates than that of the United States.

The model for the optimum lunch plan faces many obstacles when it attempts to be used in other socioeconomic and geographic regions. Many of the foods we use in our lunch plan may not be available in certain geographic locations due to the western-specific food in many cases. This takes nothing away from the model; it merely makes it less applicable to non–first world countries. Additionally, many countries have dietary requirements for state religions, along with cultural foods specific to their country that they would want on their menu. The food, while not overpriced or too expensive, is merely inappropriate for certain regions and third world countries. We do not believe that this in any way takes away from the model’s strength.

Conclusion

This consulting firm has determined that that the current average lunch being served to students is not being maximized as it should be. 90.1% of middle school students and 84.4% of high school students is not a high enough percentage of students whose daily caloric intake is being met. Having created an optimized model that feeds 98.0% of middle schoolers and 91.0% of high schoolers, we would suggest that the current average lunch method be thrown out in favor of our new method for a lunch plan, as it substantially improves the lives of middle school and high school students.

The method this firm has devised for calculating the necessary caloric intake for students at lunch is consistent and accurate in the United States and other similar first world countries. Its thorough approach gives concise data that can be used to analyze the current average lunch and other future possible lunches such as the menu this firm devised. This model can be used in other similar studies to accurately predict the necessary calorie intake of students at lunch.
The lunch plan works very well at $7.00 a week. If you decrease the lunch plan to $6.00 a week, then the meals become less optimized but still give results that are similar to the current average lunch but with less money. This consulting firm is confident in the accuracy of our results and would suggest an overhaul of the current average lunch in favor of our own.

Works Cited

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