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FOOD WASTE STUDY AT A SCHOOL DISTRICT IN CALIFORNIA

Monica Ibarra

FOOD WASTE STUDY AT A SCHOOL DISTRICT IN CALIFORNIA

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Nutrition Science

by

Monica Ibarra

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Approved by:

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ABSTRACT

This study is aimed at evaluating food leftovers and wastes among elementary school students by comparing their food preferences for different ethnic cuisines, developing strategies to reduce food waste, and an assessment of quality assurance of food served. Data were collected from a cafeteria at an elementary school located in California. The total number of students served each day at this elementary school was 475. Data was provided by the cafeteria staff after lunch was served. It was observed that students preferred Chinese food (specifically, Orange Chicken) over Mexican (Beef Chalupas) and American food (Turkey with Gravy) where 100% of the portion prepared was served for that day. Mexican food was preferred second with 74% of the portions served and American food was least favored with 73% of the portion served. Further research should include students' input to evaluate other causes of food leftovers and strategies to reduce food waste.

Keywords: *food waste, food preference, food security*

ACKNOWLEDGEMENTS

First, I would like to thank Dr. Marta Sovyanhadi, my major professor, Dr. Dorothy Chen, and Dr. Neal Malik for their patience and guidance through my undergraduate and graduate coursework. Thank you for preparing and helping me to get where I am today. Dr Tolar-Peterson, thank you for your helpful tips and guidance in preparation of the project.

I am grateful for my classmates for always being there to listen and gice advice to get through any discouraging moments faced; and for cheering on every accomplishment achieved. Your support during graduate school, work and internship is greatly appreciated.

To my father, my sister, my children and my friends for all their support and understanding, for checking on me, and making sure I was doing well when I was too busy to check on them, and especially for putting up with all my moods whether I was stressed, tired or distracted. A special thanks to Dr. Franklin Johnson and Mary Berg N.P., without your letters of recommendation I would not have been able to get into graduate school or my internship.

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DEDICATION

This project is dedicated to my mother Lourdes Ibarra for all the love and advice she gave me. I will always try my best and never give up like you did.

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CHAPTER ONE

INTRODUCTION

The impact of food waste on the environment and the economy is a growing problem in the United States. Preventing food waste can make a difference for the environment and the foodservice budget. There are many ways to prevent food waste, such as composting, preventing over buying or preparing foods that will be thrown out because they were never eaten due to spoilage, meal planning, eating leftover food, and serving only the amount of food that will be consumed Small changes like these can help the environment and budget. Teaching children to prevent food waste at an early age will be helpful to them and future generations by slowing global warming and minimizing emissions caused by trash and pollution produced with food waste and its disposal. It will also help conserve natural resources like gas and water.

Food Waste in Elementary Schools

In the United States, people waste tons of food annually and they are disposed of in the landfill. Food waste has environmental, economic, and social impacts worldwide. The environmental impact of food waste is the equipment used to move and dispose of trash, which releases emissions that are unhealthy for the air quality. A lot of the trash disposed of is not biodegradable and is rapidly filling landfills. Economic impacts include not only the cost of food being wasted bit the cost to run the facilities and equipment to collect and attempt to

dispose of trash (Derque et. al, 2019). In an elementary school, it also has an impact on the nutritional needs of students when students do not eat the food that is available to them (Martins et. al., 2020). Factors that cause food waste need to be assessed to be able to identify different methods to reduce food waste.

Purpose of the Study

The purpose of this study is to evaluate the amount of leftover food among elementary school students and to identify strategies that will help reduce food waste in a school foodservice setting. Food preference is considered to be one of the major factors in food waste. This study included a tally of leftover food on three separate occasions depending on the entree served based on the ethnic origins of the dish.

According to the USDA's Economic Research Service (ERS), food waste is defined as edible food that is available and is not consumed. It can occur at any stage of food production and for many reasons are not consumed. The food waste can occur at any point of food production and service such as during harvesting, spoilage during transportation, or buying and cooking more than needed. in 2010, it was established that each person wasted about 218.9 pounds of food per year in the United States, costing an estimated $162 billion. In an effort to reduce food waste, in 2016 the USDA and EPA launched the U.S. Food Loss and Waste 2030 CHampions. Participating businesses and organizations

have committed to 50% reduction in food loss and waste in their U.S. operations by the year 2030 (USDA).

Research Question

Which ethnic cuisine do children in the elementary school prefer and can be served more frequently to reduce leftovers and food waste?

CHAPTER TWO

LITERATURE REVIEW

Food Waste in Elementary Schools

The focus of this literature review is to address food waste at schools in the United States and other countries. The studies were conducted with school age kids because schools are in the best position to educate children on nutrition and food consumption. The articles used were secured using Google Scholar and the CSUSB library databases.

Food Programs in Schools

There are different models of food service programs used by school districts to ensure that proper nutrition is provided for students and to meet the federal requirements for reimbursement. In the United States, these programs include The National School Lunch Program (NSLP), The School Breakfast Program (SBP), and the Hunger-Free Kids Act. These programs have requirements and standards of The Dietary Guidelines for Healthy Americans as established by the USDA (Calvert et al., 2021). The NSLP was established in 1946 and the program was modified to comply with changes made to The Dietary Guidelines for Healthy Americans (niaki et. al.,; Byker et. al. 2014). The Hunger-Free Kids Act was passed by the U.S. congress in 2010. It was developed to ensure that all children in America have access to healthy food at school. The SBP and the NSLP are federal nutrition assistance programs

administered by the United States Department of Agriculture (USDA). These programs are implemented to provide healthy meals at low or no cost to families based on household income. More than 70% of students who participate are eligible for free or reduced priced lunch (Calvert et. al., 2021). Participating schools must meet federal requirements to receive reimbursement for meals served and after school snacks provided. The schools are reimbursed by the USDA if the guidelines are met. Meal patterns and serving sizes vary depending on the grade level of the children, food components in the five food groups, and other specifications for minimum and maximum amounts of energy, macronutrient contents, % of saturated fats, % total sodium, and trans fats (USDA). (APPENDIX B)

The United Nations developed The Sustainable Development Goals in 2015. There are 17 goals included to promote prosperity for the people and to protect the planet. All countries that are members of the United Nations participate in this program.Goal 2 focuses on zero hunger, with its aim to create a hunger-free world by 2030. It also assures that school-aged children receive adequate nutrition for optimal growth and development and have food security while they are in school (Garcia-Herrero et. al., 2019) by determining factors affecting food waste such as food preferences, food taste, appearance, and time allowed for students to eat (Martins et. al., 2020). The programs may develop strategies to decrease food waste and to increase the likelihood of children receiving adequate nutrition from school lunch.

Food Waste in Schools

Food waste, in general, is a problem faced in the United States and the world. Food waste affects the planet in many ways; and it has nutritional, economic, environmental, and social impacts around the world. Environmental impact includes contribution to pollution, excess methane and CO2 emissions, water waste, and many other issues which may impact global climate change (Zhao et. al., 2019; Martins et.al., 2020; Byker et. al., 2014; Garcia-Herrero et. al., 2021). Nutrition, especially in children, is largely affected by food waste when food is not consumed and contributing to food insecurity. Programs like the NSLP aim to provide children with balanced diets that meet ⅓ of their nutrition needs, to nourish their growth, and prevent malnutrition as well as other chronic diseases like cardiovascular disease, type 2 diabetes, and obesity that may develop later in life from poor food choices and food intake during periods of growth. If the food provided to students is not consumed and instead wasted, they will not benefit from the nutrients in the foods (Niaki et. al., 2016). However, if children continue to eat even though they are satisfied, they will gain weight due to overeating to prevent food waste (Yoder et. al., 2015). Therefore, it is important to control the food portions served to provide nourishing food that the children will consume.

Factors Affecting Food Waste in Schools

There are many factors to consider that may be contributing to food waste in schools. These factors include food preferences and avoidance related to religion (Halal) and culture, food allergies, acceptance of foods and texture, and the time allowed for students to eat the meal. There are a large diversity of cultures and backgrounds in California. Some children have never eaten foods outside of their culture and may have difficulty adjusting to and eating unfamiliar foods served in school cafeterias. Religious beliefs may also be an issue. Children may opt to throw away foods they are not allowed to eat due to their beliefs. For example, children within the Catholic religion may not consume meat on Fridays during Lent. If a menu item contains meat, they may choose to throw it away even if they chose it as their entree on a different day of the week. The appearance of food may also affect a child's choice to eat certain foods. If the foods looked different or unappealing, they may take it but throw it away. Texture is another issue, especially for children with special needs or disabilities like those on Autism Spectrum. The texture of food may cause them to reject a food they usually enjoy and throw it away. Cooked vegetables may be more common for some children, while others prefer and enjoy raw vegetables (Martins et. al., 2020).

Another issue may not be related to the food itself, but to the time of the meal. Longer lunch periods of 25 minutes or longer decreased food waste by 10% (Calvert et. al., 2021). Recess before the lunch period showed a reduction in waste possibly due to children eating at a later time and having more time to

develop an appetite. Also, when recess was after the lunch meal period, children rushed through lunch to go play or socialize with friends increasing food waste.

Impact of Waste on Food Security

Food waste is a growing problem around the world. It affects the environment, the economy and nutrition. Emissions produced by methane and CO2 in the landfills may have an impact on global climate change (Zhao et. al., 2019). Climate change can reduce the ability for the land to provide an environment where food for future populations can be grown and produced. Reducing food waste can help to slow the effects of these environmental changes. Educating children on the effects of waste early in life can help influence their eating habits which will aid in having a more sustainable food chain in the future (Derqui et. al., 1019). If children are educated on food waste they will produce less waste, slow climate change and have resources such as land and water to produce food and reduce food insecurity.

CHAPTER THREE

MATERIALS AND METHODS

Data Source and Collection

1. The first step in the process is to obtain permission to collect data. An email was sent to the dietitian and head chef at the school district with a proposal to conduct the study. Upon receiving the request, the dietitian informed the researchers of their separation from the school district in two weeks and referred the proposal to the head chef of the Nutrition Center.
2. A virtual meeting via Zoom was arranged to discuss the details og the project and a plan of how data collection would be conducted at a school site in the school district.
3. A background check on researchers was conducted by the city police department to gain access as a volunteer at the school site.
4. Further planning was discussed via telephone to arrange for the days the school would be visited based on the meals being served to assess the preference for the three types of ethnic foods served.
5. Data were collected from a total of 475 students at an elementary school located in California. Students with food allergies were excluded from the study since they were unable to consume most of the entree dish served on that day.

The school was visited on three different occasions, when different types of ethnic foods were being served. The students have the option to choose the main entree being offered or an alternative choice provided.

Day 1: Mexican cuisine, the entree was a Beef Chlupa and the alternate was Chili with cornbread, with a choice of steamed green beans, garden salad with ranch dressing, a fresh pear or sliced apples, and hot sauce packets.

Day 2: American cuisine consisted of Turkey with mashed potatoes and gravy, a dinner roll, a mandarin orange, and garden salad with ranch dressing. The alternate entree option for the day was a Beef Chalupa.

Day 3: Chinese cuisine was Orange Chicken with brown rice, sliced apples and baby carrots with ranch dressing. A corndog was the alternate entree.

All students have a choice of three different flavors of milk. The choices were non-fat chocolate or strawberry milk, and 1% unflavored milk. Students with a milk allergy received juice instead of milk.

The cafeteria staff keeps a count of foods prepared for lunches according to attendance for the day. The food items were prepared in a cook-chill kitchen at a central site and sent to schools to be reheated, portioned and served. Food items were heated for service and distributed on a daily basis. Milk was kept refrigerated. Fruits served varied according to what is available when the order is placed with the district.

Data Collection

According to the USDA guidelines, the foods offered at the elementary schools are a main entree with 1-2 ounces of protein per serving, a vegetable or salad, a serving of fruit and choice of milk either 1% unflavored or non-fat chocolate or strawberry. An alternate entree is also available.

Data are continuously collected by the cafeteria staff at the elementary school to analyze food preferences of the students. They use a manual count of students to collect data and use a spreadsheet to store and analyze the results. The number of lunches prepared are dependent on attendance that day. During lunch, the cafeteria staff tally which entree was taken by each student. Leftover entrees were calculated at the end of the lunch period and counted as wasted food as well as leftovers and opened salad and dressing since it was no longer able to be saved it had to be discarded. Leftover fruits that were prepackaged or whole were refrigerated and offered the next day. For this study, only the first entree consumed will be used to determine food preferences.

Data collected for the day of the study were provided by the cafeteria staff. Data for the main entrees were counted and recorded by the staff as the children were served munch. Due to limited access and not counted as food waste, fruits and milk were not part of data collection since they were conserved and served to the students the following day.

Ethics

This study was approved by the Institutional Review Board at California State University San Bernardino. The study approval number is IRB-FY2024-255 (APPENDIX A). The research study was conducted at an elementary school cafeteria in California. No human participants were involved in the data collection.

CHAPTER FOUR

RESULTS

Leftover Food Data

Leftover food data were collected on three separate days, during which different ethnic cuisines were served. The main entrees served were Beef Chalupas, Turkey with mashed potatoes and gravy, and Orange Chicken with rice. Alternative entrees were Corndogs, Chili with Cornbread and Beef Chalupas, respectively. There were a total of 475 students enrolled at the elementary school. Data collected were based on the number of students who attended each day on those three days, since preparation of meals is based on the number of students present that day.

The first day, Mexican food was the main entree where Beef Chalupas were served with the alternative entree being Chili with Cornbread. A total of 475 entrees were prepared, 260 Beef Chalupas and 215 servings of Chili with Cornbread. Side dishes were apple slices, which were prepackaged or a fresh pear, and self-serve salad with ranch dressing or steamed green beans. The children must choose one fruit and one vegetable option as well as their choice of milk. Of the 260 Beef Chupas prepared 193 were served and 67 were discarded; therefore 34% of the Chalupas were wasted. Of the 215 servings of Chili with Cornbread prepared 161 were served and 54 were discarded; therefore 33% of the Chili prepared was wasted.

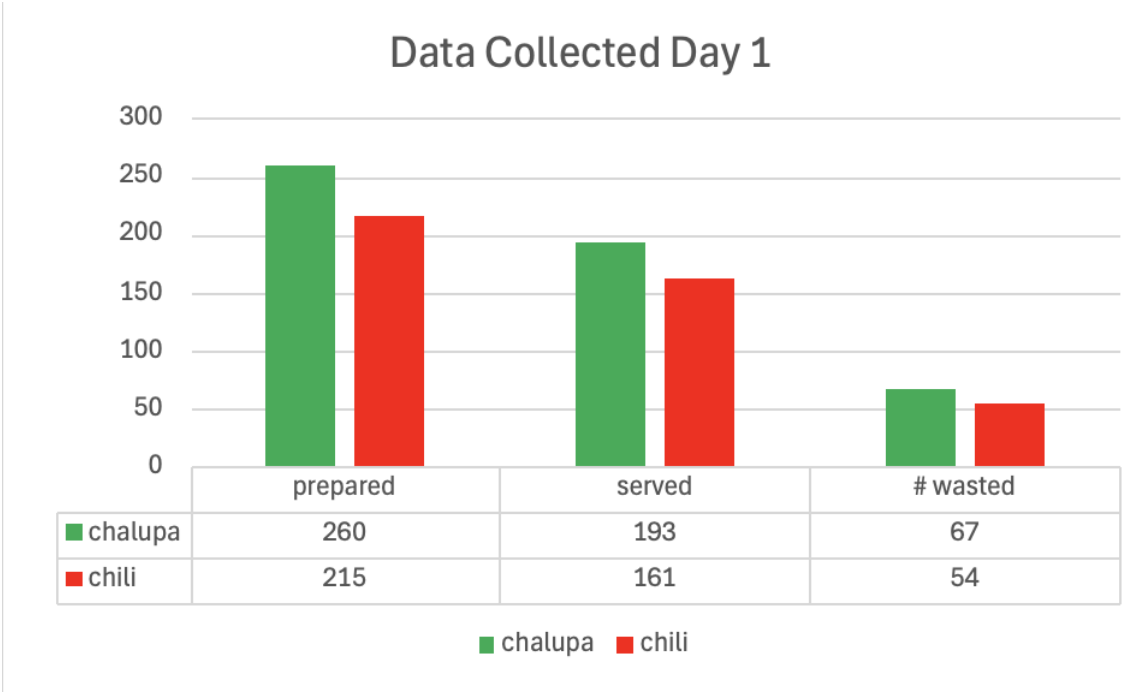


Table 1: *Day 1 of data collection. Main entree was a Beef Chalupa, an alternative choice was Chili with Cornbread. Data includes the number of servings prepared, served, and leftover/wasted.*

The second day of data collection was an American meal. The main entree was Turkey with Mashed Potatoes and Gravy and a whole wheat roll. On this day, only 340 servings were prepared since the fifth grade students were on a field trip and did not eat lunch on campus. There were 225 servings of Turkey, Mashed Potatoes and Gravy prepared. Only 165 portions were served and 60 were discarded; therefore 26% of the Turkey, Mashed Potatoes and Gravy were leftover and wasted. A Beef Chalupa was the alternate entree and of the 115

prepared, 115 were served and 0 were leftover and wasted; therefore 0% of the Beef Chalupas were wasted. Sides on this day included garden salad with ranch dressing and an unpeeled mandarin orange as well as the three milk options.

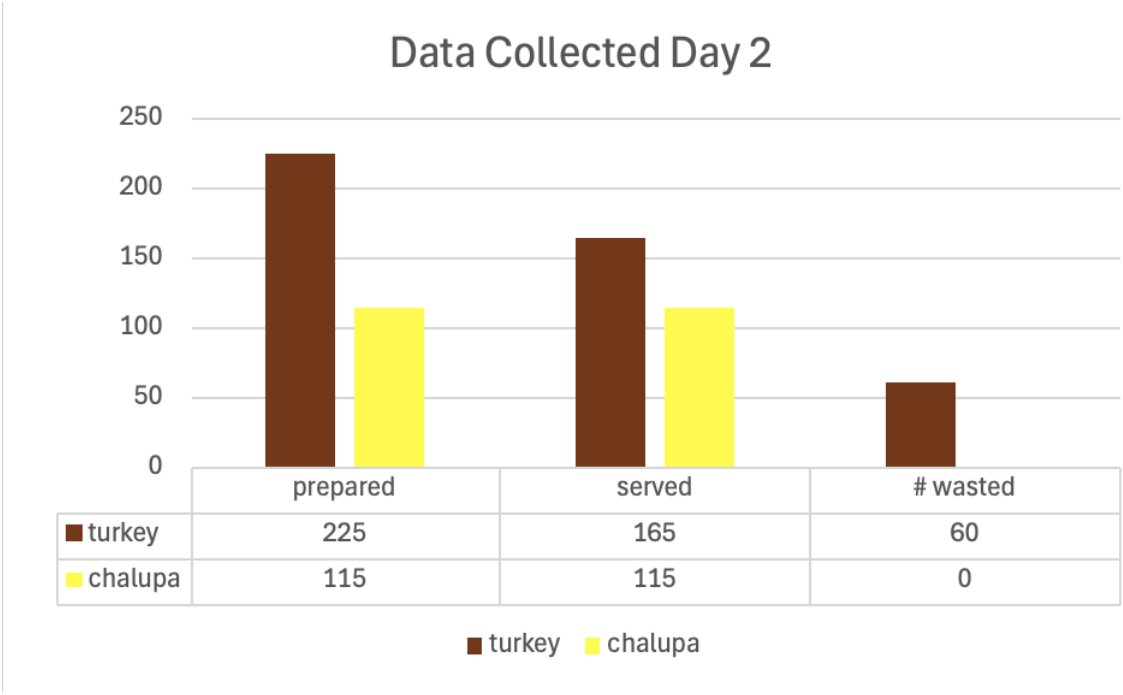


Table 2: *Day 2 of data collected; the main entree was Turkey with Gravy, alternative choice was a Beef Chalupa. Number of servings prepared, served and wasted shown*

On the third day of data collection, Chinese food was served. The main entree was Orange Chicken with rice, the alternative choice was a Corndog. A total of 475 entrees were prepared, 250 Orange Chicken with rice servings and 225 Corndogs. All 225 servings of Orange Chicken with rice were served with 0% waste. Of the 225 Corndogs, 127 were served with 98 discarded, a 43% waste of

Corn Dogs. Side dishes were corn, raw baby carrots, garden saad with ranch dressing and apple slices.

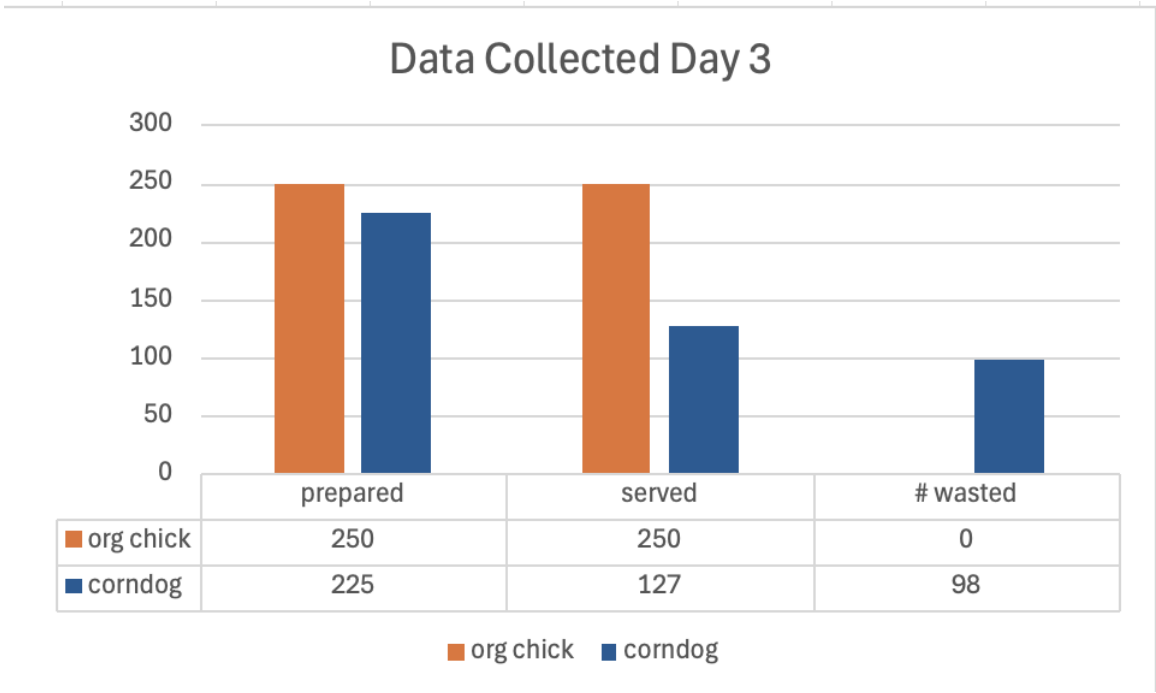
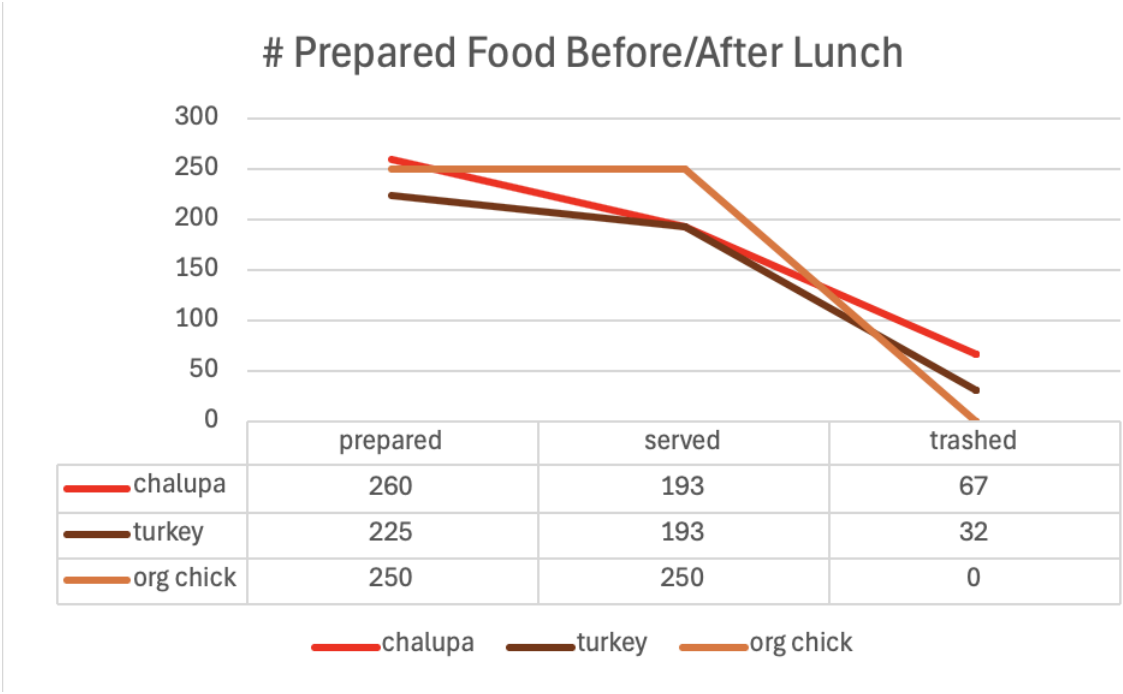


Table 3: *Day 3 of data collection. Main entree was Orange Chicken with rice, and the second choice was a Corn Dog. Data included number of servings prepared, served and leftovers wasted.*



	prepared	served	trashed
chalupa	260	193	67
turkey	225	193	32
org chick	250	250	0

Table 4: *This table shows the amount of each entree that were prepared, served and wasted. The data were collected by the cafeteria staff on three different days of the main entree served.*

CHAPTER FIVE

DISCUSSION

The results of the study showed that students preferred Orange Chicken as the main entree over the Beef Chalupa, and Turkey with Gravy.

Food Preferences

Three different types of ethnic cuisines were served as the main entree on three different days of the study. Of the three cuisines, Chinese food was preferred over Mexican and American food. When served CHinese food 250 servings were prepared and 100% were selected and taken by students. Mexican food was second preferred with 74% of the 260 servings served. American food was least preferred with 73% of the 225 servings served. This data only includes the main entree served for the day, not the second choice entree. Students who did not take the main entree of the day preferred the alternate choice. The number of meals prepared for each of the days were different.

Strengths and Limitations

Strengths for this research were attendance at the school was between 91-96% of enrolled students making it easy to calculate leftover food waste more accurately for the school. Also meals prepared were calculated after attendance was taken early in the morning to avoid preparing too many or too little food for

the day. The student population is composed of many different cultures as well giving more diverse options of food preferences among students.

Limitations of the study include no student data were used for this study due to time limitation for data collection. In order to use human subjects an IRB approval, a background check from the police department and parental consent for students to participate would be required. Food preferences were based solely on types of cuisine prepared and left unselected after lunch was served. Students that were absent or that brought lunch from home were not accounted for in the study.

Recommendation for Future Research

Recommendation for future research should include students' input for food preferences. Since the students are the ones consuming the foods, their opinions should be taken into consideration when selecting foods for the next menu cycle. If the children like the food, the likelihood of them choosing and consuming the food would be greater, reducing the amount of leftovers and wasted food.

Using more than one school with a focus on a certain age group rather than the whole population may also be helpful when gathering data. This would give a broader opinion of students in the same grades that consume the same amount of food. It would be ideal to use schools within the same school district serving the same meals to the students.

Conclusion

In the United States, people waste 80 million tons of food every year which equals 149 billion meals. Programs like the National School Lunch Program aim to provide children with balanced diets to nourish their growth and prevent malnourishment and other diseases like cardiovascular disease and obesity that may develop later in life from inadequate food intake. Serving well balanced meals that most children prefer will help to give them the nourishment they need and may lessen leftovers when they are served meals they prefer.

Identification of factors affecting leftovers in elementary schools can help determine changes in eating and wasting food that can be made by students early in life. These changes can help reduce environmental changes, reduce food cost and maintain nutrition in children throughout their lives and create a better, more sustainable future for them and generations ahead.

APPENDIX A

IRB APPROVAL LETTER

Date: 3-18-2024

IRB #: IRB-FY2024-255
Title: Plate waste in elementary schools
Creation Date: 2-8-2024
End Date:
Status: Approved
Principal Investigator: Marta Sovyanhadi
Review Board: CSUSB Main IRB
Sponsor:

Study History

Submission Type	Review Type	Decision
Initial	Exempt	No Human Subjects Research

Key Study Contacts

Member Marta Sovyanhadi	Role Principal Investigator	Contact MSovyanhadi@csusb.edu
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APPENDIX B

NATIONAL SCHOOL LUNCH MEAL PATTERN

As of July 1, 2024

Amount of Food[1] per Week (minimum per day)

Meal Components	Grades K-5	Grades 6-8	Grades 9-12
Fruits (cups)[2]	2 1/2 (1/2)	2 1/2 (1/2)	5 (1)
Vegetables (cups)[2]	3 3/4 (3/4)	3 3/4 (3/4)	5 (1)
Dark green subgroup[3]	1/2	1/2	1/2
Red/orange subgroup[3]	3/4	3/4	1 1/4
Beans, peas, and lentils subgroup[3]	1/2	1/2	1/2
Starchy subgroup[3]	1/2	1/2	1/2
Other vegetables subgroup[3,4]	1/2	1/2	3/4
Additional vegetables from any subgroup to reach total	1	1	1 1/2
Grains (oz. eq.)[5]	8-9 (1)	8-10 (1)	10-12 (2)
Meats/meat alternates (oz. eq.)[6]	8-10 (1)	9-10 (1)	10-12 (2)
Fluid milk (cups)[7]	5 (1)	5 (1)	5 (1)

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