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Effect of the implementation of the mixed cafeteria system in a Hospital Nutrition and Dietetic Service

Efecto de la implementación del sistema de cafetería mixto en el Servicio de Nutrición y Dietética de un hospital

Kamila Pires de Carvalho[1], Flaviana Pereira de Oliveira Martins[1], Isis Danyelle Dias Custódio[1], Emanuelle do Nascimento Santos[2], Daniela Nogueira Prado de Souza[3] and Yara Cristina de Paiva Maia[1,2]

[1]Graduate Program in Health Sciences. Federal University of Uberlandia. Uberlandia, Minas Gerais. Brazil. [2]Nutrition Course. Faculty of Medicine. Federal University of Uberlandia. Uberlandia, Minas Gerais. Brazil. [3]Clinic Hospital of the Federal University of Uberlandia. Uberlandia, Minas Gerais. Brazil

Received: 20/12/2016

Accepted: 28/02/2017

Correspondence: Yara Cristina de Paiva Maia. Faculty of Medicine. Federal University of Uberlandia. Av. Pará, 1720. Bairro Umuarama. 38405-320 Uberlandia, Minas Gerais. Brazil

e-mail: yara.maia@ufu.br

DOI: 10.20960/nh.865

ABSTRACT

Introduction: The type of service offered by the Nutrition and Dietetics Service (NDS) of a hospital has a direct impact on food waste.

Objective: To evaluate waste in the transition from a simple to a mixed cafeteria service.

Methodology: The study was carried out in a NDS of a University Hospital during 60 days (30 days for each type of service). The meals prepared and distributed and the leftovers of lunch and dinner were weighed.

Results: Per capita values of non-usable leftovers were below the acceptable range (7-25 g), not varying with the service transition ($p = 0.3$) at lunch. At dinner, on the contrary, values were above the acceptable range, with a median of 190 g and 202 g, also showing no difference with the service modification ($p = 0.5$). At lunch, with the transition, there was a reduction in the plate waste-ingestion ($p < 0.0001$), percentage of plate waste-ingestion ($p < 0.0001$) and percentage of non-usable foods ($p = 0.007$). At dinner, there was a reduction in the plate waste-ingestion ($p < 0.0001$) and in the percentage of plate waste-ingestion ($p = 0.0001$).

Conclusion: The modification of the service type was effective in reducing the plate waste-ingestion, but did not lead to operational modifications of the service, since the amount of non-usable leftovers remained high at dinner. Greater control of the production and distribution of meals is suggested, as well as training of food handlers and supervisors, implementation of standardized operating procedures and cost control in order to reduce waste, which has an economic, social and political impact.

Key words: Food services. Hospital. Leftovers.

RESUMEN

Introducción: el tipo de servicio ofrecido por el Servicio de Nutrición y Dietética (SND) de un hospital tiene un impacto directo en el desperdicio de alimentos.

Objetivo: evaluar el desperdicio en la transición de un servicio de cafetería simple a uno combinado.

Metodología: el estudio fue llevado a cabo en el SND de un hospital universitario durante 60 días (30 días para cada tipo de servicio). Las comidas preparadas, distribuidas y las sobras del almuerzo y cena fueron pesadas.

Resultados: los valores per cápita de las sobras no aprovechables estuvieron por debajo del rango aceptable (7-25 g), sin que variaran con la transición del servicio ($p = 0,3$) en el almuerzo.

En la cena, por el contrario, los valores estuvieron por encima del rango aceptable, con una mediana de 190 g y 202 g, y sin mostrar tampoco una diferencia significativa con la modificación del servicio (p = 0,5). En el almuerzo, con la transición, hubo una reducción en el desperdicio de alimento-ingesta (p < 0,0001), porcentaje del desperdicio de alimento-ingesta (p < 0,0001) y porcentaje de comidas no utilizables (p = 0,007). En la cena, hubo una reducción en el desperdicio de alimento-ingesta (p < 0,0001) y en el porcentaje desperdicio-ingestión (p = 0,0001).

Conclusión: la modificación del tipo de servicio fue efectiva a la hora de reducir el desperdicio de alimento-ingesta, pero no condujo a modificaciones operativas en el servicio ya que la cantidad de sobras no utilizables era mayor en la cena. Se sugiere un mayor control de la producción y distribución de las comidas, así como la formación de responsables y supervisores de comida, la implementación de procedimientos operativos estandarizados y el control del coste para reducir el desperdicio, que tiene un impacto económico, social y político.

Palabras clave: Servicios de alimentación. Hospital. Residuos.

INTRODUCTION

The Nutrition and Dietetics Service (NDS) plays an active role in hospitals, aiming to provide meals to patients, staff, companions, students and visitors, offering food assistance and education (1).

The nutrition service can also be classified as to the service type offered. The cafeteria service consists in the distribution of the meal to the customer through thermal counters (hot and cold), with the aid of servers or the clients themselves, who select the food according to their preference. The simple cafeteria is the one where meals are served in divided trays, different from the mixed cafeteria, in which flat trays are used with containers suitable to receive food (2,3).

Studies have shown that the type of service offered by the food producing unit has a direct impact on food waste, with leftovers being greater in buffet style commercial restaurants (4). In

addition, there was a reduction in the plate waste-ingestion when customers paid for the amount of food consumed in per kilo-style restaurants (5).

Leftovers are prepared and undistributed foods, while the rest is the amount of food returned, in the dish or tray, by the customer. Leftovers, in turn, can be classified as usable or non-usable. Usable leftovers, also known as clean leftovers, are the foods prepared that have not been distributed, and can be used in another meal, provided that food time and temperature are controlled. Non-usable leftovers, also known as dirty leftovers, are the foods which have been prepared and left exposed on the distribution counters, or thermal counters, to customers and have not been consumed, and must necessarily be discarded by the nutrition service (6).

Food prepared and not used effectively in human consumption results in poor management of natural resources. Food losses occur throughout the food system, from agricultural production to food consumption itself. Reducing food losses is one of the potential measures to overcome hunger (7).

It is known that a large volume of food is never consumed, but discarded, degraded or deteriorated along the supply chain. A recent study by the Food and Agriculture Organization (FAO) suggests that about one third of the food produced is never consumed. Developing countries lose more than 40% of food after harvest or during processing due to poor storage and transport conditions. While developed countries have lower product losses, more than 40% of food can be wasted in retail or consumer households (8).

The change in the service type offered by the unit may present improvements in the service provided regarding the reduction of waste. Parisenti et al. (9) observed that the implementation of a new type of service in an NDS had a positive impact on the service provided, since the implementation of the hotel service significantly decreased lunch leftovers, contributing to a significant decrease in waste.

Considering the importance of minimizing waste in Nutrition and Dietetic Services and its association with the type of service offered, the objective of this study was to evaluate the amount of waste in the transition from the service of a simple cafeteria to a mixed cafeteria.

MATERIALS AND METHODS

This study was developed in a Nutrition and Dietetics Service (NDS) of a university hospital of Minas Gerais (MG). The NDS was responsible for the production of meals for the entire hospital, being subdivided into general kitchen and dietary kitchen. The general kitchen, which was the focus of the study, produced meals for patients on a free diet which were served in the cafeteria, frequented by a very diverse clientele consisting of companions of patients, interns, residents and employees both in the administrative and assistance areas.

Meals were distributed to customers through four distribution counters (two hot and two cold), with the aid of two servers, who assisted in portioning the main course, only for lunch. Clients themselves selected and served the other food preparations according to their preference. The nutrition service provided an average of 588 (standard deviation [SD] = 76.27) meals at lunchtime and an average of 110 (SD = 16.94) at dinner from Monday to Friday, the days of the week in which data for this study were collected. In the menu, customers could choose a main course and a side dish, the base dishes (rice and beans), a type of salad and a cup of juice (about 200 milliliters). The menu of the unit was monthly, pre-set for four weeks, that is, the preparations varied weekly. At the end of about a month, the menu was repeated.

To characterize the NDS, the researchers observed factors such as menu planning; existence and use of a standard set of recipes; inventory control type (manual or computerized); frequency of requisition of materials, its periodicity and type; if the cost of the meal was calculated by the administrators; the number of nutritionists; the number of employees per shift; and the criteria for sanitary quality control and monitoring.

In order to evaluate whether the plate waste-ingestion was related to the type of service (simple or mixed cafeteria), all the food prepared, the food that was not served (usable leftovers), the food that was served but not consumed (non-usable leftovers) and the rest were weighed during 60 days (30 days for each type of service). All weightings were done at lunch and dinner, except on weekends. Food was weighed by means of a Michelitti® brand digital scale, with a minimum capacity of 10 kg and a maximum of 1.500 kg, and a Balmak® electronic scale, with a minimum capacity of 40 g and maximum of 30 kg.

For the calculation of the variables “non-usable leftovers per capita” and “percentage of non-usable leftovers”, the values of non-usable leftovers were used, since they were effectively

discarded by the service. The values of usable leftovers did not enter the calculation, because they were reused at the next meal (from lunch to dinner), following all the requirements for reusing leftovers. The following variables were also evaluated: weight of the preparation, food prepared, food served, food consumed, plate waste-ingestion, plate waste-ingestion per capita, average of food consumption and percentage of non-usable foods, whose calculations were performed using the mathematical formulas described in table I, according to Vaz (6).

The amount of food the customer served and left in the tray/plate for discarding was considered as plate waste-ingestion. Inedible materials such as fruit peel and egg shells, bones, and disposables in general were discarded in separate garbage bags and were not weighed. The weight of the plate waste-ingestion was obtained by weighing the garbage bags collected in the trays/plates and utensil return area.

The employees responsible for transporting the ready-made meals from the kitchen to the cafeteria were trained for a period of 15 days and were instructed to weigh all the containers prior to their exposure in the distribution counters, as well as after their removal from the distribution counters before sending them to the hygiene sector. Employees responsible for receiving the trays were also trained for the same period of time as to the importance of proper separation of food rest from non-edible materials.

Descriptive analysis of data using frequencies and measurements of central tendency (mean and median) was performed to characterize the nutrition service. The D'Agostino-Pearson test was used to verify data normality, and the Mann Whitney test was used to compare the waste before and after the modification of the service type, considering a level of significance of 5%. Statistical analysis was performed with the GraphPad Prism 5.0 software.

RESULTS

The transition of the service (from simple cafeteria to mixed cafeteria) of a Nutrition and Dietetics Service of a university hospital located in the city of Uberlandia, Minas Gerais, was evaluated. The service was a self-management type and the staff was composed of three nutritionists, 25 employees on even days, 23 on odd days, six on an even night shift and five on

an odd night shift. As for the menu, it was a simple, monthly type, pre-set for four weeks, and there was a standard set of recipes in the unit.

As for the administrative routine of the unit, the control of inventory and cost was computerized, the requisition of foods and non-food goods was made daily, and the requisitions were internal. Quality control was carried out by means of temperature control of the cold rooms, refrigerators and freezers; temperature control in the reception of raw material; the oil and the brine of the fryer; cleaning of the water tank; sample collection for microbiological analysis; hand and equipment swabs; periodic medical examinations of the food handlers, as well as of their behavior and conduct; waste control; and integrated pest control.

In tables II and III, the values of food prepared, number of meals, food served, usable leftovers, non-usable leftovers, non-usable leftovers per capita, non-usable leftovers percentage, food consumed, average and median of food consumption and plate waste-ingestion per capita before and after the service modification, both at lunch and dinner, are presented.

The values of non-usable leftovers per capita were below the acceptable range, according to Vaz (6), in both the simple and mixed cafeteria, with a median of 4 g and 6 g, respectively, and did not vary with the service transition ($p = 0.3$) at lunch. At dinner, on the other hand, values were above the suggested range, for both types of services, with a median of 190 g and 202 g, respectively, also showing no difference with the modification of the type of service ($p = 0.5$).

With respect to the non-usable leftovers percentage, values were lower at lunch, being within the recommended range and not varying according to the type of service ($p = 0.2$). At dinner, this percentage was above the suggested value in both cases, with no significant difference between service types ($p = 0.2$).

Table IV shows the absolute values and measures of central tendency and dispersion of the percentage of plate waste-ingestion before and after the implementation of the mixed cafeteria service at lunch.

Service transition caused a statistically significant reduction in plate waste-ingestion ($p < 0.0001$), percentage of plate waste-ingestion ($p < 0.0001$) and percentage of non-usable foods ($p = 0.007$) at lunch (Fig. 1A-C).

Table IV also shows the absolute values and measurements of central tendency and dispersion of the percentage of plate waste-ingestion before and after the implementation of the mixed cafeteria service at dinner.

There was a significant reduction in plate waste-ingestion ($p < 0.0001$) and percentage of plate waste-ingestion ($p = 0.0001$) at dinner (Fig. 2). The percentage of non-usable foods showed no statistical difference ($p = 0.7$).

DISCUSSION

In this study there was a significant reduction in plate waste-ingestion, percentage of plate waste-ingestion and percentage of non-usable foods, the latter only for lunch, resulting from the transition of the service type, both at lunch and at dinner. The non-usable leftovers per capita and the non-usable leftovers percentage were higher at dinner, and there was no change with the transition of the type of service when compared to acceptable values of 7 to 25 g per person or 3% (6).

Leftovers are related to several factors, being the main ones acceptance of the menu, inadequate per capita, presentation of prepared foods and quantity of food prepared (10). To assist in the control of leftovers, it is necessary to follow the distribution of food, to train and raise awareness among the team, to involve the entire team in setting leftover control goals and to prepare menus that satisfy customers (6). Menu planning is a continuous and essential activity in the nutritionist's routine; however, it is hampered by the need for simultaneous attention to technical criteria, operational and administrative requirements, and costs, while pursuing the goal of satisfying a great diversity of preferences and habits (11).

Studies have shown that food acceptance and, consequently, the amount of leftovers vary depending on the type of menu offered (12,13) and that the improvement in the menu was responsible for a significant reduction of 60% in leftovers (13).

The discrepancy observed in the present study between the non-usable leftovers per capita and the percentage of non-usable leftovers between meals (lunch and dinner) could probably be explained by the fact that there was no employee portioning the meals at dinner, leaving the choice of the amount of food served to the customer. Another fact that could explain the results

found would be the absence of nutritionists at dinner, since these professionals only accompany the distribution of the first main meal, making the contact time with these professionals shorter with the employees of the dinner shift and, consequently, causing less adherence to the work they developed. It should be noted that the median values obtained at lunch were below the values suggested by Vaz (6).

In a study evaluating leftovers and plate waste-ingestion of a popular restaurant in the city of Maringá (PR), an average of 10.13 g of leftovers per capita and a percentage of plate waste-ingestion of 9.49% were observed, suggesting awareness actions of the clientele as a possible way to reduce waste (14).

Oshiro do Carmo and Pereira Lima (15), when evaluating the index of leftovers in an institutional Food and Nutrition Unit in the city of Campo Grande (MS), observed that the average percentage of leftovers at lunch was 19.4%, concluding the need of training employees, an improvement in the efficiency of planning by the nutritionist and, especially, awareness-raising concerning the consequences of waste through campaigns to combat waste in order to reduce leftovers.

The percentage of plate waste-ingestion found in both types of services was lower than the acceptable value of 10% for healthy communities (5), indicating, probably, the adequacy of menus and good acceptance of them by the clientele served.

In a study conducted in Stockholm, Sweden, leftovers and plate waste-ingestion of different food services (two schools and two restaurants) were evaluated to search for differences between institutions food services. On average, 20% of food served by food services was lost. Most of the loss occurred at the end of the distribution chain, since the plate waste-ingestion accounted for half (10%) of the losses recorded. Leftovers accounted for 6% of food losses. Restaurants had a greater loss during the preparation of food and more leftovers than schools, the justification for the leftovers being the variation in the number of customers, which made planning difficult (16).

The plate waste-ingestion index is a parameter that allows the evaluation of the adequacy of meal preparation in relation to the needs of consumption, the quantity of the portion in the distribution, and the acceptance of the menu, being that the higher the rejection index, the lower the consumer satisfaction (17).

In a study evaluating the plate waste-ingestion index and leftovers in a commercial meal producing unit in Ipatinga (MG), the results showed that the percentages of plate waste-ingestion ranged from 2.90% to 7.41%, with average leftovers per capita of 20 g. Regarding leftover indices, the values found were above 3%, and the average per capita was 160 g, suggesting the need for greater control of the meal production and distribution processes in order to minimize waste (18).

Moura et al. (19) evaluated the plate waste-ingestion index and the leftovers in a food service unit of an agricultural college in Guarapuava (PR), and observed that the average percentage of leftovers was 10.41% and that of rest was 11.17%, both considered as inadequate, suggesting intervention through customer awareness campaigns and training of manipulators among the factors that resulted in the high indices.

In contrast, as in the present study, Augustini et al. (10), who evaluated the plate waste-ingestion index and the leftovers in a food service unit of a metallurgical company in the city of Piracicaba (SP), observed that the values for plate waste-ingestion index were below 10%, with the exception of the 14th day in the dinner period, when the percentage was 11.15%. As for the leftover percentages, they ranged from 7.48% to 13.39% at lunch. At dinner, indices were between 5.53% and 9.68%. At supper, percentages were between 17.09% and 60.85%, a maximum value, higher than the one found in the present study.

In the present study it was possible to observe a significant reduction in the plate waste-ingestion, percentage of plate waste-ingestion and percentage of non-usable foods, the latter only for lunch, with the transition of the type of service in both meals. This modification was consisted in the replacement of trays with divisions, known as divided trays, by plates. This fact could probably be explained by a reduction in the size of the utensil used, reducing the area for food allocation, since trays have a larger surface area than plates. Another important point is that a plate is a utensil also used in the domestic environment, facilitating the portioning of food by the customer by allusion to the amount of food usually served at home.

The impact of the type of service performed by the food unit on the indices of waste has also been observed in other studies. Saurim and Basso (4), who evaluated the waste of a buffet style commercial restaurant in Santa Maria (RS), observed a high percentage of leftovers,

approximately 71% higher than planned, in 22 different dishes of the menu. Another study, carried out in five food services in the Piracicaba region (SP), on the plate waste-ingestion index in per kilo-style restaurants found average percentages of 12.24, 7.26, 7.01, 5.47 and 5.30%, confirming that consumers are more careful when they serve themselves, since they pay according to the quantity (5).

Likewise, in a study that evaluated the leftovers in a hospital meal-producing unit and the effects of the implementation of the hotel system, the results showed that, with the implementation of the hotel system in the private sector, there was an improvement in food quality and in the service provided, significantly decreasing the leftovers at lunch. Improving the quality of nutrition services has contributed to a significant decrease in waste (9).

The present study evaluated only the plate waste-ingestion of the hospital cafeteria, but it would be of great importance to evaluate the plate waste-ingestion from food consumption of hospitalized patients, which would allow a complete evaluation of the food waste of the university hospital. Therefore, further studies addressing this subject in the university hospital of Uberlândia are suggested (MG).

CONCLUSION

The present study evaluated waste in the transition from the service of simple cafeteria to mixed cafeteria, giving a dimension on the food waste in this food and nutrition unit. However, these data involving waste are underestimated, since the plate waste-ingestion from the food consumption of hospitalized patients was not evaluated.

Besides the transition of the service type, other strategies can contribute to the rationalization and efficiency of the unit of food and nutrition, such as control of the production and distribution of meals, training of the food handlers and supervisors, implementation of standard operating procedures, and cost control. Such strategies favor the reduction of waste and, in the case of a university hospital that uses public resources, is an economic issue with political and social impact, considering Brazil is a country where hunger is still considered to be a public health problem.

FINANCING SOURCE

1. Type of aid: Acquisition of equipment and utensils in the transition of type of service in the Food and Nutrition Unit.

2. Name of the financial agent: Prorector of Research and Graduate Studies at the Federal University of Uberlandia.

3. File number: Public notice 06/20013 of PROPP/UFU - Special Program to Support New Doctors and Reconstructions of UFU, Base Year 2013.

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Table I. Formulas used to calculate the analyzed variables

Variables	*Formulas*
Weight of the preparation (kg)	$\frac{Weight\ of\ the\ containers\ containing\ the\ ready\ preparation}{Container\ weight}$
Prepared food (kg)	$\sum = Preparation\ 1 + Preparation\ 2 + \cdots$
Served food (kg)	$Prepared\ food - (Usable\ leftovers + Non - usable\ leftovers)$
Consumed food (kg)	$Prepared\ food - (Usable\ leftovers + Non - usable\ leftovers + Plate\ waste - ingestion)$
Non-usable leftovers per capita (kg)	$\frac{Non - usable\ leftovers}{Number\ of\ meals\ served}$
% Non-usable leftovers	$\frac{Non - usable\ leftovers}{Served\ food} \times 100$
Plate waste-ingestion (kg)	$\sum = Garbage\ 1 + Garbage\ 2 + \cdots$
Plate waste-ingestion per capita (kg)	$\frac{Plate\ waste - ingestion}{Number\ of\ meals\ served}$
% Plate waste-ingestion	$\frac{Plate\ waste - ingestion}{Served\ meal} \times 100$
Mean of food consumption (kg)	$\frac{Consumed\ food}{Number\ of\ meals\ served}$
% Non-usable foods	$\frac{(Plate\ waste - ingestion + Non - usable\ leftovers) \times 100}{Prepared\ food}$

Vaz (2006), with modifications.

Table II. Characterization of the Nutrition and Dietetics Service during the simple cafeteria service and after the implementation of the mixed cafeteria at lunch

	Lunch			
	Simple cafeteria		Mixed cafeteria	
	Mean (SD)	Median (p25-p75)	Mean (SD)	Median (p25-p75)
FP (kg)	338 (58.2)	351 (316-377)	301 (42.7)	296 (268-325)
N meals	595 (94.7)	615 (523-661)	580 (52.2)	596 (538-608)
SF (kg)	306 (54.1)	316 (277-338)	271 (37.9)	268 (237-292)
UL (kg)	27 (16.58)	24 (16-39)	24 (17.7)	22 (9-32)
NUL (kg)	5 (6.2)	2 (1-7)	5 (5.7)	3.5 (1-10)
NUL per capita (g)	9 (12)	4 (1-11)	10 (10)	6 (3-17)
% NUL	1.7 (2.1)	0.8 (0.2-2.1)	2.2 (2.3)	1.4 (0.5-3.4)
CF (kg)	281 (49.4)	288 (258-308)	255 (36.4)	251 (222-276)
MFC (kg)	0.47 (0.06)	0.46 (0.44-0.51)	0.44 (0.05)	0.44 (0.39-0.48)
PWI per capita (kg)	0.04 (0.009)	0.04 (0.03-0.04)	0.02 (0.008)	0.02 (0.02-0.03)

SD: Standard-deviation; FP: Food prepared; N meals: Number of meals; SF: Served food; UL: Usable leftovers; NUL: Non-usable leftovers; CF: Consumed food; MFC: Mean of the food consumption; PWI: Plate waste-ingestion.

Table III. Characterization of the Nutrition and Dietetics Service during the simple cafeteria service and after the implementation of the mixed cafeteria at dinner

	Dinner			
	Simple cafeteria		Mixed cafeteria	
	Mean (SD)	Median (p25-p75)	Mean (SD)	Median (p25-p75)
FP (kg)	90 (9.2)	91 (85-95)	84 (14,9)	84 (73-94)
N meals	112 (21.4)	114 (94-125)	108 (10.6)	109 (100-113)
SF (kg)	63 (10.4)	61 (54-69)	55 (8.2)	57 (47-63)
UL (kg)	5 (5.1)	4.7 (0-8)	6.6 (8.0)	1.7 (0-12)
NUL (kg)	21 (7.9)	22 (16-26)	22 (7.5)	22 (15-28)
NUL per capita (g)	205 (100)	190 (127-250)	204 (68)	202 (145-261)
% NUL	37 (20.2)	32 (24-47)	40 (15.8)	36 (28-52)
CF (kg)	58 (9.9)	58 (52-64)	53 (7.5)	53 (45-59)
MFC (kg)	0.52 (0.07)	0.53 (0.47-0.58)	0.49 (0.07)	0.51 (0.42-0.51)
PWI per capita (kg)	0.03 (0.01)	0.03 (0.03-0.04)	0.02 (0.01)	0.02 (0.01-0.03)

SD: Standard-deviation; FP: Food prepared; N meals: Number of meals; SF: Served food; UL: Usable leftovers; NUL: non-usable leftovers; CF: Consumed food; MFC: Mean of the food consumption; PWI: Plate waste-ingestion.

Table IV. Percentage values of the plate waste-ingestion, lunch and dinner

Lunch					
	Simple cafeteria		Mixed cafeteria		
	Mean (SD)	Median (p25-p75)	Mean (SD)	Median (p25-p75)	*p*
% of PWI*	8 (1.6)	8 (6-8)	6 (1.4)	5 (4-6)	< 0.0001
Dinner					
	Simple cafeteria		Mixed cafeteria		
	Mean (SD)	Median (p25-p75)	Mean (SD)	Median (p25-p75)	*p*
% of PWI*	6 (1.9)	6 (5-7)	4 (1.5)	4 (3-5)	0.0001

*Plate waste-ingestion; SD: Standard-deviation; Mann Whitney test.

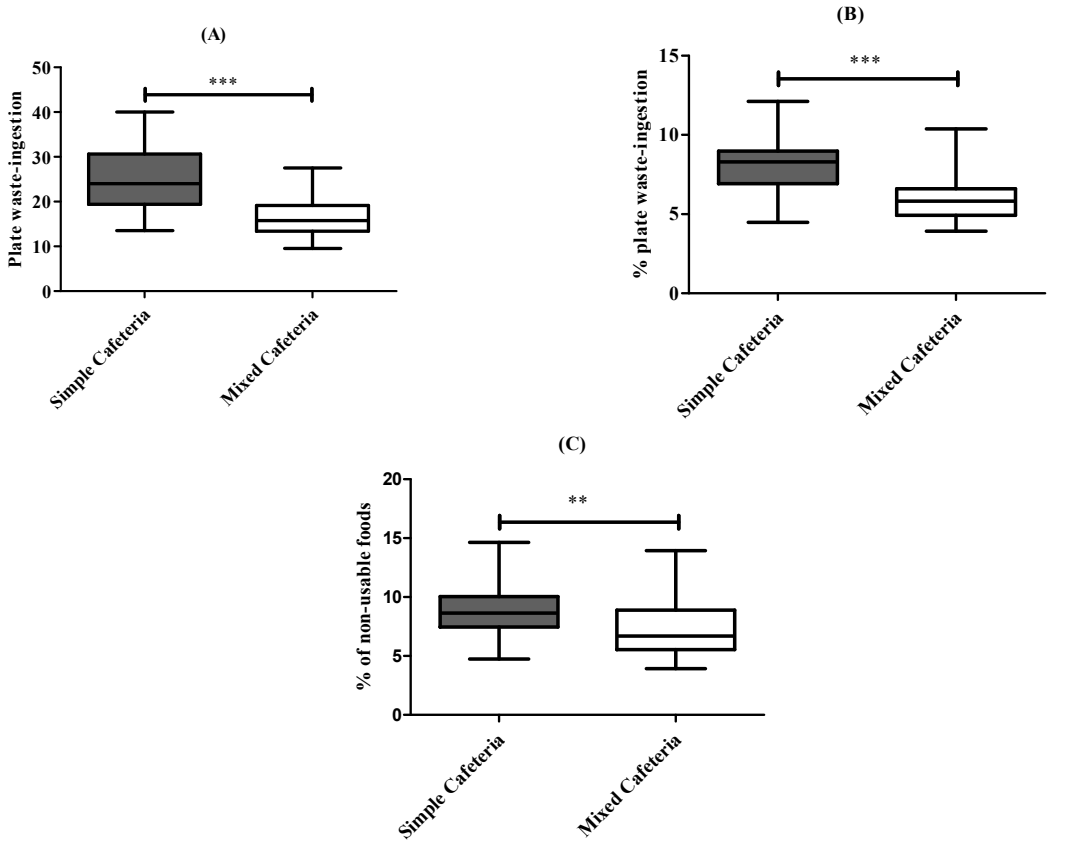

Fig. 1. Values for lunch. A. Reduction of the plate waste-ingestion with the modification of the service. B. Decrease in the percentage of plate waste-ingestion with the service transition. C. Reduction of the percentage of non-usable foods with the transition from the simple to mixed cafeteria service. **p = 0.007; ***p < 0.0001; Mann Whitney test.

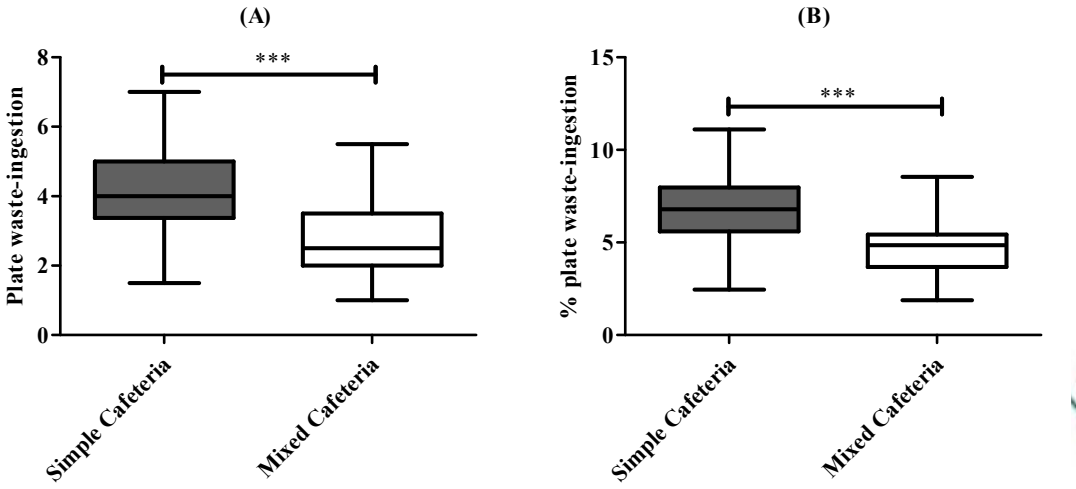

Fig. 2. Values for dinner. A. Reduction of the plate waste-ingestion with the modification of the service. B. Decrease in the percentage of plate waste-ingestion with the service transition. ***p ≤ 0.0001; Mann Whitney test.