EXAMINATION OF PLATE WASTE IN SCHOOL CATERING

Zoltán TÚRÓCZI[1], András BITTSÁNSZKY[1], Lajos FÜLÖP[1],
Anna DUNAY[2], András J. TÓTH[1,2]
[1]*InDeRe Analytical and Economic Research Institute, Budaörs, Hungary*
[2]*Szent István University, Gödöllő, Hungary*
E-mail: andras.bittsanszky@indere.hu

Summary: In catering for children and examining the quality of school catering the amount of food waste is a decisive factor. Regulating the necessary daily intake of nutrients can only be successful if it is consumed by children. The analysis of food waste can serve qualitative and quantitative information on efficient and economical catering at schools. In our research 664 lunch portions of school children at 15 serving kitchens of secondary schools were analysed together with the plate waste. According to the results, 46% of total transported food become food waste, 81% are served and its 33% will also be thrown away. Regarding the leftover, 46% of it was soup, 23% of it was protein, 40% carbohydrate and 17% vegetables. The average 919 KCAL value of the daily menu comply with the rules. Conclusions can be drawn from the quantity of food to the quality of service performed by the suppliers, the food preferences of children, the quantity of nutrients taken into their body, which, together can serve as the basis for strategies to enhance the efficiency of catering.

Keywords
plate waste, food waste, school meals, school canteens, weighting

1. Introduction

In accordance with the European trend, more and more children have their meals in the canteen, so all the questions of food safety, nutrition biology and regulation that have something to do with children have come into the limelight (Tóth – Bittsánszky, 2014). The role played by plate waste is also becoming greater and greater as leftovers are taken into account when planning menus. Considering waste can also help in matching food, setting the daily recommended nutrients and also preparing educational materials in this topic. Plate waste can also refer to the efficiency of the catering service, consumers' preference and the appropriateness of nutrients (Martins et al., 2014). It was also pointed out in earlier researches that the high ratio of plate waste can be disregarding students' preferences and lack of accepting the menu. In judging the general quality of the service the senses and the temperature of food play the greatest role (Marlette et al., 2005). When surveying canteen leftover, it should also be considered that parents pay the whole sum in any case even if their children do not even have a look at the food. However, when children eat well in canteens and it is not necessary to spend money on other things, then households can calculate with less extra expenses on food (Cohen et al., 2013).

According to the international efforts in school catering reduced salt intake is a must, the use of wholegrain cereals and high fibre-content food is stressed while food and drink with rich calorie, salt and sugar content must be curbed. A general problem is that although meals contain the necessary nutrients, if children dislike or will not eat them, then all is in vain and the efficiency of catering can be questioned. The main problem is that regulations on nutrient intake say what should be put on the table but if it is not delicious for children, the result, in many cases, can be contra productive. Ensuring the necessary nutrients for all the children at

schools is a priority not to mention poorer children in a disadvantaged situation as for them, lunch mostly covers half of the daily recommended amount and there are fewer substitutes to make up for the loss. Social network is the basis for favourable, discounted catering options but its accessibility is also the responsibility of teachers at schools. In Hungary 20% of secondary students are in a disadvantaged situation who can have a 50% reduction in school catering and 5% more are severally disadvantaged who can get this service free of charge (KSH, 2013). Despite this fact, generally only 15% of secondary students have meals at school.

According to Food and Agriculture Organization 1.3 billion tonnes of plate waste are produced annually all over the world, which is one-third of all the manufactured amount. In poorer countries the bulk of the waste is generated at the beginning of the chain while the case is opposite for the developed countries. Researchers concluded that after households it is the food service industry that produces most food waste and called attention to the fact that two-thirds of it could be avoided. According to Betz et al. (2014) eating out can be divided into three parts: commercial, non-commercial and other. The non-commercial part includes school canteens, catering services at work, institutionalised catering and catering at healthcare institutions. In their opinion, households generate the most plate waste.

2. Material and methods

Our survey was carried out at 15 secondary school canteens where 664 trays of plate waste were analysed. The research was carried out by food industry experts who were present from the transportation of food to the kitchen to the end of the consumption period on the spot. Every occasion a checklist was filled in about the data of the school and the menu, the number of consumers, the quantity of served food, returned food and unserved quantities. The kilocalorie (KCAL) values of the served and returned quantities were calculated on the basis of nutrition calculations made by the kitchen. Schools only served and did not cook food, so when measuring storage and prepare waste could not be determined so only serve waste and leftovers were analysed (Betz et al., 2014). Unserved food counted as serve waste. Of the four different measuring methods (weight, visual estimates, digital photo and children's memory of consumed food) of plate waste analyses (Martins et al., 2014) we used weight as a markedly time consuming and labour intensive method as we found it the most reliable. Measuring is the most effective with it as data can be produced in different ways. Food was divided into categories: soup, protein, carbohydrate and vegetable (Marlette et al., 2005).

3. Results and discussion

The daily menu generally complied with the regulation. The average KCAL value of the menus was 919 (581-1336) in the 15 canteens. The daily energy content between 700 and 900 KCAL by law was proper in 6 cases, in 3 cases it was lower and in 6 further cases higher than expected mostly due to fat and sugar (Marlette et al., 2005). 81% of the manufactured quantity were served so the proportion of the children is very high (19%) who just ordered but did not consume food. The returned food was 33% of the served one so in general one-third of the menu were thrown away. A total of 46% of manufactured (ordered and paid) food were waste (Table 1).

**Table 1: KCAL value of the quantity of food waste (15 kitchens, 814 portions)**

Name	Quantity (KCAL)	Quantity (in % of manufactured)
Manufactured quantity	729 916	100%
Served quantity	592 132	81%
Consumed quantity	394 457	54%
Returned quantity	197 675	33%*
Unserved quantity	137 784	19%
Total leftover	335 459	46%

* in percentage of served quantity

Source: own research results

The distribution of manufactured food and plate waste is illustrated on Figure 1. As it may be seen, more than the half of manufactured food is served and consumed, while 46% is food waste. 59% of total waste consisted of served (and returned) food while unserved food comprised 41% (Figure 1).

Figure 1: Distribution of manufactured food and plate waste
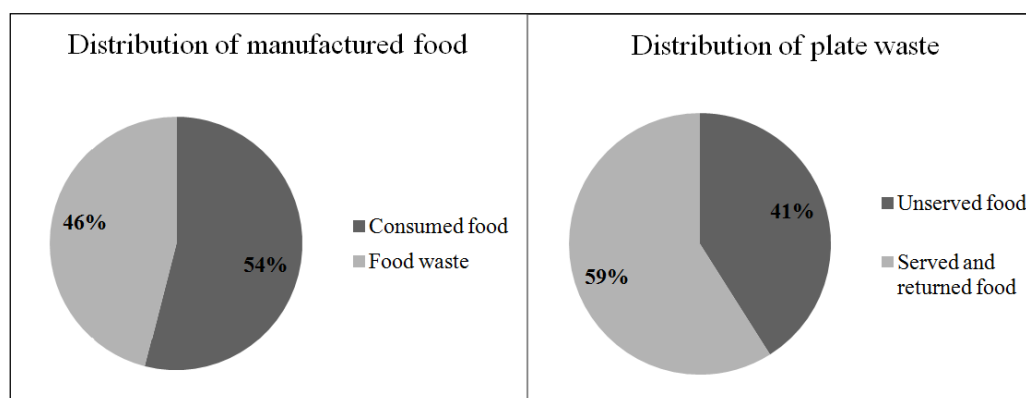
Source: own research results

When examining the served food per category we can conclude that 46% of soup, 23% of protein, 40% of carbohydrate and 17% of vegetables served were not consumed. In the case of served menus 67% of the necessary calories were taken in, which is 16% better that in the survey of Cohen et al. (2013).

Most plate waste included soup and garnish (carbohydrates) and vegetables per category. However, the proportion of vegetables in menus was strikingly low.

The average values of the analysis in SPSS are included in Table 2.

Table 2: Means of plate waste (95% Confidence Interval of the Difference)

	Mean	Lower	Upper	Sig.
Ordered portions	54.27	37.85	70.68	.000
Number of consumers	44.27	31.04	57.49	.000
KCAL value/portion of daily menus	918.73	789.38	1048.08	.000
KCAL value of manufactured food	48661.13	34230.54	63091.73	.000
KCAL value of served food	39475.47	28232.09	50718.84	.000
KCAL value of returned food	13481.07	9415.22	17546.91	.000

Source: own research results

4. Conclusion

The reasons for plate waste are that too big portions are served, the children do not like one of the components or they have problems with one of the senses (taste, texture, temperature) (Betz et al., 2014). The quantity of unserved food is strikingly high (19%), which can be due to improper organisation of catering. and also lack of cancellations. Considering the attitudes of serving staff and the flexibility of organising school catering attention must be paid on the quality of staff: more attractive menus should be created and meals should preserve their pleasure values both while being cooked and served. (Cohen et al., 2013).

In the future steps of our research, we would like to explore, what are the main factors which may influence the attractiveness of the served food, what managerial tasks shall be taken to improve the present situation.

The question is very important, as the children's nutrition influences significantly their future life and adulthood, which may have severe economic and social impacts in the future.

References

1. Betz, A. et al., 2015. Food waste in the Swiss food service industry - Magnitude and potential for reduction. *Waste management (New York, N.Y.)*, 35, pp.218–26.
2. Cohen, J.F.W. et al., 2013. School Lunch Waste among Middle School Students. 44(2), pp.114–121.
3. KSH, időszaki jelentés: Óvodától a munkahelyig, Központi Statisztikai Hivatal, 2013. június, http://www.ksh.hu/docs/hun/xftp/idoszaki/pdf/ovoda_mhely11.pdf
4. Liz Martins, M. & Rocha, A., 2014. Evaluation of prerequisite programs implementation at schools foodservice. *Food Control*, 39, pp.30–33.
5. Marlette, M. a, Templeton, S.B. & Panemangalore, M., 2005. Food type, food preparation, and competitive food purchases impact school lunch plate waste by sixth-grade students. *Journal of the American Dietetic Association*, 105(11), pp.1779–82.
6. Tóth, A. J. & Bittsánszky, A., 2014. A comparison of hygiene standards of serving and cooking kitchens in schools in Hungary. *Food Control*, 46, pp.520–524.