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Evaluation of food waste at primary schools based on protein source: Meat vs. fish-based meals

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Introduction:

Food waste has been an issue of concern at schools due to nutritional, economic, environmental and social impact. Plate waste at school lunch may be affected by several situational factors, being one of them the individual preferences, where the preference for meat or fish might be of great relevance.

The present study aims to evaluate food waste at lunch in primary schools while comparing the effect of the main protein source.

Methods:

Plate waste of main dish at school lunch was evaluated for fourth-grade children aged 9 to 10 years old, attending to three public primary schools from the municipality of Porto. Weighing of individual meals and leftovers was performed on a full week during February 2013. Throughout the municipality, the same menus are put forward for all the public schools at the same time. A total of five different menus (three meat-based and two fish-based based) were evaluated. For each child, individual plate waste (%) was calculated by the ratio between food discarded and food served. Besides protein source, school, gender and school meals financial assistance were explored as potential factors influencing food waste.

Results:

A total of 135 children were evaluated. Globally food waste was $44\pm 18\%$, and within the different menus waste has varied considerably: $22\pm 20\%$ for *pasta with roasted hamburger*; $45\pm 25\%$ for *stewed beans with chicken meat*; $45\pm 23\%$ for *chicken filets with rice*; $48\pm 27\%$ for *stewed hake filets with boiled potatoes*; and $53\pm 28\%$ for *pasta with fish*. Waste values within the evaluated dishes were significantly different between schools (all p-values < 0.05). Boys showed significantly lower waste values than girls for three of the evaluated dishes: $18(\pm 16\%$ and $28\pm 23\%$ for *pasta with roasted hamburger* ($p=0.009$); $41\pm 22\%$ and $50\pm 23\%$ for *chicken filets with rice* ($p=0.028$); and $42\pm 26\%$ and $55\pm 27\%$ for *stewed hake filets with boiled potatoes* ($p=0.010$). Children with financial support wasted more $57\pm 21\%$ than those without support $39\pm 21\%$ only for the *chicken filets with rice* dish ($p=0.001$).

Grouping dishes by the main protein source, it was observed that the waste of meat dishes ($38\pm 18\%$) was lower than that from fish dishes ($54\pm 23\%$). Waste values for meat and fish dishes were significantly different among each school ($p < 0.001$): for fish dishes values ranged from $40\pm 14\%$ to $77\pm 16\%$, while for meat dishes values ranged from $31\pm 14\%$ to $52\pm 18\%$. Boys wasted less than girls both for fish ($48\pm 22\%$ and $57\pm 23\%$; $p=0.039$) and meat ($33\pm 16\%$ and $42\pm 19\%$; $p=0.012$) dishes. School meals financial assistance showed no influence on food waste when comparing meat and fish dishes.

Discussion:

Food waste values at school lunch were generally very high and were different according to school and dish composition. Meat-based dishes were better accepted than fish ones and boys wasted less food than girls.

Considering an average of 44% of plate waste and that each meal costs to the municipality 1.72 euros, an average of 0.75 euros are wasted in each meal. Around 5,000 meals are offered each

day at Oporto's primary school, which might have an estimated economic impact of 82,500 euros per month, just for a single municipality.

In view of such results, urgent strategies are requested. Offering more appealing fish-based dishes and making efforts for the school community to be more conscientious of the economic, environmental and social impact of food waste are needed.

Keywords: children, economic impact, Portugal