Fruit and Vegetable Waste in the School Lunch: A Systematic Review

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INTRODUCTION

Frequent Fruit and Vegetable (F&V) consumption has been proved to be one of the effective ways to help provide diverse and nutritious diets to individuals and help reduce risk of diseases such as cardiovascular disease, hypertension, diabetes, cancer, obesity, depression and osteoporosis (WHO 2003, Boeing et al. 2012, Lui et al. 2016, Wang et al. 2014). Since most Americans do not consume enough F&V, the Dietary Guidelines for Americans - DGA (2010, 2015-2020) recommends increasing F&V daily intake and variety of vegetables, especially dark-green, red and orange vegetables and beans and peas. School meals are the ideal settings to implement the recommendation inasmuch as children take at least one of the main daily meals at school.

In 2015, 30.5 million school children[1] participated in the National School Lunch Program (NSLP), which represents about 61% of the school children in the U.S.[2]. Created in 1946, the NSLP served more than 5 billion lunches each year since 2006. In 2015, 72.6% of participants received their meal for free or at a reduced price. NSLP provides nutritious and balanced food to children by improving availability, accessibility and quality of meals in recognition of the relationship between food and good nutrition and the capacity of children to develop and learn[3]. DGA (2010) was enforced through the Healthy Hunger-Free Kids Act (2010) and incorporated to the NSLP starting in Fall 2012.

In addition to accomplishing the NSLP nutritional goals, implementing a cost-effective program and reducing waste are also policy goals. Waste is, of course, an undesired outcome of the food school programs, and a main concern for policy-makers, school administration authorities, cafeteria managers, parents and a broad public because it threatens not to reach nutritional objectives, generates higher costs and leads to significant environmental issues.

In 2002, the House of Representatives Committee on Appropriations requested to the USDA's Economic Research Service (ERS) an evaluation of plate waste in school meal programs. In response to this request, ERS prepared an extensive review of the existing published and unpublished studies and officially reported a waste of 12% of calories served and cited (Devaney et al. (1995), a study that used data from the School Nutrition Dietary Assessment (SNDA-1, 1991-92). The official report included some important findings on nutrition benefits of school meals and strategies for reducing plate waste, but authors claimed that more research was needed in many aspects of policy implementation (Buzby and Guthrie, 2002). No further comprehensive evaluation in this topic has been reported.

In policy analysis, research and practice synthesis is considered an important approach to monitoring the implementation of a public policy by using available information (Dunn, 2008). By analyzing and synthesizing research reports that address relations among policy actions and outcomes, it is possible to produce valuable information to decision-making. The NSLP has been incorporating a number of standards and good practices to improve availability, accessibility, and intake of nutritious meals as desired outcomes and to reduce waste.

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[1] https://www.fns.usda.gov/sites/default/files/pd/slsummar.pdf

[2] According to the National center for Education Statistics, in 2015 a projection of 50,268,100 students would be enrolled in public schools. https://nces.ed.gov/programs/digest/d15/tables/dt15_203.20.asp. [Accessed January 2017].

[3] U.S. Child Nutrition Act of 1966.

It includes Offer vs. Served (OVS) provisions, promotion of salad bar use, restriction to snack sales, and adoption of the DGA (2010). Last improvement is especially important due to the mandatory specifications on servings and portion sizes. A large amount of published work about the effects of these decisions is now available. Then, contribution from the Academy and Research Centers to monitoring implementation of nutrition school programs can be analyzed and summarized to make new information available to interested people.

This systematic review aims to update the 2002 ERS report on plate waste focused on F&V waste at lunch since that time those were already recognized as the more wasted components of meals, taking also into account changes in regulation. Additionally, this review wants to identify the trends on research interest and information gaps to address policy analysis.

METHODOLOGY

This review includes articles published in peer-reviewed journals. Search was performed using TAMU library databases and MEDLINE PubMed. One-hundred eighteen references were reviewed. Eighty-four references were included in the analysis: 57 references quantifying F&V waste or consumption, 15 references of reviews and meta-analysis on interventions to promote F&V intake, and 12 references on determinants of F&V preferences, selection or consumption. A database of reported % F&V waste or % F&V consumption (24 references) was constructed in Microsoft Excel spreadsheet, and data analysis was performed using SAS 9.4.

PRELIMINARY FINDINGS

This review compiles and compares the published results on:

- F&V waste quantification before and after DGA incorporation, and summarized them in tables.
- Factors associated with plate waste such as age, gender, lunchtime schedule and time assigned to eat, as well as portion size.
- School-based interventions to promote F&V consumption (results of reviews and meta-analysis).
- Cost of F&V waste.
- Effectivity of strategies to reduce plate waste such as OVS provisions, rescheduling lunch, improving quality and/or acceptance of NSLP food, and self-service.
- Determinants of F&V consumption from school-based studies.

Preliminary results show that before DGA incorporation average % of fruit waste was 38.55% (SD 13.54%) and 53.13% (SD 19.74%) for vegetables. Data for the after DGA period show that average % of fruit waste was 29.14% (SD 7.73%) and 47.68% (SD 17.98%) for vegetables. These results are not adjusted for age, type of school, method used to measure or estimate plate waste, and time spent eating lunch at school. Overall, % F&V wasted in school lunch for the reviewed literature was 35.82% (SD 13.1%) for fruits, 51.32% (18.78%) for vegetables and 28.75% (9.26%) for fruit and vegetables combined. Less waste for combined fruit and vegetable could be associated to the presence of salad bars in schools. Currently, authors are comparing results and conclusions from selected references and analyzing data to draw some sound conclusions from statistical tests.

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