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Make every bite count: Can reduced food waste sustain free school meals in South Carolina?

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Abstract

Recent federal cuts to the Supplemental Nutrition Assistance Program could reduce children's access to free school meals by affecting schools' eligibility for the Community Eligibility Provision program. In this study, we examine whether food waste reduction can be used as a strategy to sustain meal programs in South Carolina. Using direct weighing waste data and surveys, we assess potential cost savings, reinvestment opportunities, and meal quality improvements.

Keywords

Community Eligibility Provision, food waste, free or reduced-price lunch

Introduction

It is expected that recently passed cuts to the Supplemental Nutrition Assistance Program (SNAP) in the budget reconciliation law (An act to provide for reconciliation pursuant to title II of H. Con. Res. 14, 2025) will affect schools' ability to implement the Community Eligibility Provision (CEP), a federal program that allows schools to provide free meals to all students. Currently, some

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schools can participate in CEP if at least 25% of students are certified for free and reduced-price lunch, such as those who receive Medicaid and participate in SNAP. However, SNAP cuts may lead to fewer families qualifying for SNAP and thus cause some children to lose their automatic eligibility for free school meals. Raising the CEP threshold to 60% has also been considered (Food Research & Action Center, 2025, p. 33), which would disqualify over half of the current CEP schools. Such a change could affect about 24,000 schools nationwide, potentially reducing meal access for about 12 million children (Center on Budget and Policy Priorities, 2025, para. 5).

South Carolina (SC), which ranks among the top states for students qualifying for free and reduced-price lunch, had approximately 70% of students eligible during the 2022–2023 school year. Potential changes to the CEP threaten equitable access to nutritious school meals for 351 schools across 31 school districts across the state, resulting in 246,009 public school students losing eligibility for free meals (Food Research & Action Center [FRAC] & Center on Budget and Policy Priorities, 2025). While states such as SC are exploring alternative funding solutions, our study investigates whether reducing food waste in school meals can generate cost savings and potentially be a viable strategy to sustain free meal school programs or improve meal quality amid declining federal support.

Our research objectives are threefold: (i) to estimate the amount of food potentially wasted in SC school lunches and the cost savings the federal government could achieve by reducing food waste in schools; (ii) to compare these savings to the costs of continuing programs such as free meals to all students through the CEP and the "Local Foods for Schools" program; and (iii) to explore parents' perspectives on food waste and the role of school meal offerings, with a particular focus on children's access to local and organic food products.

Applied Research Methods

This section describes the methods used to collect and analyze data for the study. We first outline the approaches used to measure food waste, followed by the parent survey design and data collection procedures.

Measurement of Food Waste

To estimate the percentage of food served to children that is ultimately wasted, we combine both direct weighing and self-reported survey methods. Direct weighing involves physically measuring the amount of food discarded after meals. It is widely used as the most accurate approach for quantifying food waste, although it can be time-consuming and labor-intensive (Roe et al., 2018). In contrast, self-reported surveys measure food waste by collecting respondents' estimates or perceptions of food waste. Using self-reported methods can provide insights into individual behavior but can be susceptible to reporting bias (Li et al., 2023). In this study, we integrate the two approaches to capture both objective measures of actual waste and subjective perceptions of food waste, thus enhancing the validity and comprehensiveness of our initial estimates. Specifically, we directly measured food waste during lunch periods using the weighing method and conducted surveys among parents to obtain their estimates of food waste.

Parent Survey

Following institutional review board approval (IRB2024-0711), we conducted a survey among parents (U.S. adults aged 18 and older who have children enrolled in elementary school). The survey was distributed through multiple outlets across three elementary schools in upstate SC,[1] yielding 61 valid responses. The survey was distributed via a QR code and flyers shared through school communication channels, including newsletters sent by principals to parents. Additional recruitment occurred through a booth at a school community event, a booth at the school fall festival, and in-person outreach during a Parent-Teacher Organization (PTO) meeting. Respondents estimated the percentage of school lunch waste on any given day by selecting from predefined ranges, which serves

[1] The Upstate region of South Carolina is defined as the counties of Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Spartanburg, and Union.

as the self-reported approach for food waste.

In addition, we included questions to evaluate how elementary school parents perceive the inclusion of local and organic products in school meals. Local food procurement by schools has been linked to potential benefits for both schools and local farmers, and although school procurement initiatives may prioritize proximity over organic status, there is public interest in supporting farmers transitioning to alternative farming systems, including organic production (Fitzsimmons & O'Hara, 2019; Izumi et al., 2010). Specifically, our survey asked about parents' purchasing behavior regarding organic products, such as their knowledge and frequency of buying organic items, as well as their opinions on increasing the availability of organic options in school meals. Additionally, we collected demographic information, including age, household size, and the grade level of their children.

Results

This section presents the findings from the direct food waste measurements and the parent survey. We first estimate the level of food waste in South Carolina elementary schools and then examine its economic implications and parents' attitudes toward school meals and organic food.

Figure 1. Free Student Meal Advertisement (top left), Lunch Assembly Process (top right), and an Example of a Completed Lunch in a School Tray (bottom) at an Elementary School in Upstate South Carolina, on September 5, 2024



Estimating Food Waste in South Carolina's Elementary Schools

Direct Weighing

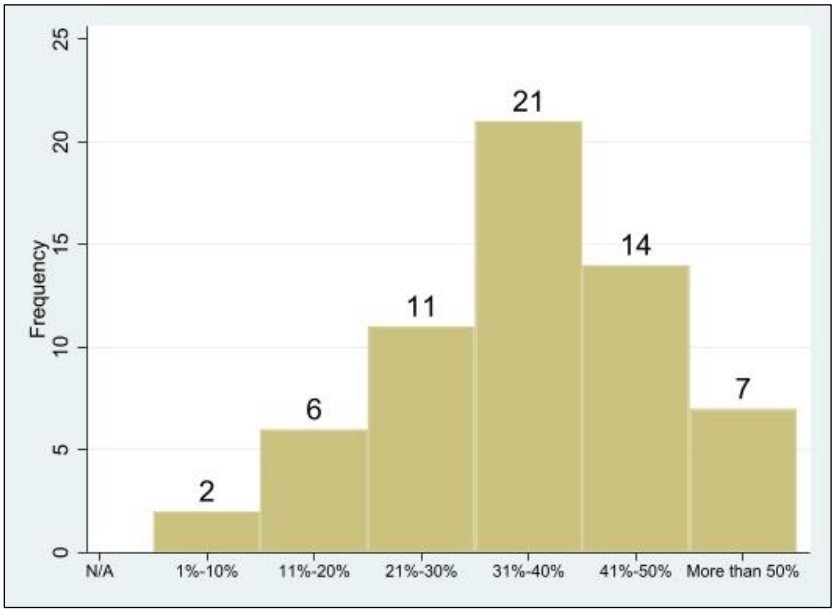
For the direct-weighing approach, we conducted a field visit to an elementary school cafeteria in upstate SC, during the lunch period (10:00 AM to 1:00 PM). The cafeteria offers three daily entrée options that contain grains or protein, with a complete meal comprising grains, an optional protein, a required fruit or vegetable, and a choice of flavored or unflavored milk (Figure 1). On the day of our visit, the entrée choices were a traditional cheeseburger (Choice A), a mashed potatoes and chicken bowl (Choice B), and a sunflower and grape jelly sandwich (Choice C). Monthly menus are available online, and students

indicate their entrée selection to teachers daily before lunchtime. To estimate the total weight of food served, we used the teachers' notes on student selections, along with interviews with the school principal and lunchroom staff. On that day, students could choose either baked beans or seasonal vegetables to satisfy the required vegetable component of the meal. Based on this information, we assumed that 80% of students selected baked beans and 20% selected seasonal vegetables.. Additionally, we assumed that all students picked a dinner roll, two fruit cups, and a 205 g milk container, consuming approximately 75% of the milk on average. That day, 68% of students chose Choice A, 16% selected Choice B, and 16% opted for Choice C, resulting in an estimated entrée weight of 50.7 kg (32.3 kg of Choice A, 11.0 kg of Choice B, and 7.4 kg of Choice C). Combined with 89.4 kg of fruit, 30.0 kg of vegetables, 13.4 kg of dinner rolls, and 91.4 kg of milk, the total estimated weight of food served was 275 kg. To assess the total weight of food wasted, we measured the weight of discarded food along with utensils and packaging, including milk containers, paper napkins, forks, and fruit cups. The discarded food was collected in trash bags and weighed in the kitchen during the lunch period as students completed their meals and each bag reached capacity. The utensils and packaging were collected during lunch and then weighed in a university research laboratory using an Ohaus semi-micro balance with a readability of 0.01 mg (10 micrograms). After subtracting the estimated weight of discarded utensils and packaging (13 kg) from the total weight of the trash (108 kg), we found that food waste totaled 95 kg. This indicates that 65.5% of the food served that day was consumed (180 kg out of 275 kg), while approximately 34.5% was wasted (95 kg out of 275 kg). Furthermore, we estimated that milk contributed approximately 24% of the total food waste by weight. Food waste estimates can fluctuate depending on the daily entrée options available, and on the day of our visit, the cheeseburger was the most popular choice among students.

Self-Reported Survey

For the self-reported approach, as illustrated in Figure 2, all respondents acknowledged the presence of food waste, with approximately 69% estimating that children discard more than 31% of their meals. To approximate the average reported waste, we assigned the midpoint of each range (e.g., 5.5% for the 1%–10% category, 15.5% for the 11%–20% category, 25.5% for the 21%–30% category, 35.5% for the 31%–40% category, and 45.5% for the 41%–50% category) and calculated a weighted average using the number of responses in each category. For the "more than 50%" category, we conservatively assigned a midpoint value of 55%. Using these midpoint values and the response frequency shown in Figure 2, the average reported waste was approximately 34.7%, closely aligning with the 34.5% estimated through the direct weighing approach. Given this consistency between direct weighing and self-reported survey estimates, we adopted a 35% food waste estimate as the foundation for all subsequent cost analyses.

Figure 2. Distribution of Reported Food Waste Percentages in School Meals Across Three Elementary Schools in Upstate SC



This close alignment between the two independent measurement approaches provides additional confidence in the validity of the estimated waste level.

Cost Implications

Given our 35% food waste estimate, we find that $1.55 of every $4.43 spent[2] per school meal may be ultimately wasted, based on the National School Lunch Program (NSLP) reimbursement rates for the 2024–25 school year (School Nutrition Association, n.d., "Federal Reimbursement Rates for SY2024–25"). We assume that approximately 59% of all public-school students (about 473,000 students) in SC benefit from the Free or Reduced-Price Lunch (FRPL) program daily (SC Department of Education, n.d.-a).[3] Since 349,501 out of 796,780 public school students (about 44%) were enrolled in elementary school (grades 1 through 6) in 2024–2025 (135-day active headcount) (SC Department of Education, n.d.-b), we estimate that up to 207,458 elementary school children may participate in the FRPL program each day. This program is crucial in ensuring food access, including fruits and vegetables, for children who might otherwise lack it. However, if 100% of the 207,458 elementary school children enrolled in the FRPL program receive a free lunch each day and $1.55 of every meal is wasted across SC elementary schools, this amounts to approximately $321,663 wasted every school day, equating to a loss of about $59.90 million every school year (Table 1).

Since the FRPL estimate includes both free and reduced-price recipients, and our analysis focuses specifically on federal savings, we further adjust our food waste cost estimates by considering varying assumptions regarding the proportion of students receiving fully funded (free) meals. Moreover, because 100% food waste reduction may not be a viable goal, we consider varying assumptions regarding the percentage of reduced food waste. We examine scenarios where these shares range from 25% to 100%, in 25% intervals, to explore potential monetary impacts of food waste reduction.

As illustrated in Table 2, if 25% of the FRPL-enrolled elementary school students (207,458 × 25% = 51,865) receive free meals, and total food waste is reduced by 25% ($1.55 × 25% = $0.39), the potential savings in SC over the standard 180 school days per year would total approximately $3.6 million (51,865 × $0.39 × 180). If all food waste were eliminated and all elementary school students received free meals, savings could reach $57.9 million. While achieving maximum savings is

Table 1. Preliminary Estimates of Food Waste in Elementary Schools Across South Carolina [a]

Estimated % of food wasted from meals served	35%
Cost per meal	$4.43
Estimated wasted dollars per meal	$1.55
Enrollment of all public-school students	796,780
Enrollment of public elementary schools only (Grades 1–6)	349,501
Share of students enrolled in public elementary schools (Grades 1–6)	43.86%
Enrollment of FRPL SC per day	473,000
Estimated enrollment of FRPL in SC per day: elementary school student (Grades 1–6)	207,458
Cost of food waste in SC per school day	$321,663
Cost of food waste in SC per school year (180 days)	$57,899,397

[a] All currency in U.S. dollars (US$). Data sources: Original survey conducted September–November 2024 and March 2025 (n = 61); cost-per-meal and student enrollment data from the South Carolina Department of Education.

[2] All currency mentioned in this article is in U.S. dollars (US$).

[3] This assumption falls between state and federal estimates. State reports indicate a lower rate of students receiving subsidized meals in 2021–22, such as 47% (SC Department of Education, n.d.-c), possibly because they count only directly certified students enrolled through safety-net programs. By contrast, federal estimates are closer to 70%, potentially because they incorporate Community Eligibility Provision (CEP) multipliers.

unlikely, our sensitivity analysis shows that even a modest 25% reduction in food waste could significantly impact resource allocation and contribute to the sustainability and quality of meal programs in SC elementary schools. Many schools in upstate SC offer free meals to all enrolled students. The last column of Table 2 represents a reality where all elementary schools in SC behave as in this school district, where savings would range from $14.5 million yearly (with food waste reduction of 25%) to $58 million yearly (with food waste reduction of 100%).

Leveraging Food Waste Reduction to Sustain Free Meals and Other Programs

Savings from reduced food waste could be reinvested to expand meal access, helping to sustain free and reduced-price meal programs for low-income students. Based on our preliminary 35% food waste estimate, we find that $1.55 of every $4.43 spent per school meal may be ultimately wasted. Our most conservative estimate in Table 2 indicates that reducing total food waste by 25% could lower the cost per meal to $4.04 ($4.43 – $0.39). This reduction would allow one additional free meal to be provided for every 10.36 students ($0.39 × 10.36 = $4.04). In practical terms, if all elementary school students enrolled in the FRPL program receive free lunch, approximately 20,027 additional meals (207,458 ÷ 10.36) could be provided, feeding up to 111 more children each school year. Alternatively, a complete elimination of food waste (100% reduction) would drive the cost per meal down to $2.88 ($4.43 – $1.55). Under this scenario, one additional free meal could be provided for every 1.86 students ($2.88 = 1.86 × $1.55). This would result in approximately 111,653 additional meals (207,458 ÷ 1.86), feeding up to 620 more children each school year.

Savings from reduced food waste could also be reinvested to improve meal quality and strengthen connections between students and their local community. This funding could help sustain the availability of local food options despite the termination of the U.S. Department of Agriculture's (USDA) $660 million Local Foods for Schools program, which was set to distribute funds across 40 states for fiscal year 2025. Currently, the USDA's support for local food initiatives plays a significant role in students' access to local food in school meals. For example, in 2022, the USDA Agricultural Marketing Service (AMS) entered a cooperative agreement with SC, providing more than $3.1 million to increase the purchase of nutritious, locally sourced foods for school meal programs (USDA AMS, 2022). Congress could also establish similar funding mechanisms to expand state initiatives such as South Carolina's Certified SC Cafeteria program.

Lastly, savings from reduced food waste could be reinvested to improve access to organic produce for children from low-income families. As discussed in the next section, our survey indicates that the parents of elementary school children highly value the inclusion of organic food both at home and in school settings. However, cost remains the primary barrier, making school meals the only opportunity for children from low-income households to access any type of organically produced food.

Table 2. Preliminary Estimates of Annual Savings (in U.S. dollars) Based on a 180-Day School Year across Varying Levels of Food Waste Reduction and Student Participation Rates in the Free School Lunch Program

			% and # of Free Lunch (of FRPL-enrolled)			
	%	$	25% (51,865)	50% (103,729)	75% (155,594)	100% (207,458)
% of reduced food waste	25%	$0.39	$3,618,715	$7,237,432	$10,856,147	$14,474,863
	50%	$0.78	$7,237,431	$14,474,863	$21,712,295	$28,949,727
	75%	$1.16	$10,856,147	$21,712,295	$32,568,442	$43,424,590
	100%	$1.55	$14,474,863	$28,949,727	$43,424,590	$57,899,453

[a] All currency in U.S. dollars (US$)

Children's Needs and Parents' Food Behavior

Among the 61 valid survey responses, price emerged as the most frequently considered attribute when grocery shopping (79.49%), followed by sugar-free options, avoidance of specific ingredients (such as food dyes, high-fructose corn syrup, and genetically modified organisms [GMOs]), and then organic certification.

Among respondents who selected "organic" as one of their preferred attributes, the average rank assigned to "organic" was 2.135, while "price" was ranked higher at 1.714, indicating that while organic products are valued, affordability remains the top priority. All respondents recognized the USDA Certified Organic label when shown the image; however, while over 60% reported purchasing organic food products, including vegetables, fruits, milk, or beef, only 40% specifically noted purchasing items with the USDA organic label. This discrepancy suggests that some organic purchases may come from local farmers markets or third-party sources perceived as organic but lacking formal USDA certification. When asked whether they would like to see more organic products incorporated into school meals, approximately 87% of respondents expressed support, citing the nutritional and health benefits of organic food for their children. Among those less supportive, the most cited concern was the potential higher cost associated with organic options.

Our findings indicate that younger parents (ages 20–40 vs. 40–60), those with smaller households (2–4 members vs. 5–10), and parents of younger children (kindergarten to grade 2 vs. grades 3–6) are more likely to prioritize organic options when grocery shopping, purchase organic products more frequently, and express stronger support for incorporating organic foods into school meals (Table 3). These trends may reflect a greater health-consciousness among younger parents and their attentiveness to the preferences of young children, who are often more selective or particular about their food choices (Fromm & Garton, 2013; Patrick & Nicklas, 2005; Russell et al., 2015).

Overall, parents of elementary school children value the inclusion of organic food both at home and in school settings. However, cost remains a primary concern, as organic products are often more expensive. This aligns with findings by Maubach, Hoek, and McCreanor (2009) and Hammad and Kay (2023), who observed that while parents desire healthier food for their families, various factors influence purchasing decisions. This underscores the importance of offering high-quality, low-cost (or free) food options in schools. With the potential rise in school meal costs, regardless of whether organic food is included, children from low-income households may face greater challenges in accessing nutritious meals. For many, school-provided meals represent their only opportunity to consume healthy food, and in some instances, to consume a meal at all. Efforts could focus on minimizing food waste to lower costs and help maintain the accessibility and quality of school meals for all students.

Table 3. Summary Statistics of Parents' Preferences for Organic Food Products

Survey questions (61 valid respondents)		
What food characteristics do you prioritize when buying food for your child(ren) at the store?	**Organic** 28.21%	**Price** 79.49%
Please rank the food characteristics you seek when buying food for your child(ren) at the store.	**Organic** 2.13	**Price** 1.71
Have you purchased organic food products (for example, vegetables, fruits, milk, or beef) in the last month?	**Yes** 60.66%	**No** 39.34%
Do you know this label? (USDA Certified Organic label)	**Yes** 98.36%	**No** 1.64%
You have said you know the USDA Organic label; do you try to buy products with this label when you grocery shop?	**Yes** 60.00%	**No** 40.00%
Would you like to see organic foods in school meals?	**Yes** 86.89%	**No** 13.11%

Conclusion and Future Directions

Using data from in-school food waste measurements, a survey across three elementary schools, and discussions with members of the school board of directors, county procurement

office, school principals, and Parent-Teacher Organizations (PTOs) in upstate SC, our preliminary findings show that stakeholders share similar concerns about food waste and interest in exploring strategies to reduce it. Our estimates indicate that a 25% reduction in total food waste could provide about 20,027 additional meals, and a 100% reduction (in theory, a complete elimination of food waste) could yield about 111,653 additional meals, potentially feeding between 111 and 620 more children each school year, respectively. Savings from reduced food waste could also be reinvested to improve meal quality, particularly considering the USDA's termination of the Local Foods for Schools program and our findings on parents' perceived value but limited accessibility of organic foods. By integrating insights into waste reduction with parental preferences, we aim to inform strategies for reinvesting saved resources in ways that ensure children's continued access to high-quality, nutritious meals.

In this research brief, our preliminary estimates suggest that potential savings from food waste reduction could help offset costs and sustain crucial programs such as the CEP, which allows schools to provide free meals to all students, and the Local Foods for Schools program or similar iniatives in SC, both essential for elementary school children to access nutritious and healthy food in school meals. However, these estimates should be interpreted with caution. The food waste measurements were conducted in a single elementary school and the survey responses were collected from three schools in one district, which may not fully capture the variation across schools and districts statewide. Therefore, the statewide cost estimates presented in this study should be viewed as illustrative scenario-based estimates rather than precise forecasts.

At the same time, accurately measuring food waste is a challenge in itself (Bellemare et al., 2017). Our future research seeks to enhance the measurement of food waste in school cafeterias by combining multiple approaches: tray-level digital imaging to estimate consumption and waste at the item level, smart bin weight sensors to track discarded food in real time, integration of waste data with cafeteria administrative records (e.g., meals served and menu composition), and repeated behavioral observations to monitor patterns over time. By triangulating all these methodologies, we seek to produce more reliable and policy-relevant estimates, evaluate the effectiveness of targeted interventions in elementary schools, and establish practical and achievable reduction goals for food waste reduction.

Potential interventions for reducing food waste in schools include launching schoolwide awareness campaigns, integrating food and nutrition education into the curriculum, and encouraging student participation in waste reduction initiatives (Broad Leib et al., 2016). These efforts could not only foster responsible consumption habits in schools but also empower students to carry these behaviors into their homes, promoting waste reduction beyond the school setting. Additionally, schools can implement practical solutions such as "offer versus serve" models (Ishdorj et al., 2015), which provide students with greater choice in their meal selections (Nguyen et al., 2023); adjusting lunch schedules to optimize food consumption; and establishing "share tables" where uneaten food can be redistributed rather than discarded (USDA, 2016). Schools may also consider strengthening partnerships with local producers to support local and regional food systems and potentially reduce procurement costs, while incorporating locally sourced conventional or organic menu items that align with parents' preferences and reduce the barriers identified in this study.

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