

## **Assessing the Educational Effect, Student Perceptions, and Satisfaction with School Feeding Programs in Addis Ababa's Public Primary Schools**

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### ***Abstract***

*Across the globe governments have been implementing school feeding programs (SFPs) aiming at enhancing students' health and educational outcomes. This study examined the effect of the government funded school feeding program on educational outcomes in Addis Ababa's public primary schools. Using an Interrupted Time Series design and a cross-sectional survey design, the research examined changes in enrollment, dropout rates, and promotion levels, as well as students' perceptions and satisfaction with the food provision. Data were collected from school records and 173 students across 27 schools in five sub-cities. Results have indicated that the SFP significantly improved educational outcomes, including increased enrollment, reduced dropout, and enhanced promotion levels. Moreover, regardless of demographics, more than 80% of beneficiary students perceived the program as important, with 87.4% reporting high level of satisfaction with the food provision. These findings suggest that SFPs can be an effective tool for improving educational outcomes in developing countries though potential adverse consequences such as dependency and sustainability need careful consideration.*

*Keywords: School-Feeding Program, educational outcomes, interrupted time series analysis, students perceptions, satisfaction*

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## **Introduction**

### **Background of the Study**

In the history of school feeding the prominent school meal movements were started in Europe in the late 18th century aiming at reducing inequality, and improving health, nutrition and educational progress. Initially private organizations and individual donors (Levenstein, 2003; World Food Program [WFP], 2020) funded the provision of in-school meals. It was during the global food, fuel, and financial crises of 2008 that school feeding got new prominence as a potential safety net and as a social support measure. Following the crises, school feeding programs (SFPs) were implemented in several poor countries as a key response to the social shocks. Besides, in 2013, the report titled ‘the State of School Feeding Worldwide’, prepared by the World Food Programme (WFP), was published providing the first picture of SFPs around the globe. The report also helped a lot as a continuing and systematic process to describe and better understand the strengths and challenges of SFPs (Drake et al., 2016; WFP, 2020).

Recent evidence have indicated that globally at least 368 million, about 1 out of every 5, pre-primary, primary and secondary school children receive a meal every day at schools in 161 countries in year 2020. Out of these, the first four largest school feeding programs are found in India, Brazil and China, the United States, and Egypt with 90, 40, 30 and 90 million children respectively in year 2020. Besides, among the children receiving school meals around the world, about 188 million (68%) were found to live in one of the five BRICS (Brazil, Russia, India, China and South Africa) countries (WFP, 2020). Further, in terms of having the largest number of SFPs: South

Asia (107 million), Latin America and the Caribbean (78 million), take the lead followed by East Asia and the Pacific (58 million) and Sub-Saharan Africa (53 million) (Global Child Nutrition Foundation [GCNF], 2021; WFP, 2020).

In-school feeding programs have two primary objectives. The first objective is to alleviate short-term hunger among attending children. Since a hungry child has less attention span and more difficulty to accomplish composite tasks, many argued that, short-term hunger has an adverse effect on school children learning achievements. Thus, providing in-school meal early in the school day helps for school children to reduce their hunger prior or/and during classes, to improve their attention span and focus better, as well as to avoid their need to leave the school to find food. Second, the provision of meal will create opportunity for beneficiaries to become more efficient and successful in school, and thus eventually leading to facilitating learning, reducing dropout and improving promotion rates (Bundy et al., 2009; Drake et al., 2016; GCNF, 2021; Ramin, 2018).

A study by Hinrichs (2010) showed positive contribution of the SFP implementation in enhancing both educational and health outcomes. However, according to this study, the effect size of the program on educational and health outcomes as well as on students' grade level were not similar. Besides, a higher effect on educational outcomes was found in higher-grade levels compared with earlier grade. In addition, some of the positive contributions of SFP include enhancement of academic performance (Chepkwony et al., 2013; Kazianga et al., 2009); improved level of students' efforts and attentiveness (Afridi et al., 2013), a significant increase in

attendance rate (Ahmed, 2004; Alderman et al., 2012; Hinrichs, 2010; Sarah et al., 2008); and reduction of household food costs (Dheressa, 2011)

A study by Jisook et al., (2009) showed that the satisfaction of beneficiary students on meal services were highly related with the quantity and quality of food, waiting time for meals, adequacy of eating place, and suitability of the school meal environment. Besides, it was reported that students receiving adequate food were highly satisfied (Jisook et al., 2009). Lee and Jang (2005) also indicated that students are more likely to be satisfied when there are no prolonged waiting times for meals, adequate dining rooms in a school, as well as adequate space, suitable chairs and tables in the dining rooms. Other studies also reported that students have received uneven meal quantity in schools which lack own cafeterias (dining rooms), have problems with a high risk of safety accidents in the food preparation and serving process, and improper meal temperature (Kim & Lee, 2004).

In Ethiopia, the first SFP funded by WFP was launched in 1994 in Tigray region targeting 25,000 children in 40 schools, and this was extended to Afar, Amhara, Oromia, Southern Nations, Nationalities and People's Region (SNNPR) and Somali regional states. In 2004, the number of beneficiaries and the coverage of schools grew to 650 thousand students and 1,200 schools (WFP, 2019). Before 2019, SFPs supported by non-governmental organizations (NGOs) were implemented in some public primary schools in Addis Ababa. The beneficiaries were students having a family with poor economic background. However, before 2019 a number of students with similar economic background in both beneficiary schools and non-beneficiary public schools

in Addis Ababa went to school without eating food (Belachew, 2021; Tefera et al., 2021).

The first city government-funded SFP was launched in September 2019 in Addis Ababa. In addition, in 2019, the city council approved a proclamation that established the “Feeding Agency” (hereinafter the Agency), which is accountable to the mayor. The rationale behind the establishment of the Agency include: increasing the access and equity of primary education for all children in the capital, reducing short-term hunger, enhancing educational outcomes of public primary school students, and managing the provision of in-school feeding in public schools in a consistent and integrated manner. Accordingly, the Agency has been providing in-school feeding in public pre-primary and primary schools (grades 1 to 8) located in Addis Ababa (School Feeding Agency (SFA), 2021; Addis Nigari Gazeta (ANG), 2019 & 2021).

These days, governments, including the city administration of Addis Ababa, are showing an ever-increasing demand for evidence-based information that can help them to better understand, and thus serve as a guidance to improve the effectiveness and efficiency of their school feeding programs and scale up the programs (Drake et al., 2016; Paul et al., 2016). Therefore, the main purpose of the study was to assess the performance of the SFP in public primary school students in Addis Ababa.

### **Statement of the Problem**

Findings from empirical studies have shown that in-school feeding programs, when well designed and effectively implemented, can have the potential to alleviate short-term hunger and improve attention span. Further, it helps to avoid a need to leave the school to find food, to advance education outcomes of school going children; and

to benefit parents through transferring the cost of schooling (Africa Union Commission [AUC], 2018; Bundy et al., 2009; Drake et al., 2016; Ramin, 2018). Since the commencement of the SFP, the Agency has been providing in-school feeding two times a day, every day for all public pre-primary and primary school students free of charge. For instance, in 2019/20 academic year, approximately 382 thousand students in Addis Ababa received a breakfast and a launch every day from the city administration funded SFP. Besides, the number of beneficiaries in public primary schools grew to a total of 528 thousand and 629 thousand students in school years 2020/21 and 2021/22, respectively (SFA, 2021).

In general, it can be assumed that the SFP can play positive roles in enhancing the health status and educational outcomes of public primary school students in Addis Ababa. However, it requires empirical evidence to tell whether the SFP has been practically contributing to the same or not in the study area. A preliminary desk review was conducted to understand what is already known, and it revealed that there is a paucity of studies examining the issue of interest. In other words, despite some prior studies that assessed performance of the SFP in Addis Ababa and/or, most of them did not provide adequate empirical evidence around the contributions of the program, satisfaction of beneficiary students with regard to various aspects of the food provision along with the key factors affecting its efficiency and effectiveness in the study area.

For instance, some studies focused on the SFPs funded by non-governmental organizations such as WFP and other donors rather than by government. Besides, these studies were conducted in rural contexts such as protracted refugee situations in SNNPR, Somali and Afar regions as well as in Amhara and in other regional states

(Asmamaw, 2014; Dheressa, 2011; Ramin, 2018; TANGO International, 2009; Yigzaw, 2019). This indicates the context and geographical coverage gaps in these studies.

There are also studies that evaluated the SFPs implemented in Addis Ababa. However, some focused on assessing only the factors influencing success of the program in Arada sub-city (Michale, 2021); the SFP and its contribution to quality education in first cycle in Yeka Sub-city (Mulat, 2019). Besides, the effect of SFP funded by NGOs and individual donors on the school performance of primary public school children in Arada sub-city (Abiy, 2017); the practice and challenges of the SFP (Belachew, 2021) and specific issues such as effects of COVID-19 (Tefera et al., 2021). In addition, none of these studies did assess either effect of the SFP using panel data or the satisfaction of beneficiary students on various aspects of the food provision, only few employed using mixed approach. Except a study by Abiy (2017), none has drawn on the existing body of documented data from school record. These imply a combination of thematic, methodological and context gaps of existing studies to provide adequate empirical evidence with regard to the topic of interest of this study.

In general, given the geographical coverage, thematic and methodological gaps, it is difficult to generalize the findings obtained from the existing studies to the population of interest. Put differently, existing studies provide little importance for understanding the performance of SFP to enhance educational outcomes, satisfaction level of beneficiary students as well as the key factors affecting efficiency and effectiveness of the government funded SFP in public primary schools in Addis Ababa.

Hence, this study aimed to fill the gaps by assessing/addressing the following three main research questions:

To what extent does the SFP affect the educational outcomes of public primary school students in Addis Ababa?

How important do beneficiary students perceive the SFP to be?

To what extent are beneficiary students satisfied with the provision of meals?

### **Scope of the Study**

The study was delimited to assess the effects of the SFP, its perceived importance level, and satisfaction level of beneficiary students with the food provision. In other words, thematic issues including process evaluation and cost-benefit analysis were not the focus of the current study. Besides, it covered only five sub-cities and 27 public primary schools in Addis Ababa indicating that the SFPs implemented at pre-primary level was out of its scope. In terms of time scope, the study assessed the topic of interest delimited to academic years ranging from 2016/7 to 2021/2.

### **Significance of the Study**

Overall, the study could be useful for decision makers, program-implementing schools and various actors, researchers, and other relevant stakeholders as well. Specifically, it is expected to contribute to the body of knowledge on the effects of SFP on educational outcomes in urban settings of developing countries, providing insights into how SFPs can influence various aspects of educational participation and performance. Further, it provides quantitative evidence on students' perceptions and satisfaction with various aspects of the meal provision in an urban Ethiopian context,



an area often overlooked in previous research. Moreover, it identifies areas for improvement, draws lessons and offers recommendations to inform evidence-based policy decisions. Besides, it serves as reference for future research.

## **Methods**

### **Research Designs**

The study employed two research designs, combining an Interrupted Time Series (ITS) analysis with a cross-sectional survey.

The ITS design, a quasi-experimental approach, was utilized to assess the effect of the School Feeding Program (SFP) on educational outcomes by comparing trends comparing the pre- and post-intervention, with the pre-intervention period serving as a counterfactual, addressing the first research question (Bernal et al., 2017; Biglan & Wagenaar, 2000; Glass et al., 2008; Kontopantelis et al., 2015). This design is particularly suitable and robust in detecting changes when randomized controlled trials are not feasible due to ethical or practical constraints (Bernal et al., 2017; Lopez et al., 2018). In this study, the universal nature of the SFP in Addis Ababa precluded the use of a control group, making the ITS design an appropriate alternative. Thus, alternative designs such as controlled before-and-after studies were not feasible due to the universal implementation of the SFP, which left no suitable control group.

On the other hand, the cross-sectional survey design addressed the second and third research questions, focusing on students' perceptions of the SFP and satisfaction with the food provision. The survey design allows for the collection of standardized information from a large sample, facilitating generalization to the broader population, while aligning well with the research objectives of assessing student perceptions and

satisfaction (Ponto, 2015). This design was considered most appropriate and efficient over other designs for it yields maximal information and provides an opportunity for considering many different aspects of the topic of interest, accurately describing a situation and applying measurement strategies that minimize bias and maximize the reliability of the evidence collected (Kothari, 2008; Kumar, 2014). While longitudinal surveys could provide insights into changes over time, the cross-sectional nature of the survey design is more appropriate for capturing current attitudes towards an ongoing program, at a specific point in time.

### **Data collection methods**

For the ITS analysis, administrative data on enrollment, dropout rates, and promotion levels were collected from school records covering six academic years (2016/17 to 2021/22), with three years each in the pre- and post-intervention period. A pretested standardized structured school questionnaire was used to gather gender-disaggregated data for each academic year, resulting in 162 school-year observations (27 schools  $\times$  6 years).

### ***Student Survey***

The student survey questionnaire included three major sections. The first section comprises items to assess the respondents' demographic and socio-economic characteristics. The second and third sections include items assessing the students' perception concerning importance of the SFP and level of satisfaction with various aspects of the food provision, respectively. The questionnaire used a combination of response options, including checkbox indications and Likert scales.

***Data Collection Procedure***

Trained research assistants administered the student survey face-to-face within selected schools, using child-friendly language to enhance comprehension and ensure accurate completion.

**Instrument development and validation**

Validated instruments from existing literature on student satisfaction and school feeding programs informed the selection of both the school and student questionnaire items (e.g., Gelli et al., 2016; Bundy et al., 2009). Particularly, the selection of the student survey items was grounded in the need to ensure clarity, relevance, and reliability in capturing the satisfaction levels of school-age children.

The survey questionnaire development involved pilot testing, and experts and fellow researchers' consultation to ensuring content validity and strengthening the dependability and conformability of the approaches used in the study's approaches. Feedback from the pilot testing and consultation was used for refinement of wording for clarity and comprehension. Furthermore, comprehensive documentation of data collection, analysis procedures, and decision-making processes was ensured by maintaining all records. This transparency helps to assess reliability of the interpretations and overall trustworthiness of the results, while allowing for potential replication and verification of the study's findings.

### **Sampling Design**

The study employed a random sampling method combining stratified and random sampling techniques to select sample subcities, schools and students in the study.

### **Sample size determination**

The required sample sizes for subcities, schools, and students were determined using established statistical formulas and power analysis. For subcities, Yemane's (1997) formula was applied to calculate the sample size based on a 95% confidence level and a 5% margin of error, yielding approximately 9.8 subcities. Adjusting for small populations with Finite Population Correction (FPC), the sample size resulted in five subcities representing 50% of the total, ensuring geographical and socioeconomic diversity while being manageable. Likewise, the initial sample size for schools was calculated based on Yemane's formula, resulting in a minimum of 78 schools. However, due to resource constraints, the number was adjusted to 30 schools (out of 137), which aligns with the finite population correction method to maintain feasibility while ensuring diversity (Israel, 2003). For students, the necessary sample size was determined conducting a power analysis using SPSS, assuming a medium effect size ( $f = 0.25$ ),  $\alpha = 0.05$ , and a power of 0.80 for a one-way ANOVA across five subcities. The analysis indicated a sample size of 200 students, which is sufficient for achieving reliable and valid results, remaining feasible for data collection (Cohen, 1988; Field, 2018).

### **Sampling Techniques, Criteria and Procedure**

The study employed a multi-stage sampling approach to select a representative sample from subcities, schools, and students, using a combination of stratified and random sampling techniques.

In the first stage, using a stratified random sampling technique, the population of subcities were stratified into two distinct subgroups (strata) based on geographic location (i.e., inner and outer city), ensuring representation across different contexts. Each of the first and second groups consist five subcities located at inner city and outer city, respectively. Then, five subcities (Lideta, Addis Ketema, and Kirkos from the first, and Gullele and Akaki from the second group) were randomly selected, employing probability proportional to size technique. This ensured that subcities located at inner cities consisting larger number of schools had a higher chance of selection.

In the second stage, a comprehensive list of all primary schools within each selected subcity was obtained, and then a final sampling frame comprising eligible schools was compiled by screening them on the basis of certain inclusion criteria. Accordingly, only schools that had implemented the SFP for three academic years, with accessible administrative records for the six-year period (2016/17 to 2021/22), and having enrolled students in grades 1-8 were included in the sampling frame. The sample size of schools required from each selected subcity was assigned proportionate to the total number of eligible schools in the subcity. Finally, 30 schools were randomly selected from selected subcities, proportionate to the number of schools in each subcity.

In the third stage, first, sections from grades 4-8 within each sampled school were selected randomly. Then, within the selected sections, selection criteria were used to screen students for inclusion in this study. The study then involved students who were enrolled from grades 1-5 in the sampled schools during the pre-intervention period and those who participated in the SFP at least for two years. The study also included those students who were attending classes in grades 4-8 during the data collection period.

Finally, using a stratified random sampling technique, a random sample of 200 students was drawn from the selected schools.

***Operational definitions of key concepts and variables***

***Interrupted Time Series (ITS) Analysis:*** This refers to a quasi-experimental design that uses longitudinal data to evaluate the impact of an intervention by comparing trends before and after its implementation, controlling for pre-existing trends (Bernal et al., 2017).

***School Feeding Program (SFP):*** It is a structured initiative providing regular meals to students within the school environment, aimed at improving nutrition and educational outcomes (WFP, 2020).

***Educational Outcomes:*** The phrase refers to the measurable indicators of student performance and engagement, including enrollment, dropout rates, and promotion level (Kristjansson et al., 2016).

***Student Perceptions:*** Self-reported views and opinions of students regarding the importance and effect of the School Feeding Program on their health and educational experience, collected through surveys (Bundy et al., 2018).

***Meal Satisfaction:*** The degree of contentment expressed by students regarding various aspects of the provided meals, including quality, quantity and variety, measured on a 5-point Likert scale (Aurino et al., 2019).

### **Measurements and Procedures**

In the ITS regression analysis, there was one independent variable, nonexistence vs. existence of the SFP. The independent variable was coded as a dummy variable (0= nonexistence of SFP, 1= existence of SFP). It also included three primary dependent variables that are overall enrollment, dropouts, and promotion levels. In addition, subgroup analyses were carried out to find out the program's effect on these outcomes for female and male students separately. Thus, the ITS design included nine models, which means three related to the three primary dependent variables and six for the gender-based assessment. Prior to data collection, informed consent was obtained from sample subcities and schools, and anonymity and confidentiality were assured.

With regard to the procedure, the ITS analysis was conducted following a three-step approach, using Stata statistical software. First, we specified a single-group ITSA model with the 2019/20 academic year (year number 4 in the model) as the intervention point, and then we estimated the initial model using the 'xtitsa' command with the 'vce (robust)' option to account for potential heteroscedasticity. Second, we run the initial ITSA regression model using the 'actest' command, generating residuals and testing

them for autocorrelation. This step involved analyzing the output to identify the optimal number of lags that accurately captured the autocorrelation structure within the data. Moreover, identifying the correct autocorrelation structure involved the following steps: visual inspection of autocorrelation function (ACF) and partial autocorrelation function (PACF) plots (Box et al., 2015), comparison of models with different autocorrelation structures using information criteria such as AIC and BIC (Burnham & Anderson, 2004), and checking for remaining autocorrelation in the residuals using Ljung-Box test (Ljung & Box, 1978). Hence, the final model was selected based on the best fit according to these criteria, balancing model complexity with explanatory power. Finally, we refined the regression model by incorporating the identified optimal lag structure based on the autocorrelation analysis. Then, we re-estimated this refined model to produce the results.

Regarding the survey design, participants were presented with a standardized structured questionnaire consisting two major measures (perceived importance of the SFP and satisfaction with the food provision) and additional items assessing demographic information. The first measure comprises seven items designed to assess the participants' perceptions the importance of the SFP in providing nutritious meals, preventing hunger during school, enabling full-day attendance, increasing attentiveness, reducing meal costs. The items were coded as a dummy variable (0= disagreement, 1= agreement with importance of the SFP). The scores of the seven items were totaled to create an index for the perceived importance measure (Cronbach's alpha .89).



The second measure includes eight items to assess the participants' level of satisfaction with regard to quality, quantity, diversity, and timeliness of the food (both breakfast and lunch) provided to them from the SFP. All the eight items were measured on a five point Likert scale (1, highly dissatisfied to 5, highly satisfied). Participants responded to eight questions, four regarding breakfast provision and the other four concerning lunch provision. The scores of these eight items were averaged to beneficiary satisfaction measure (Cronbach's alpha .92). The use of a 5-point Likert scale was chosen for its balance between having enough points of discrimination without overwhelming respondents with too many options, making it more suitable for children compared to scales with more points (Mellor & Moore, 2014; Revilla et al., 2014). The variety offered by a five-point scale encourages children to provide honest feedback without the pressure of having to select extreme options, likely leading to more reliable data, as respondents are more likely to express their true feelings.

Prior to administering the survey, the instrument was translated to Amharic and back translated to English by the researcher, assisted by language experts to ensure conceptual equivalence (Sousa & Rojjanasrirat, 2011). The translation process involved identifying and resolving any discrepancies in meaning between the original and translated versions.

Concerning procedure in the student survey, first, participants were provided with information about the objectives of the study and the importance of their participation in the survey. Besides, participants were told about their right to stop taking part in the survey whenever they need to do so. After obtaining informed consent, participants were invited to reflect on the items included in the questionnaire. Further,

the study utilized major strategies to mitigating potential response bias, such as social desirability bias. These include assuring anonymity and confidentiality to respondents (Krumpal, 2013), ensuring voluntary participation, using indirect questioning techniques for sensitive items (Fisher, 1993), and incorporating reverse-coded items to detect acquiescence bias (Weijters et al., 2013). Besides, trained research assistants administered the student survey face-to-face within selected schools, using child-friendly language to enhance comprehension and ensure accurate completion.

### **Statistical Analysis**

***Interrupted Time Series Analysis:*** the ITS regression analysis was used to assess the effects of the SFP on educational outcomes, controlling for pre-existing trends and potential confounding factors (Bernal et al., 2017; Biglan & Wagenaar, 2000; Wagner et al., 2002). The standardized ITSA regression model (accounted for autocorrelation) took the following form in equation 1.

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \epsilon_t \quad (1)$$

Where:  $Y_t$  is the aggregated outcome variable measured at each equally spaced time point  $t$ .  $\beta_0$  is the intercept or starting level of the outcome variable.  $\beta_1$  represents the slope or trend of the outcome variable until the introduction of the intervention.  $T_t$  is the time since the start of the study.  $\beta_2$  represents the change in the level of the outcome that occurs in the period immediately following the introduction of the intervention (Thus we look for significant p-values in  $\beta_2$  to indicate an immediate treatment effect).  $X_t$  is a dummy (indicator) variable representing the intervention (pre-intervention periods 0, otherwise 1).  $\beta_3$  represents the difference between pre-intervention and post-intervention slopes of the outcome; and  $X_t T_t$  is an interaction term.

In general, significant p-values in  $\beta_2$  indicate an immediate treatment effect, while significant p-values in  $\beta_3$  show a treatment effect over time (Linden, 2015). In addition, STATA (version 15) served as a tool for the purpose of processing, tabulating, and summarizing the quantitative data.

***Descriptive and Inferential Statistics:*** Survey data were analyzed using descriptive statistics including frequencies, percentages, means, and standard deviations to summarize students' perceptions and satisfaction levels. Moreover, inferential statistical techniques such as chi-square, t-tests, and ANOVA were employed to assess differences in perceptions and satisfaction across demographic groups. Besides, Statistical Package for Social Science (SPSS, version 23) was used for processing, tabulating, and summarizing the quantitative data. In addition, it was used to encode data, calculate, and generate some graphs.

#### **Additional Robustness Checks**

To ensure the validity and reliability of the results, several additional robustness checks including sensitivity analyses, subgroup analyses, and alternative model specifications were conducted. The sensitivity analyses included varying the intervention start date and excluding potential outliers. The separate subgroup analyses conducted for overall, female, and male students help to examine potential gender differences in the SFP effect. Different model specifications were tested to ensure consistency of findings.

Overall, before undertaking the various statistical tests, normality check was carried out using both a histogram and Q-Q Plot and the appropriate goodness of fit tests.

## **Results and Discussion**

### **Results**

#### **Demographic and socio-economic characteristics of participants**

Five subcities and 27 public primary schools in these subcities were participants of the ITS design. Of these, six schools were found in Lideta, five in Kirkos, five in Gulele, nine in Addis Ketema, and two schools in Akaki sub-cities. All the schools included grades 1 to 8. Note that initially the study aimed to include 5 sub-cities, 30 schools, and 200 students. However, the final sample consisted of 5 sub-cities, 27 schools and 173 students, excluding three schools and associated students from Akaki subcity, due to missing data. We noted that the uneven distribution of schools across sub-cities could introduce bias if the excluded schools differed significantly from those included. To address this, first, we conducted a missing data analysis and found that the missing data were not random. Second, we conducted comparative analysis comparing the demographics and socio-economic characteristics of excluded schools associated students with those included to identify potential bias and found no significant differences. Besides, a relatively large number of sample students were drawn from selected schools from Akaki. Cases with huge incomplete data on educational outcomes and related variables were also removed from the final analysis, leading to a reduction of sample size).

Participants of the survey were 173 (52 %, female) students from the sampled 27 public primary schools. The near-equal representation of participants with a slight majority of female students aligns with broader population trends towards gender parity in education (Ethiopian Ministry of Education, 2022). Participants were between 10 and 17 years old ( $M = 12.98$ ,  $SD = 1.86$ ). The age range and mean age suggest that the sample primarily consists of pre-adolescents to early adolescents, which aligns with typical school attendance ages (Central Statistical Agency of Ethiopia [CSA], 2021). Nearly 59% and 37% of the participants respectively responded that the head of their household are fathers and mother, and the remaining four percent indicated the household heads were others such as sisters or brothers. This result suggests that a significant proportion of students live in households headed by fathers. The substantial representation of mothers also highlights the role of women in family leadership. Besides, as participants reported, overall there were 307 (51.14 %, female) school age children in the households of students who provided valid responses. Of these, about 83 % were enrolled in public primary schools. Overall, the above figures imply similarities between the demographic and socio-economic characteristics of participants. The figures further indicate the opportunities that the school age children and their parents had in terms of benefiting from the government funded SFP in the study areas.

Overall, these demographic and socio-economic characteristics can significantly influence how beneficiaries perceive the program and their satisfaction level with food provision, making it essential to explore their relationships further.

## Effect of SFP on Educational Outcomes

### Effect of SFP on Enrollment

As shown in the regression output Table 1, the starting level of average number of enrolled students were estimated at 863.8 students per school per year, and the number appeared to decrease, but not significantly, every year prior to 2019/20 by 22 students ( $p = 0.104$ ,  $CI = [-50.6, 4.7]$ ).

**Table 1**

#### *ITSA Regression Results of the Effect of SFP on Enrollment*

	Description	Overall	Female	Male
		Model 1	Model 2	Model 3
_t(Since 2016/7)	Trend at the time since the start of the study	-22.93 (14.11)	-17.41* (7.46)	-5.45 (6.93)
_x4(2019/20)	Trend at the first year of the intervention	32.2* (14.17)	17.97* (7.93)	13.5 (8.83)
_x_t4	Annual trend during the intervention period	40.23** (13.34)	21.60** (6.64)	19.22* (7.82)
_cons	Constant	863.77*** (92.31)	466.44*** (48.01)	408*** (49.48)
_b[_t]+_b[_x_t4]	Post-intervention linear trend	17.3* (8.40)	4.19 (3.97)	13.78** (4.71)
N	Number of observations	162	162	162
N	Number of Schools	27	27	27

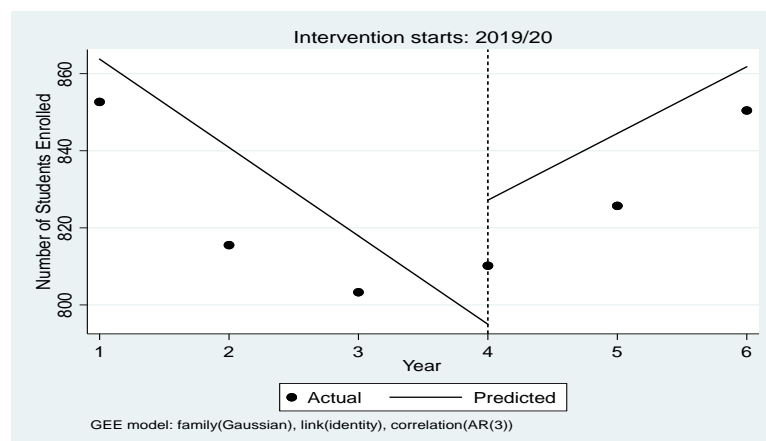
Note: Numbers in brackets are robust standard errors; \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

In the first year of the intervention (2019/20), there appeared a significant increase in the average number of overall enrollment by 32 students ( $p = .023$ ,  $CI = [4.4, 59.98]$ ), followed by a significant increase in the annual trend of enrollment (relative to the pre-intervention trend) by 40.23 students per school per year ( $p = 0.003$ ,  $CI = [14.1, 66.4]$ ). Figure 1 provides a visual display of these results.

The result further shows that after the introduction of SFP, the average number of enrolled children significantly increased annually by 17.3 students ( $p = .04$ ,  $CI = 0.8, 33.8$ ).

**Figure 1.**

*Single-group ITSA with GEE model \_ Enrollment Source: Survey data, 2022*



With regard to results disaggregated by gender, as depicted in Model 2 and Model 3 of Table 1, the average number of female and male students enrolled initially

was estimated at 466.4, and 408 students, respectively. Enrollment of both female and male students showed a decline; however, the decrease for males was not significant. The annual average decline rate for female and male students was 17.4 ( $p=0.020$ ) and 5.5 ( $p=0.432$ ), respectively. In the first year of the intervention (2019/20), there appeared to be a significant increase of 17.97 ( $p=0.024$ ) female and a non-significant increase of 13.5 ( $p=0.126$ ) male students. These were followed further by a significant increase in the annual trend of average enrollment (relative to the pre-intervention trend) of 21.6 ( $p=0.001$ ) female and 19.2 ( $p=0.014$ ) male students at the 1% and 5%, respectively. On the other hand, the results from the lincom estimate further indicate that after the introduction of the SFP, average enrollment for males significantly increased at the 1% level annually by a number of 13.8 students and insignificantly by 4.2 female students.

#### ***Effect of SFP on Dropouts***

ITSA results indicate that the overall initial dropout rate was 10.4%, 5% for females and 5.5% for males. Since the beginning of the study (i.e., 2016/7), the dropout trend of total students declined by 1.77, although this decrease was not statistically significant.

Likewise, the analysis disaggregated by gender shows a non-significant increase in the total dropout rate (0.478) and the dropout rate of female students (1.29). Looking at the trend at the first year of the intervention, the findings have shown a non-significant decrease of 1.94 and an increase of 0.15 female and male students respectively. Besides, the annual trend during the intervention period dropout of female students exhibited a decrease (but not a significant one) by 0.08, while it showed an



increase by 0.78 for male students though the variation was not significant. Figure 2 shows these results.

**Table 2**

*ITSA Regression Results of the Effect of SFP on Dropout*

	Description	Overall	Females	Males
		Model 4	Model 5	Model 6
_t(2016/27)	Trend at the time since the start of the study	-1.77 (1.94)	-.478 (.92)	-1.29 (1.08)
_x4 (2019/20)	Trend at the first year of the intervention	-1.75 (2.6)	-1.94 (1.44)	.15 (1.47)
_x_t4	Annual trend during the intervention period	0.7 (2.08)	-.08 (1.00)	0.78 (1.14)
_cons	Constant	10.44** (3.45)	5** (1.58)	5.46** (1.91)
_b[_t]+_b[_x_t4]	Post-intervention linear trend	-1.07** (.31)	-.56** (.17)	-0.5** (0.19)
N	Number of observations	162	162	162
N		27	27	27

Note: Numbers in brackets are robust standard errors; \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

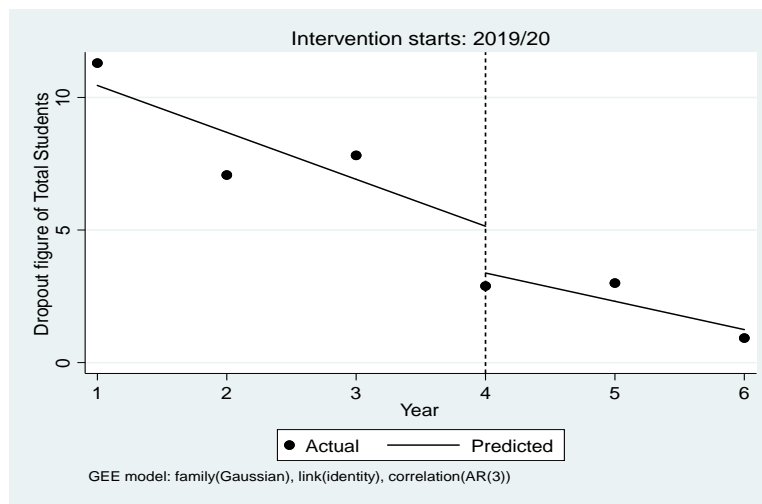
Source: Survey data, 2022

On the other hand, the results from the lincom estimate indicate that after the introduction of the SFP, the dropout significantly decreased annually by 1.07 ( $p =$

0.001) for total, by 0.56 ( $p = 0.001$ ) for female, and by 0.5 ( $p = 0.007$ ) for male students at the 5% level.

**Figure 2**

*Single-group ITSA with GEE model\_ Dropout. Source: Survey data, 2022*



### ***Effect of SFP on Promotion***

The average number of students promoted to the next grade at the starting level was estimated at 809.4 per school. The slope prior to intervention was decreased non-significantly by 22.74 ( $p = .121$ ,  $CI = [-51.4, 5.98]$ ) students per school per year followed by a significant change in the average number of promotion immediately following the introduction of the intervention (compared with counterfactual) by 60.5 students ( $p = .002$ ,  $CI = [21.95, 99.1]$ ). Besides, the post-intervention annual trend of promotion showed a sustained significant increase of 43.3 students per year per school at 1% level ( $p = .001$ ,  $CI = [17.6, 69.12]$ ).

**Table 3**

***ITSA Regression Results of the Effect of SFP on Promotion***

	Description	Overall	Female	Male
		Model 7	Model 8	Model 9
_t	Trend at the time since the start of the study	-22.74	-18.4*	-4.93
(-2016/7)		(14.65)	(7.52)	(7.46)
_x4	Trend at the first year of the intervention	60.5**	37.2***	24.8*
(-2019/20)		(19.67)	(9.57)	(11.63)
_x_t4	Annual trend during the intervention period	43.33**	24.2***	19.91*
		(13.2)	(6.35)	(7.84)
_cons	Constant	809.4 ***	4.11 ***	368.02***
		(89.22)	(46.39)	(43.41)
_b[_t]+_b[_x_t4]	Post-intervention linear trend	20.6 **	5.8	14.99**
		(7.9)	(3.7)	(4.58)
n	number of observations	162	162	162
N	number of groups	27	27	27

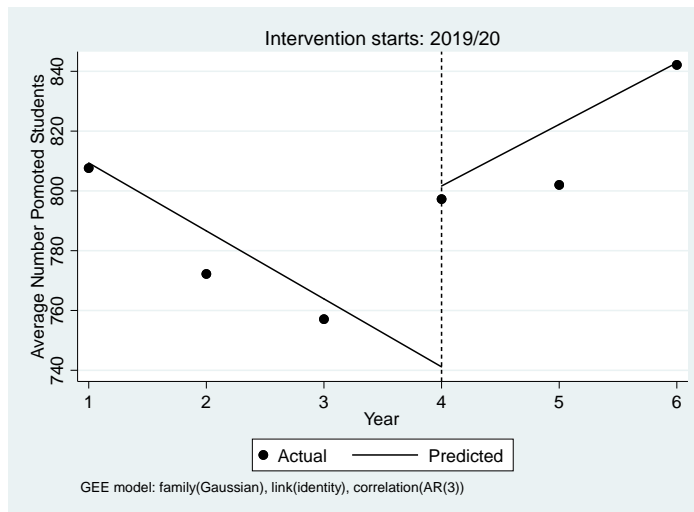
Note: Numbers in brackets are robust standard errors; and \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$   
 Source: Survey data, 2022

The result further indicates a significant higher increase of 20.6 students at 1% level. ( $p = .009$ ,  $CI = [5.13, 36.1]$ ) in post-intervention slopes of promotion as compared to the pre-intervention period. Figure 3 provides a visual display of the result for Model 7.

Overall, the results indicate that the program has both significant immediate and sustained effect over time in increasing the average number of students promoted to the next grade at a school level.

**Figure 3**

*Single-group ITSA with GEE model \_ Promotion. Source: Survey data, 2022*



Results of the analysis disaggregated by gender show that the average numbers of female and male students promoted to the next grade were estimated to be 441.8 and 368.02 per school, respectively. The annual trends in promotion appear to decrease significantly by 18.4 at 5% level ( $p = .014$ ,  $CI = [33.12, 3.66]$ ) for female students, and insignificantly for male students by 4.93 ( $p = .509$ ,  $CI = [19.55, 9.69]$ ). At the first year of the intervention, significant increases in the promotion trends of students were found for female by 37.2 level at 0.1 % level ( $p < .001$ ,  $CI = [18.45, 55.95]$ ), and for male by 24.8 level at 5 % level ( $p = .011$ ,  $CI = [1.99, 47.6]$ ). The level of the post intervention

annual trend also appeared to significantly increase by 24.2 for female ( $p < .001$ ,  $CI = [17.75, 36.65]$ ) and by 19.91 for male ( $p = .011$ ,  $CI = [4.55, 35.26]$ ) students per school at 0.1% and 5% level, respectively.

Besides, as compared to the pre intervention trend, the post intervention annual trend of promotion showed higher a significant increase of 14.98 male students at 1% level ( $p = .001$ ,  $CI = [6.01, 23.96]$ ), and insignificant increase of 5.8 female students per year per school.

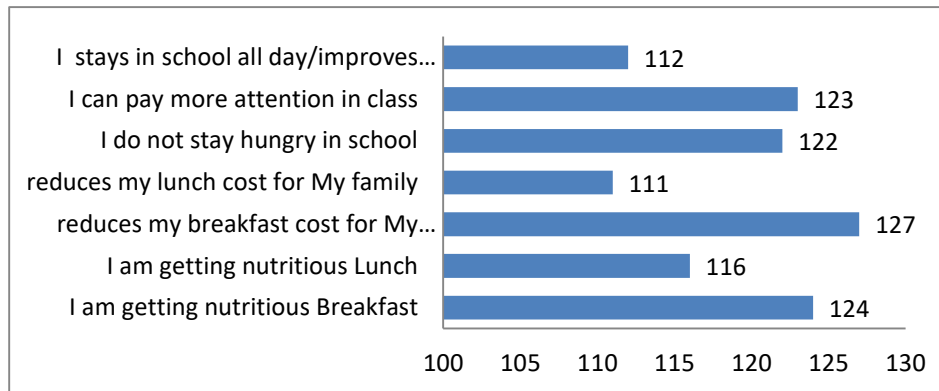
### **Perceived Importance of the SFP and Beneficiary Satisfaction**

#### ***Perceived Importance of the SFP***

Results of the descriptive analysis indicate that majority of the students had positive opinion/ perception with regard to the importance of the SFP. The program was perceived as important for them in various ways: not to be hungry during school (92.4%), to become more attentive in class (89.1%), to get nutritious food both at breakfast (88.6%) and lunch times (85.3%), and to show full-day attendance at school (84.2%). Furthermore, participants showed positive agreement regarding the program's contribution in reducing the costs of breakfast (92.7%) and lunch (88.1%) for their parents.

**Figure 4**

*Perceived Importance of the SFP .Source: Survey data, 2023*



***Beneficiary Students' Satisfaction on the SFP***

As shown in Table 4, the majority of the sampled students responded that they were highly satisfied with the timeliness (4.51), food diversity (4.33), quantity (4.25), food quality (4.21) of the food provided both at breakfast and lunch hours. The results further show that most of the beneficiary students were highly satisfied with the food provision with a mean score of 4.21.

Moreover, the study conducted additional tests to find out if there existed significant differences in the average scores of participants' satisfaction level with the food provision, based on gender, grade level, and school location. Accordingly, result of the t-test indicates no significant difference between the average scores of male and female students ( $t = .48, p = 0.34$ ).

**Table 4**

***Satisfaction Levels of Beneficiary Students in Addis Ababa***

No.	Items	N	Mean	Std.Dev.	Descriptive Level
1	Average Satisfaction on food provision time	139	4.51	0.79	highly satisfied
2	Average Satisfaction with Quantity of food provided	134	4.34	0.89	highly satisfied
3	Average Satisfaction with Diversity of food provided	135	4.33	0.896	highly satisfied
4	Average Satisfaction with Quality of food provided	135	4.21	0.97	highly satisfied
5	Average Satisfaction with the food provision (overall mean)	140	4.37	0.75	highly satisfied

Source: Survey data, 2022

Analysis of differences in mean scores based on the two independent variables measured on ordinal scale (subcities and students' grade level) were undertaken using two tests of analysis of variance (ANOVA). The ANOVA's F-test ( $F(4,135) = 8.368$ ) of significance results in  $p < 0.001$  indicating the influences of Subcity on the average score of students' satisfaction level. Furthermore, pair wise tests were conducted to test which differences between groups are significant. The results confirm mean scores in Akaki was found to be significantly lower than Kirkos, Lideta and Addis Ketema respectively with  $p < 0.001$ . Mean scores in Gulele was also significantly lower than Kirkos, and it was statistically indifferent between/among Kirkos, Lideta and Addis Ketema ( $p > 0.05$ ). A possible reason for the variations could be the differences in sample sizes.

On the contrary, the F-test test of ANOVA indicate the mean scores among grade levels to be more or less similar ( $F(4,135) = 1.371, p = .247$ ). This finding is not in agreement with some studies that reported differences in effect size of the program on health and educational outcomes on grade levels (Hinrichs, 2010). Overall, these results imply that majority of the students are highly satisfied with the food provision regardless of their gender and age.

## **Discussions**

### **Discussion Related to Educational Outcomes**

One of the aims of this study was to assess the effects of the SFP in increasing of the rates of enrollment and promotion and decreasing the rate of dropouts. The study found enough evidence that the SFP resulted in statistically significant change in the level and trend of overall of enrollment, promotion, and dropout growth.

The evidence suggests that the immediate treatment effect of the SFP on the level of enrollment and promotion occurs in the period immediately following the introduction of the intervention. However, the level of dropouts at the first year of the intervention had a decreasing trend compared with the counterfactual, but this change was not significant.

The study also found another important divergence between the results of enrollment and promotion, and dropout concerning their annual trend during the intervention period. While the post intervention trend in the enrollment and promotion increased per year per school at significant levels, the decrease observed in the annual level of dropout was not significant.



Despite these divergences, the study found that the SFP affect all the three primary outcomes over time at a significant level. Overall, the study provides evidence regarding the program's immediate effect on enrollment and promotion growth as well as it's over time effect on the three primary outcomes.

These findings were entirely consistent with the study's predictions and findings from previous studies with regard to the effects of existence of the SFPs on educational outcomes (Afridi et al., 2011; Hinrichs, 2010).

The study also estimated the program's immediate and over-time effect on the educational outcomes based on gender differences. As compared to the pre-intervention period, the numbers of enrolled students were higher for both female and male students. However, the change in the level of enrollment was significant only for female students. This indicates that the program did not result in immediately affecting the enrollment growth of male students. On the other hand, the results suggest the annual trends in the level of enrollment for both female and male students were significantly growing during the intervention period. Conversely, the program was found to have a significant sustained over time effect on the enrollment growth level of only male students. One possible explanation for such the level of dropout could be the growth of enrollment trends at the time since the start of the study were decreasing for both but significantly only for female students.

Concerning dropout, the numbers of dropouts were lower for both female and male students at the first year of the intervention. The annual trends in the levels of dropout growth were decreasing per school for both as compared to the pre-intervention trend. However, the change in the level of dropout was significant only for male

students. These results suggest that the SFP had a significant immediate effect in reducing the level of male students' dropout growth as compared to female students. Despite this, the study provides evidence concerning the SFP's effect in reducing both the female and male students' levels of dropout growth over time. The results are in line with studies that indicated the effect of SFP on dropout growth (Asmamaw, 2014).

With regard to promotion, the study found out that the levels of promotion growth trends at the first year of the intervention as well as the annual trends during the intervention period were significantly higher than the pre-intervention period. These indicate an immediate effect of the SFP in increasing the level of female and male students promoted to the next grade. Nevertheless, the program was found to have a positive significant sustained over time effect only on the level of male students' enrollment growth. In other words, though increasing; the overtime effect of the SFP in changing the level of female students' enrollment growth was insignificant. One explanation for this could be the existence of significant difference between preintervention and postintervention slopes. For instance, the promotion growth trend for male students at the time since the start of the study were decreasing but not significantly, and the vice versa is true concerning female students. Another explanation might be the analyses were undertaken based on aggregated data at city and school level. Thus, time-variant factors across the schools may account for the divergence of results.

Overall, the SFP has significant immediate effect on female and over time effect on male students enrollment growth; significant immediate effect on male and over time

effect on both male and female students dropout growth; and significant immediate effect on both as well as over time effect on male students promotion growth.

### **Discussion Related to Perceived Importance and Satisfaction**

The study found out the SFP was perceived as highly important by majority of beneficiary students. It appears that the SFP have benefited primary school students to get nutritious breakfast and lunch, to come to, and stay in schools (to improve their attendance) and to become more attentive and remain alert during class, and in reducing short term hungry. There was also evidence that benefits of the SFP were not associated with student's gender. Besides, the SFP have played a role in reducing food (breakfast and lunch) costs for families that they used to spend for cooking/preparing breakfast and lunch for their children. The findings are in line with previous studies which reported positive contribution of the SFP implementation in enhancing both educational and health outcomes (Ahmed, 2004; Hinrichs, 2010; Dheressa, 2011; Alderman & Bundy, 2012; Afridi et al., 2013). Moreover, this study found that majority of the students were highly satisfied with the timeliness, diversity, and quantity of the food, and satisfied with the food quality. Overall, most students were highly satisfied with the SFP. The results are in line with studies which indicated that beneficiary students receiving adequate food were highly satisfied (Jisook et al., 2009); and when there are no prolonged waiting times (Lee & Jang, 2005).

In general, the findings of this study imply that the SFP has been performing well in terms of contributing to enhance the educational outcomes and satisfaction level of beneficiary students in public primary schools in the study areas. Overall, the statistically significant changes of average values found on most of the educational

outcome indicators suggest that the positive effect of the program improve educational outcomes. Furthermore, it could also be inferred that the SFP has positive contribution to attract students to come to, and stay at schools.

Nevertheless, there are concerns with potential adverse consequences warranting attention. For instance, students and families might become overly reliant on the program. Strategies such as integrating the SFP with broader food security and poverty alleviation initiatives and implementing nutrition education programs to promote sustainable food practices can help to address the concern (Aliyar et al., 2015). Besides, implementing the SFP on a regular basis is highly costly. The costs may threaten long-term sustainability of the government funded SFP. This calls for a need to exploring local food sourcing to reduce costs and support local agriculture, and seeking diverse funding sources, including public-private partnerships, to ensure sustainable finance sources for the program (Drake et al., 2016).

## **Conclusions and Implications**

### **Conclusions**

On the whole, this study provides interesting insights into the effects of the SFP on educational outcomes, its perceived importance, and the beneficiary students' level of satisfaction with the food provision. It is found that the existence, presence or implementation of the SFP led to an increase in enrollment and promotion rates and a decrease in dropouts, compared to when the SFP did not exist. The study also found that the majority of the beneficiary students strongly agreed with the importance of the SFP in providing nutritious food, reducing short-term hunger, helping them to attend school, being more attentive during learning times attending school regularly, and

reducing food costs for their parents. Besides, this study found that the majority of beneficiary students were highly satisfied with the food provision.

Thus, on the basis of the overall findings it can be fairly concluded that existence of the SFP put a significant effect in enhancing the educational outcomes of public primary students in Addis Ababa. Besides, the SFP was regarded as highly important and highly satisfactory for beneficiary students.

### **Implications**

The funds required for implementing the SFP in the study areas were made available from the city administration. The results imply the need for the city administration to continue its strong commitment to the SFP by allocating adequate fund and disbursing it timely to ensure the continuity and effectiveness of the program.

Since the SFP has significant effects on educational outcomes as well as beneficiary students satisfaction, the feeding agency and program implementing schools needs to work in collaboration with relevant public sectors and NGOs and members of the community so as to strengthen their sense of ownership and performance of the SFP as well.

Another implication is that a particular attention is needed in schools found in Gulele Subcity where a comparatively lower level of beneficiary satisfaction was found. Hence, key stakeholders are required to further assess in which school and why such results were found.

Moreover, the results indicate the need/possibility to further enhance the diversity and quality of food provided to beneficiary students. Concerning this, relevant

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public sectors such as the Bureau of Education (BoE) are expected to enhance the health and nutrition of beneficiary students. This can be done by including the nutrition, health, and sanitation issues into the curriculum of major subjects such as biology and social study, developing nutrition/operational guidelines, and providing training related to food preparation and sanitation for implementing schools as well as cooks and caterers.

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