

**Food for thought? Experimental Evidence on the Learning Impacts  
of a Large-Scale School Feeding Program**

Elisabetta Aurino, Aulo Gelli, Clement Adamba, Isaac Osei-Akoto, Harold Alderman<sup>1</sup>

**Abstract**

There is limited experimental evidence on the effects of large-scale, government-led interventions on human capital in resource-constrained settings. We report results from a randomized trial of the government of Ghana's school feeding. After two years, the program led to moderate average increases in math and literacy standardized scores among pupils in treatment communities, and to larger achievement gains for girls and disadvantaged children and regions.

Improvements in child schooling, cognition, and nutrition constituted suggestive impact mechanisms, especially for educationally-disadvantaged groups. The program combined equitable human capital accumulation with social protection, contributing to the "learning for all" sustainable development agenda.

## I. Introduction

Average learning levels for primary school pupils in low- and middle-income countries (LMICs) are dismal: for instance, only 40 percent of students in Sub-Saharan Africa (SSA) master basic literacy and numeracy at the end of primary school (World Bank 2018). Further, large disparities in achievements are present, with children from lower socioeconomic status or rural households, and, sometimes girls, lagging behind the average pupil. This "learning crisis" occurred despite unprecedented expansion in primary school access and completion: in SSA, for example, 78 percent of children at primary school age were enrolled in 2014, up from 58 percent in 1999 (World Bank 2017). Consistent with the principle of "quality education for all" underscored by the Sustainable Development Goal 4 (SDG4), raising average learning achievements in an equitable way is a pressing global educational objective.

Currently, there is very limited rigorous evidence focusing on the effectiveness and distributional impacts of large-scale, government-led interventions on human capital, especially in SSA (Snilstveit et al. 2015). One such intervention is school feeding, which ranks amongst the world's most common forms of social protection (Alderman, Gentilini, and Yemtsov 2018). Every day, about 368 million children receive some form of school feeding globally, for an estimated investment of \$70 billion a year (WFP 2013). In SSA, since the early 2000s, many governments have invested in school feeding as a multisectoral strategy involving education, health, and agriculture, with funding mostly stemming from Ministries of Education (Alderman and Bundy 2012; Drake et al. 2017). At an average cost of US\$54 and US\$82 per child per year in low- and middle-income countries, respectively, and often with limited poverty targeting, the share of the educational budgets devoted to school feeding is often considerable (Aulo Gelli and Daryanani 2013).

This paper experimentally addresses whether large-scale, government-led school feeding programs can contribute to equitable learning goals in resource-constrained settings. While school feeding has a robust track record in increasing school participation (Kristjansson et al. 2015; Drake et al. 2017), experimental evidence on its effectiveness on learning is more limited, and with mixed findings (see Appendix 1 and Snilstveit et al. [2015] for a meta-analysis).

Importantly, existing experiments have evaluated small-scale programs implemented as part of international food assistance, usually by the World Food Programme (WFP) or other international non-governmental organizations (NGOs), or by researchers. As an illustration, of the 16 randomized control trials (RCTs) of school feeding in LMICs published since 1980 onwards that we were able to find, all assessed programs implemented by either NGOs or researchers. Additionally, only three were implemented in more than one district in the country (Table A.1, Appendix 1). As noted by Vivalt (2019), smaller-size programs or programs implemented by academics and international organizations tend to report larger effect sizes than government-led ones reaching large populations daily. The latter may suffer from additional challenges as compared to smaller-scale interventions, including: market equilibrium effects and spillovers (Acemoglu 2010; Filmer et al. 2018); endogenous political economy reactions (Bold et al. 2018); heterogeneity by site or in organizational effectiveness (Allcott and Mullainathan 2012; Vivalt 2015); and scale-related implementation issues, including poor monitoring, limited administrative capacity or bureaucrat incentives for the proper functioning of the program (Deaton 2010; Muralidharan and Niehaus 2017; Berry et al. 2018). Further, existing experiments were conducted during limited time periods between baseline and follow-up, and programs often employed complex or unsustainable supply chain logistics (e.g., menus including perishable and/or higher-cost foods). Given these issues, the generalizability of existing evidence stemming

from smaller-scale, internally-valid trials may fail to translate to “real-world” programs reaching millions of children daily through sizable government budgetary expenditures.

Further, in contexts characterized by widespread food insecurity, school feeding programs, through targeting the transfer directly at the child conditional on school attendance, may be more effective in raising learning through lowering educational costs and tackling child short-term hunger than alternative social protection measures targeting households, such as cash transfers or generalized food assistance. The most vulnerable groups of learners, such as girls and children from economically-disadvantaged households and geographical areas, may benefit disproportionately more from the transfer than less disadvantaged pupils. This is because the transfer may induce steeper declines in the marginal opportunity costs of human capital investments for these groups, as compared to the average child (Akresh, Walque, and Kazianga 2013; Björkman-Nyqvist 2013). Yet, heterogeneity analysis focusing on educationally-vulnerable groups constitutes another under-investigated topic within the literature on educational interventions in LMICs (Evans and Yuan 2018; Bashir et al. 2018; World Bank 2018). In the case of school feeding, our review of evidence in Appendix 1 shows that there is a lack of systematic investigation of heterogeneity across gender and socio-economic status in existing experimental evidence.

We tackle these questions by evaluating the average and distributional effects of the Ghana School Feeding Programme (GSFP) on child learning achievements. The GSFP provides a free, hot-cooked daily meal to over two million pupils in government primary schools across<sup>1</sup>. In collaboration with the government, we conducted a randomized control trial designed around the re-targeting and scale-up of the GSFP to the most food insecure districts in all regions of Ghana. While the overall trial was aimed at assessing program impacts on education, nutrition,

and agriculture<sup>ii</sup> (see Gelli et al., 2016), here we report on both treatment effects on pre-specified educational outcomes, including child math and literacy scores, and heterogeneity in treatment effects on per-protocol population subgroups.

Ghana's learning challenges are similar to the ones currently faced by many other LMICs. First, while the government's efforts to raise schooling in the 2000s resulted in primary enrolment rates that are among the highest in SSA, average learning levels remain disappointingly low: a 2017 study highlighted that more than 80 percent and 70 percent of Grade 2 and Grade 4 students, respectively, could not read a single familiar word or perform a two-digit subtraction (World Bank 2018). Second, wide inequalities in learning exist by gender, poverty, and place of residence (World Bank 2018). Further, Ghana is highly varied in terms of agroecology, ethnicity, socioeconomics, as well as political and administrative capacities. Uncovering the average effect of the program, in face of this diversity and potential heterogeneous program implementation and monitoring across regions, is therefore of interest for policy makers operating in settings characterized by high heterogeneity in administrative and socio-economic environments.

Following the methodology outlined in our protocol (A. Gelli et al. 2016), we document the following intent-to-treat (ITT) findings. After almost two academic years of implementation, exposure to school feeding led to average increases in math, literacy and a composite score of learning by about 0.15 standard deviations (s.d., hereafter). Turning to impact heterogeneity, we find strong variation in program impact in favor of the groups that are at higher risk of falling behind in terms of learning. Girls' math, literacy, and learning composite scores increased by more than 0.2s.d. in school feeding communities compared to controls. Treatment effects among children living in the northern regions, the country's most disadvantaged areas, and for children

from households below the poverty line at baseline ranged between 0.25s.d. and 0.3s.d. across all scores. These findings are likely to correspond to lower bounds of potential effects, as program take-up was imperfect, and some implementation challenges were present. The latter mostly related to delays in financial disbursements to the caterers which are in charge of procuring food and cooking and serving the meals. The school feeding intervention also led to increases in grade attainment for the average child, while it promoted enrolment among children from poorest households and regions. In line with the results on learning, cognitive scores of attention span and short-term memory also improved moderately for the average child, while they expanded more markedly for educationally vulnerable groups. Nutritional outcomes also improved for girls and poorest children in treatment communities (Aulo Gelli et al. 2019).

To the best of our knowledge, this is the first large-scale RCT from a LMIC context, investigating the effects of a nationally-mandated, government-led program on educational attainments. Compared to existing trials on school feeding, the importance of this study lies in showing the social protection-*cum*-human capital accumulation of a government school feeding program. As discussed, the issue of implementation at scale is of critical importance as treatment effects tend to decrease with the size of the implementing organization (Muralidharan and Niehaus 2017; Vivalt 2019). Regularity and quality in the provision of school meals is in fact critical for the effectiveness of the program, as children and parents may respond to irregular or lower quality meal provision in multiple ways (e.g. going home for lunch and not returning to school afterwards, changing school, or not attending at all). So far, the effectiveness of full-scale government-led school feeding on learning in LMICs has been previously assessed only in the context of India, and with quasi-experimental methods. Specifically, Chakraborty and Jayaraman (2019) exploited staggered program implementation to identify positive effects of the local

“midday-meal” scheme on math and literacy, finding moderate and positive average effects but no treatment effect heterogeneity by gender or household assets. We also add to the school feeding literature, and, more broadly, to the one on educational and social protection interventions in LMICs, by providing evidence on treatment effects heterogeneity. Our findings suggest that in contexts characterized by wide educational inequalities such as Ghana, school feeding programs can contribute to “levelling the playing field” by raising learning outcomes, especially among children at the margin (Jukes, Drake, and Bundy 2008). More generally, this study highlights the importance of social protection on human capital. In LMICs, existing evidence has overwhelmingly focused on schooling (enrolment and attendance), rather than on learning achievements (Baird et al. 2014).

This paper is organized as follows. The next section presents the background and the study design. Then, Section III illustrates the data and identification strategy. Sections IV and V, respectively, present the ITT estimates and potential mechanisms for impact. Section VI presents some robustness checks, while Section VII concludes, including a concise discussion of costs.