

Correlates of Academic Performance in Pupils under a Feeding Program

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Abstract School feeding (SF) has long been a welfare scheme adopted in the Philippines but there are very limited empirical studies that assessed its effectiveness. The nutrition-cognition nexus needs to be examined especially that regular SF program has been institutionalized recently by the government. From a set of socioeconomic factors and anthropometric measures, the present study determined which of them are significantly associated with the composite final grade of pupils. All recipients (N=80 malnourished primary schoolchildren were served lunch) of the “*Busog-Lusog-Talino*” (“*Full-Healthy-Bright*”) School Feeding Program in San Carlos Elementary School in southern Bicol (Philippines) for two school years were participants to the study. Pearson correlation analysis revealed that parents’ education and pupils’ concurrent body mass index (BMI) are positive explanatory factors correlated with the final grade. Differing from many studies where mother’s education had commonly been a dominant and only parent gender significant factor to pupils’ academic achievement, the study revealed that under circumstances of poor family economic status the education of fathers had higher association than mothers’. Concurrent BMI (i.e., measured while the school feeding was implemented) is significantly linked to pupils’ grades providing evidence for the need in sustaining good nutrition from school to the home. Schoolchildren under varying low levels of nutritional status and with low parents’ education are predisposed to low academic performance. Implications of the findings to improving school feeding monitoring were elucidated.

Keywords: final grades, anthropometrics, socio-economic status, parent’s education

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1. Introduction

Education begins at home. Parents’ schooling experiences and expectations for the family can strongly influence their decision on the education of their children [1,2]. While the intellectual stimulation from a primary grade teacher could offer the first formal academic experience to a child, the home environment exerts the strongest influence to a child’s academic performance [3,4]. For poor households, the struggle to meet basic ends is as urgent or can be more important than the pursuit of excellent grades [5,6,7,8,9]. Community context also wields influence through the family. Home environment comprises factors conventionally expressed as socio-economic status variables including education of parents. Innate capacities including anthropometric indices inherently usher cognitive outcomes. The extent and interplay of these factors in the home, school and community could determine pupils’ academic achievement [10].

Association between parents’ education and the school grades of their children can be attributed to the former’s

transference of knowledge through their interactions together taking place consciously or unconsciously among them [11]. Parents with low educational attainment lack experiences and insights they can share to their children so the latter generally may feel inadequate to aim for higher life than what their parents have achieved. They may not have higher expectations for their children because they themselves lack or do not have the life skills to pursue higher professional careers. Parents’ education matter in the interaction as it provides parents with the cognitive resources, values and skills that enable them to better support and facilitate their child’s learning and developmental environment [12].

In the Philippines, there are few studies that examined effects of nutritional status to school outcomes and no empirical studies using quantitative techniques have been employed under a feeding program for malnourished schoolchildren. School feeding programs have been implemented many years ago yet the evaluation of their impact is virtually absent or largely unexplored as evidenced by the scanty literatures [13,14,15]. There is thus impetus for assessing feeding program in school to obtain scientific basis for its effectiveness and institutionalization to guide long-term policy [16,17].

One of the guiding principles in attaining the goals of the Philippine Plan of Action for Nutrition [18] is implementation of “evidence-based interventions and strategies, with bias to local research” which the present study is responding to in tangible terms. The DepEd Nutritional Assessment for (SY 2012-2013) reported that 14.24% or about 1.98 million schoolchildren are undernourished in the whole country. The PPAN underscores that,

“The attainment of nutritional well-being is a main responsibility of families but duty bearers like government organizations and nongovernment organizations should help the families especially the marginalized, to be able to provide for their own nutritional needs.”

Through a correlational analytical framework, the study investigated which factors are significantly linked to the composite (i.e., for all subjects) final grades of malnourished primary schoolchildren in a semi-urban elementary school in Tabaco City, southern Bicol, Philippines. It also reported the incidences of underweight, stunting and wasting among the schoolchildren. Analyzing a set of variables that reasonably capture these contexts among primary pupils under a school feeding program for malnourished pupils, the three underlying factors of father’s education, mother’s education and concurrent body mass index were found significant correlates of the final grades.

2. Materials and Methods

2.1. Description of the School Feeding Program

San Carlos Elementary School (SCES) is located in Barangay San Carlos in Tabaco City, southern Bicol, Philippines. It is a pioneer school for the *Busog-Lusog-Talino* (BLT) Feeding Program, which is a rationale for the choice of the school as the study venue. BLT are Filipino words that translates to “Full-Healthy-Bright” intended to depict the goal of the program jointly implemented by the Jollibee Food Group Company and the Tabaco City local government. Pupil-beneficiaries of the BLT every school year were 40 schoolchildren of varying levels of malnutrition. In SCES, the BLT has been implemented in 2012 to 2014. Every year the beneficiaries are a different set of pupils as a matter of program policy to widely serve malnourished pupils in the school. The data by school year are therefore not directly comparable since they are from different set of pupils. Lunch meal given for each child consists of a cup of rice, a serving of vegetables and another viand (fish, chicken, pork or beef) with total of 450-500 g mostly developed by the DepEd Health and Nutrition Center and the Nutritionist-Dietician’s Association of the Philippines. Estimated nutritional content is 320 kcal energy, 9.0 g protein and 229 µg RE Vit. A. Each child-beneficiary is allotted a budget of P14.00 (USD0.29) per day for 120 days per feeding cycle.

The Philippine Department of Education (DepEd) issued Memo. Circ. No. 182, s. 2013 officially disseminating the program to all collaborators and agencies concerned to implement this school feeding program (SFP) mainly “to improve the nutritional status, improve attendance and reduce dropout among schoolchildren”.

2.2. Research Design and Study Participants

This cross-sectional research examined the data consisting of two 6-month periods within two school years (2012-2013 and 2013-2014). The BMI values (i.e., baseline - measured in July before the feeding, midline - monitored in October while the school feeding was going on, and endline taken in March few days after the feeding), final grades and demographics from the pupils (pupil’s age, father’s education, mother’s education, total family income, distance in kilometer of house from school and others) were the datasets analyzed. A program year (equivalent to a school year) consisted of 120-day feeding period where pupils’ anthropometrics (height, weight and BMI) were monitored at baseline, mid-line and endline. Parent’s education was expressed in number of years in school. House distances less than 0.5 km were rounded to zero value. Actual distances were recorded in kilometer.

BMI values were obtained at baseline (i.e., before the feeding; July), midline (during the feeding; October) and endline (after the feeding; March). Each 120-day feeding (with one replicate) covered six months school days (i.e., 20 feeding days per month). Sampling universe consisted of all primary pupils under the BLT (N=80 malnourished schoolchildren) for school years 2012-2013 and 2013-2014 (i.e., total enumeration). Pupil-participants were the combined group from Grades I through III who represent 100% of the beneficiaries of the program.

2.3. Data Gathering and Analysis

Pupils’ anthropometrics were obtained adopting standard techniques. Height (Ht, barefooted) was recorded to the nearest 0.1 cm using a standard instrument, and weight (Wt) was recorded to the nearest 0.1 kg in standard school clothing (without shoes) using a digital weighing scale. BMI was calculated as Wt/Ht^2 (kg-m⁻²), assessed for nutritional status based on the 1995 Food and Nutrition Research Institute (PPS Table) and standardized using the 1995 WHO Technical Report No. 854 on the use and interpretation of anthropometry. The distribution of final grades was examined for normality using the Shapiro-Wilk test. Percentage and mean were used to express categorical variables and quantitative data. The paired t-test was used to compare mean values (e.g., BMI, final grades) between two monitoring periods. Pearson correlation analysis revealed variables that are associated with final grade. Fifteen variables were analyzed in the study. Statistical analyses ($\alpha = 1\%$) were implemented through the IBM SPSS Statistics 20 for Macintosh (2011).

3. Results

3.1. Pupil’s Demographic Profile

The children were mostly born as 4th child in the family and about two-thirds of them are males. Their mean age of 8.3 years was close to the 3rd primary elementary grade. Mean age is at the higher end of the primary grade level indicating that the pupils are older than the ideal median age for the grade. First grade pupils in Philippine primary schools are supposed to be six years old. Middle primary

grade is the second grade where pupils are supposed to be seven years old. Notably, the average final grades of the pupils were low at 80% (Figure 1). The final grades were found normally distributed but the high frequency of the 77% rating was evident. Their mean weights, were 17.5 kg nutritionally evaluated equivalent to “moderately underweight” at baseline and 19.5 kg at midline and 21.0 kg at endline both at “average underweight”. The weight increments between the weigh-ins (i.e., baseline-midline, midline-endline and baseline-endline) equal to 11.4%, 7.7% and 16.7% were significant ($F_{0.05, 2-tailed} = 3.034$). Undernourished children face the reality of late admission and being underweight that could manifest adversely in their cognitive development.

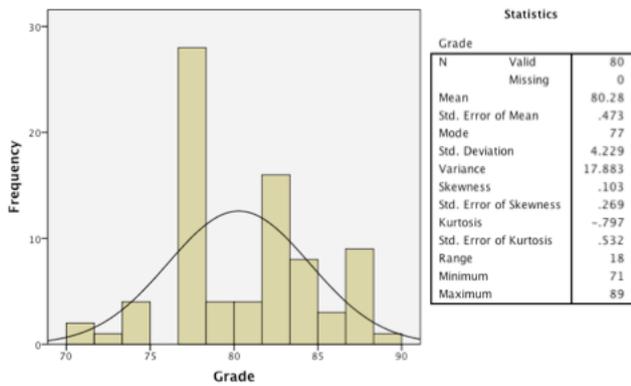


Figure 1. Final grades of pupils superimposed with normal curve

3.2. Pupil’s Body Mass Index

Upon start of the feeding, all pupils had either wasted (W, 86.25%) or severely wasted (SW, 13.75%) nutritional status with mean BMI of 12.4. However, at midline, there were already 56.25% pupils with normal nutritional status (N). This significantly increased to 95% at the endline measurement. The proportion of wasting (i.e., number of W and SW pupils) among the children was also significantly reduced to about 44% at midline while only four pupils were with wasted status and the rest had normal BMI at endline (Figure 2).

At baseline, BMI was 12.4. It rose significantly to 13.5 at midline then tapered off to 14.1 at endline. The mean BMI increments from baseline (BMI1) to midline (BMI2), and from midline (BMI2) to endline (BMI3) were statistically significant ($F_{0.05, 2-tailed} = 3.03$). These increases are markedly noticeable in the progressive shift of mode of the BMI distributions that indicate significant improvement on the nutritional status of the schoolchildren during the feeding program.

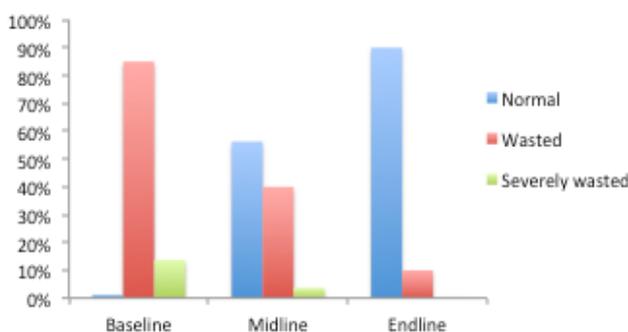


Figure 2. BMI change during the study

3.3. Parents’ Demographics

Mean total family income was low at P54433 (USD1120.02) a year. Poverty threshold on income in Bicol province (south Luzon, Philippines) where the study site belongs, for a family of five members (i.e., three children) was reported at P90336 (USD1858.77) annually (National Statistical Coordination Board, 2013).

The mothers and fathers both had nine years of school attendance equivalent to 3rd year in high school or a year less from graduating under the Philippine educational system. Slightly more fathers (6.25%) than mothers (5%) completed college (i.e., 14 years in school). More fathers (21.25%) than mothers (18.75%) had completed elementary education. Finally, more fathers (55%) than mothers (53.75%) had high school education (Figure 3). These descriptive statistics may indicate higher educational qualification by the fathers thus a better propensity to influence children’s education. Subsequent results are consistent with these comparisons and would show that father’s education is the factor with the highest significant correlate to pupil’s final grade.

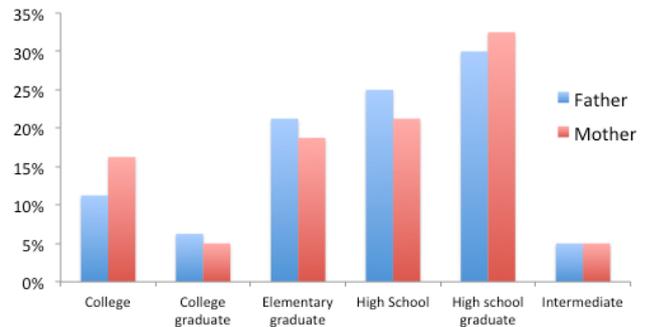


Figure 3. Parents’ education of the pupils

3.4. Correlation Analysis

The Pearson correlation coefficient between final grade and SES (including BMI) variables showed significant positive association with father’s education, mother’s education, and BMI2. The *r*-values for the three paired factors were 0.395, 0.374, and 0.304, respectively. Fathers who spent more years in school (i.e., to be college graduate, college level, elementary graduate) were associated with children possessing relatively high final grades and inversely. Similarly though in lesser degree, mothers who spent more years in school (e.g., college graduate, high school graduate, elementary graduate) were associated with children who have relatively high final grades and inversely. Concurrent BMI (i.e., BMI2) was also positively associated with final grade. The autocorrelation values were low ($r < 0.70$) to significantly affect the key inferences derived.

4. Discussion

Parents’ education and pupils’ midline BMI were significant factors associated with the pupils’ final grades. These suggest that the combined effects of low parents’ education and poor nutritional status predispose malnourished pupils to poor academic performance [3,6,8,9,19].

Undoubtedly, parents are the first and best teachers to their children who can teach or convey message both physically and from cognitive intentions. Secondly, the findings emphasize the crucial role of nutrition to school outcomes. Moreover, BMI of the pupils increased significantly from baseline to midline then to endline indicating relative success of the feeding program. But at endline, the BMI and pupils' grade are not correlated indicating that this success has not been sustained in the homes (i.e., where BMI3 was reckoned). Changes in body mass indices arising from the school feeding are program intervention variables because they have been introduced from the program [7,20].

Mother's education has been commonly implicated as influential to their children's school grades [21,22,23]. Philippine history and literature (e.g., *Noli me tângere* [24]) are full of accounts of mothers patiently teaching their young children at home to read, write and count. Father's education, on the other hand, has also been associated with their children's academic performance although less frequently. Research on how fathering may influence children's educational outcomes point to direct and mediated or indirect effects [25]. The latter involves the father influencing mothering that is also regarded as father's involvement. Father's involvement includes not only the time spent by fathers' with the child, their activities with the child but also relational aspects described as warmth, support, decision making, and monitoring [25]. Infant's attachment to the father is recognized to be as strong as the mother [26] that can lead to positive school outcomes. It has been suggested that the rough-and-tumble play that fathers often do than mother's promotes a particular aspect of development, emotion regulation that can be distinctively beneficial to children [26]. Moreover, there is the father's unique role in promoting gender identity, especially among sons [25] who will propagate the family's surname that is very typical of and source of pride among Filipino families regardless of economic status.

The significance of BMI2 influencing final grades confirms that improving childhood nutrition is an effective measure to increase pupils' academic performance. Midline BMI was a concurrent nutritional status because it was measured while the school feeding was undergoing. Contextually, the link between nutritional status and grades was persisting as the children's status was obtained during the feeding. Association between grades and nutrition was real because feeding was in effect. By far, the largest school feeding program in the world is the School Lunch Program of India. Its Supreme Court has promulgated a law in 2001 mandating all government-assisted schools to provide meals to school children [27] that benefitted 140 million children by 2008. Performance evaluation of the program reported increase in school enrolment, decrease in pupil and teacher absenteeism and improvement of health among primary school children. A recent study [28] examining the nutrition-learning link in the program showed increase in standardized test scores for reading and mathematics. In comparison, the present study showed evidence of the association between nutritional status and mean school grades, although the improved status could have been sustained to the household level.

What could it mean that BMI1 and BMI3 did not significantly influence final grades? First, BMI1 was obtained before the feeding so it is understandable, even expected, that it would not be related to final grades. Second, BMI3 could have been associated with final grades under the condition that after feeding in school the pupils have been sustained with nutritious meals, similar if not better than those served in the BLT lunch meals, in the homes. But intuitively this might not have happened because BMI3 was non-significant in its correlation with final grades. This finding is crucial because it indicates that school feeding has to be regular, continual and sustained in the homes to be of value in enhancing academic outcomes [3,4,20,27,29] for the pupils.

Although it was shown that parents' education is linked with the final grades, and BMI was increased by the school feeding, parents' education was rather low and quality nutrition may not have been provided after BLT meals. They are found to be correlates of academic achievement but they were not substantial in the current case to provide long-term benefits. These two aspects prevail and could be improved within the household, which strengthens the rationale of the family's stronger role, than other environments, in ensuring robust educational outcomes for the children. The family therefore should be the centrum for policy considerations in the nutrition-learning nexus.

Earning only about half of the NCSB figure, the households of the malnourished pupils were obviously in dire economic condition. The high parity or number of live children (i.e., 5) borne in the family would have exacerbated poverty condition. The NSCB estimate was based on only three children whereas the households in the study had a mean of five, so the economic difficulty is expected to have been worse with more family members. It is well-established that factors describing family socio-economic status determine child development and educational outcomes particularly aspects of economic benefits from employment, nutrition and health, parents' education, parental support and motivation [30-45]. This places the family environment *albeit* singularly as the niche of opportunities for developing recommendations for policy to link nutrition and academic performance.

A key family asset of a couple is their knowledge and maturity for family life that can be suggested by one's education level. Economic capacity is also associated with educational background. Inferred relations from findings of the study provide empirical bases for these assertions. Within the household, these are contextual variables that school nutritional programs generally do not have control over. So the specific recommendations outlined below delve on conditions external to the household with emphasis on monitoring for evidence-based local research studies.

There is technical and practical merit to replicate a similar study or series of parallel studies in other schools in the country to see comparable trends with current findings. It can be reiterated that there have not been similar studies published as monograph or technical paper evaluating school feeding program for improved monitoring. Specifically, the BLT has been implemented for several years already but there are no published literatures providing technical basis of its effectiveness as a program.

Monitoring becomes robust with increased comparable results in similar and varying contextual socio-cultural environments.

Data quality is central to any monitoring. Accurate data is obtained with continuous exploration and data analysis. In the data analysis parlance covering large databases (e.g., many schools nation-wide), this is called data mining. Data mining covers a wide suite of processes and techniques to examine data from different perspectives to reveal new knowledge (i.e., for policy, program enhancement and productivity). Within a school implementing a feeding program, it is initially implemented by a point person or partnership who should regularly update, examine and draw preliminary inferences from the monitored variables. Familiarity on the nature of data and appreciation of their interrelationships with school, home and community domains would be attained. It may require further in-service training of teachers and school officials to enhance their competencies. In the long-term, cluster of schools would be able to perform the analyses that may ultimately lead to examination of data with wider coverage of recipients.

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