EFFECT OF NUTRITION ON CHILDREN READING ABILITY

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ABSTRACT

Early nutrition supplementation's effect on children's reading ability was assessed during the conduct of the study. The study methodology followed children who participated in an early nutrition supplementation intervention and conducted a reading test to measure how well the children read. The effect of school resource endowment on student reading ability was assessed. School resources as a lead effect on variations in reading performance through a fixed effect regression model was discounted and confirmed that early nutrition supplementation explains variations in reading performance. However, it was found that school resources accessibility on factors such as library availability and access to reading textbooks post classroom lessons to children complements the acquisition of reading skills in children. The policy implication from the findings calls for the domestication of reading curricula and leveraging the children's nutrition to sustain reading gains.

INTRODUCTION

Childrens' nutrition intensity levels below five years and their ability to learn to read was examined in this study. The nutrition levels were identified through the children's access to food supplements in their first 36 months after their birth. The nutrition levels were grouped as below:

i) Group A: This group involved children who received a delayed Supplementation treatment. The treatment was introduced 18 months after birth. The treatment that the participating children received included counselling sessions for the mothers on complementary feeding, with the goal of ensuring that each parent of the participating children was providing complementary foods as their child grew. In addition, the participating children in this group received Vitamin A every six months until they were 36 months old. Furthermore, the participating children received, through their mothers, one (1) kilogram (kg) of maize and soy flour every two weeks, equivalent to approximately 71 grams (g) per day. These participating children received the intervention on nutrition supplementation between 18 and 30 months of age.

ii) Group B: In this group, the participating children received a standard fortified spread. They were also given milk powder as a source of protein. In addition, the participating parents also received guidance on food preparation and complementary feeding of their young children, as well as the continuation of these practices following the nutrition intervention. Additionally, the children were given Vitamin A every six (6) months. In addition, the children in this group received 750 grams of fortified peanut spread each for two (2) weeks, which translated into fifty-four (54) grams of the spread per day. The duration of these interventions for the participating children was 18 months. The children were introduced at six months.

iii) Group C: The children in this group were given a modified fortified spread containing soy powder as the protein source. Parents or guardians of the children also received nutrition and complementary feeding guidance to sustain the practice of post-nutrition intervention. In addition, the children were given Vitamin A every six months. Each of the participating children were given 750 grams of fortified spread twice a month, translating into 54 grams of fortified spread per day, between 6 and 18 months.

iv) Group D: The children in the fourth group were given Likuni Phala as a source of protein. In addition, the parents or guardians of the children were counselled on nutrition and food supplements in order to inculcate a nutrition culture regarding how they would support the feeding of the children following the nutrition intervention. In addition, the children received Vitamin A supplement every six months. The children also had access to one (1) kilogram of fortified maize or soy flour given to the families every two weeks, equating to 71 grams per day for children aged 6 to 18 months.

The children were grouped randomly in various levels of nutrition intensity to track their growth. The primary objective of the grouping of the children per level of intensity of food supplements was to determine the growth patterns of the children based on the food supplements. This study was conducted by Tempere University of Finland, and University of Malawi's College of Medicine. The findings revealed that the intervention did not cause significant growth differences amongst the children across the groups. However, there was marginal statistical significance for children enrolled in Groups 1 and 2 (considered high-nutrition intensity groups). This finding suggested a positive correlation between high-intensity nutritional supplements and children's vertical growth (Thakwalakwa, Phuka, Valerie, Maleta & Arshorn, 2009).

The results above, provided an opportunity to follow through the participating children with a reading test to examine if their growth patterns in their first 36 weeks had any effect on their reading ability. Therefore, in this study, children who were enrolled in primary schools in Lungwena, Mangochi District were traced, to test their ability to read through a standardised reading test levelled for Children in Grade 2 of primary education. At the time, the Children were followed up, they had an average age of nine and a minimum of two years of primary education.

In addition, since the children were followed up six years post the early nutrition intervention, school related factors were assessed to examine if they had an influence on reading ability of the children growing up. The home factors were also assessed for any non-homogeneity that may have affected how well the children read, minus the factors mentioned above.

REVIEW OF RELEVANT LITERATURE

Effect of Nutrition on Children's Reading Performance

Early studies conducted in Jamaica on the effects of early childhood supplementation with and without stimulation on the later development in stunted children revealed that the stunted children scored significantly lower on most assessments than non-stunted children. In addition, stunted children's heights and head circumferences at enrolment predicted intelligence quotient at follow-up in a significant manner (Grantham-McGregor, Walker, Chang & Powell, 1997). Similarly, research conducted in Guatemala on a cohort of subjects exposed to nutrition supplements prenatally and for at least the first two years of postnatal life and others who received supplementation after

24 months of age revealed consistent differences between groups on the psychoeducational tests (Pollitt, 1996). It was further found that those who received supplementary nutrition prenatally and postnatally scored significantly higher on knowledge, numeracy, reading, and vocabulary tests than those who did not.

Further to these findings, the study concluded that nutritional differences provide the most robust explanation for the differences in test performance. However, in a survey conducted in Indonesia, Pollitt, Watkins, and Husaini (1997) did not find any immediate benefits of nutritional supplementation. Instead, the benefits on the infants were observed eight years later, when their memory function was better than those who did not receive nutrition supplements earlier in their lives. Similarly, another study on supplementation attests to the longer-term benefits of nutrition supplementation, where benefits begin to manifest at five years and none are observed at 18 months in terms of variations in children's learning (John, Bullock, Brenner, McGraw & Scalapio, 2013). Therefore, it is more appropriate to examine the effects of early nutrition on learning outcomes after a longer period of nutrition supplementation.

The aforementioned findings suggested that longitudinal tracking of beneficiaries of early nutrition supplements should be conducted for a sufficient period of time to assess their learning performance, which may not be significant in the years immediately following nutrition supplementation.

Studies on nutrition reviewed above largely agree on the positive correlation between early nutrition supplementation and performance of children on cognitive tests such as reading test, when conducted after a substantive timeframe post-intervention. Several studies have also shown that vitamins and minerals are essential to humans because they play essential roles in a variety of primary metabolic pathways that support fundamental cellular functions. Their involvement in energy-producing metabolism, DNA synthesis, oxygen transport, and neuronal functions makes them critical for brain and muscular function which affects cognitive and psychological processes, including mental and physical fatigue. These elements include the B-vitamin family (B1, B2, B3, B5, B6, B8, B9, and B12), vitamin C, iron, magnesium, and zinc, all of which have proven recognisable roles in cognitive development (Beluska-Turkan, Korczak, Hartell, Moskal, Mackonen, Alexander & Salem, 2019). Therefore, the vitamins provided to children under study was likely going to influence the cognitive ability of the children and hence an effect on their performance in standardised reading tests.

Therefore, cognitive-based curricula interventions must be cognizant of the dietary diversification of micronutrients through food intake, or they must be coupled with micronutrient interventions that target cognitive development and complement curricula instruction for faster, more sustainable gains in learning outcomes. It is a fallacy to assume that the population targeted by curricula interventions will have adequate access to micronutrients and the appropriate cognitive development state to learn at the right level without reading scores deviance around the mean benchmark score. Such a scenario must be adjusted based on the baseline micronutrient uptake if it is not invested and addressed together with the delivery of the reading intervention.

Another research on a population-based epidemiological cohort in the Japanese American community of King County, United States of America, revealed that a larger brain volume, measured by head circumference, provides a buffer against clinical symptoms of Alzheimer's disease, which lowered the risk and reduced the severity of diseases. According to additional studies, the head circumference of 1,985 older adults who underwent cognitive testing was associated with superior

cognitive performance (Graves, Mortimer, Larson, Wenzlow, Bowen, & McCormick, 1996). These findings established a correlation between head circumference positively and nutritional status, and by extension, cognition and academic performance.

Having observed the nutrition status of Malawian children in general, trials of food supplementation at a young age have demonstrated an effect on the linear growth of children who were given 10–40 g/day of Lipid-based nutrient supplements. This has resulted in higher energy and macro-nutrients intakes among 9 to 10-month-old Malawian infants without displacing locally accessible Complementary Foods (Hemsworth, Kumwenda, Arimond, Maleta, Phuka, Rehman, Vosti, & Ashorn; 2016). However, such trials have not been implemented on a large scale nor have they been proven on a large scale; consequently, the benefits of food supplementation cannot be observed on a large scale. Significant reasons for not scaling up the trials include the amount of financial resources and public civility that must accompany the rollout in order to benefit as many children as possible and improve the nutrition status of the children in Malawi. Otherwise, a more recent study found that at a median cost of $2.26/person/day (2011 US$ PPP), the shared diet is unavailable or unaffordable to 80% of rural Malawian households based on their current food expenditures, and to 69.5% even if all available resources were spent on food.

On the other hand, the individualised diet is more accessible – 90% of the time on average – at a lower price ($1.79/person/day) but is still unavailable or unaffordable for 62% of the rural population within current food budgets and 44% even if spending all resources on food (Schneider, Gerlad, & Friedman; 2021). These findings suggest that undernutrition is perpetual in Malawi, therefore, any post-intervention resource effect of the children under study will be homogenous and hence no effect on their growth, such that at the time a reading test was conducted, there was likely less variations of after-effects of resource access, and nutrition to describe the variation in cognitive ability, and hence their performance in the reading test.

The underlying assumption of the studies mentioned above is that the effects of nutrition on learning outcomes are positive. Therefore, any intervention seeking to increase gains in learning outcomes should explore complementary effects to improve the nutrition and effort levels of the population. Otherwise, the studies reviewed above have infinite potential impact in driving the nutrition status of the children by targeting linear growth, the age for height, weight for age, and head circumference of the children. However, a gap in the literature still exists on the linkages that such lineal growth has on the ability of the targeted populations to learn and the impact this may have on the development of the curricula and development interventions with a learning scope and cognition as targeted vital objectives.

Effect of Access to School Resources to Reading Performance

Having reviewed the literature on nutrition, and noticing the homogeneity of access to nutrition post-intervention, and the uniformity of access to resources at household level, the researchers discount these factors as being critical in explaining the variation in reading performance of the pupils. However, it is notably clear that access to resources at school level would explain the performance of the children in their reading, since these factors are non-homogenously present across the schools that the children were enrolled. As such the study incorporated these factors to check whether they complement the reading performance of the children under study.

Literature shows that pupils and teachers utilise a library if it is available in schools and stocked with appropriate books for pupil use (Sailors, Hoffman, Pearson, McChung, Shin, Phiri & Saka, 2014). Therefore, the study included the latent variables on the availability of school libraries and books. As a result, they predicted the use of library resources relating to pupils acquiring reading skills, in particular, mastery of pre-reading skills, which studies have proven as essential in the teaching of reading as advanced by Graaff et al. (2009) and Torgerson et al. (2019). Schools could only distribute textbooks if enough were available. Thus, the study proposition was that the distribution of the textbooks was contingent on materials adequacy. Where this occurred, pupils had the opportunity to read the books at home, thereby improving their reading skills. Similarly, literature states that teacher friendliness towards pupils and their willingness to support pupils' learning and acquisition of reading skills creates an atmosphere where pupils felt comfortable seeking reading remediation (Dimmock, 2015; Gurr, 2015; Mombourquette, 2017; Cruickshank, 2017; Day, Sammons and Gorgen , 2018). The inherent assumption is that pupils who enrolled in schools where it was easier to seek remediation had an advantage in acquiring reading skills. Therefore, teacher friendliness and ability to support the acquisition of reading skills, latently, determines the reading practice environment and the frequency with which a pupil practised reading outside of the school timetable. Such amenability to reading practice and remedial learning predicted pupils' ability to acquire reading skills.

Contribution of the Study to the Research Literature

The study acknowledges the available literature linking nutrition to better cognitive ability and likelihood of better learning to read based on the nutrition status of a child. However, the study extends such literature to trace the evidence that early nutrition supplementation may have in the long-term, even post intervention in efforts on child growth. Furthermore, the study considered the literature available on the teaching of reading through phonics. It however questions the applicability of such literature and models on the teaching of reading, where context is not given adequate thought and investments. Therefore, the findings of this study will contribute to the literature that blends theory and practice by calling on a leveraged investment on the programming of reading intervention, especially on taking account the physiological factors of the children or students targeted to undergo through a reading approach and curricula.

PURPOSE OF THE RESEARCH

The purpose of this study is to examine the effect of early nutrition supplementation on children's ability to read, considering the access to school-based resources that complement the teaching of reading.

RESEARCH QUESTIONS

i) How does access to early nutrition affect children's ability to read?

ii) To what extent does access to school resources affect children's ability to read?

METHODOLOGY

Approach of the Study

The study was conducted using a quantitative research approach. The approach was informed by a positivist worldview. The primary objective of this philosophical position was to derive inferences regarding the causal relationships of variables within the pupil, household, and school resources associated with reading theories. Schmidt-Petri (2003) categorised positivism philosophy in research on its ability to hypothetically deduce a process from the theory in literature, construct hypotheses, operationalise relational variables, conduct an empirical study and use findings to advance the theoretical discourse.

Positivist research has, over time, relied on the study's internal validity, objectivity, and sampling adequacy to draw inferences about the study's results that are representative, according to Park, Konge and Artino (2020). From this perspective, the study's data collection was done independently of the researchers' interference by independent enumerators who administered the study tools. In addition, the sample size from the study population was large at fifty percent to ensure that results could be attributed and were representative. This sample size was determined to mitigate the effects of sample attrition and ensure that there were adequate study subjects when data collection was conducted to ensure adequate representation. The study collected data for inferencing from 37 percent at the time of data collection.

Furthermore, the positivist philosophical stance on research epistemology contends that knowledge must be developed objectively to be authentic (Bunniss & Kelly, 2010). Therefore, in this study, the researchers were detached from interacting with research participants and study enumerators during the research. The research enumerators visited schools and interviewed pupils independently of the researchers. The positivist axiology also endorses reducing subjective experiences and values in research using carefully developed research protocols that limit subjective responses from study participants (Ponterotto, 2005). Therefore, the study deployed closed questionnaires that prohibited subjective explanations in the participant responses to ensure objectivity in the study results.

Research Instruments

A survey design was used in the study. The survey included an early grade reading test and a school resources survey. The early grade reading test was used to test the ability of the children with a minimum of two years of primary education to read. The school resources survey was conducted to examine whether resource endowment in schools explained reading performance, aside access to nutrition.

Early grade reading test

The reading test had five essential sub-tasks that were assessed as adopted from the Ministry of Education standardised reading test (Malawi Government, 2017). The parts were determined to be the essential components of the phonics-based reading instruction homogenously used by the children under study for a minimum of two years. The reading sub-tasks tested are described below:

i) Letter naming: Children were asked to name random letters grouped in a box. Children were asked to name the letters at random intervals over one minute. Correctly named letters were marked. The total number of letters read correctly were recorded for the sub-task.

ii) Letter Sounds: Children were requested to provide sounds of letters pointed randomly by the survey administrators within a minute. Letters sounded correctly were marked and totals recorded.

iii) Reading Fluency: Children were requested to read words in a paragraph loudly within a minute. Words read correctly were marked and recorded.

iv) Comprehension: Children were requested to read and answer questions based on the story provided within a minute. Questions answered correctly were recorded.

v) Extended comprehension: Children were allowed two more minutes to read and answer questions from a story presented to them. All questions answered correctly were marked and recorded.

The reading test was in local language, Chichewa. The administrators of the test were practising teachers. They were familiar with the early-grade reading assessments and were further trained by the researchers.

School resources survey

The school resources survey examined key resources available to the children who took the reading test. Resources examined are as follows:

i) Textbook availability: The study examined the availability of additional textbooks that were not included in the reading curriculum's core textbooks. The purpose of this objective was to determine how effectively the school is working to improve the vocabulary and reading comprehension of its pupils by providing alternative texts from which the pupils were expected to develop further reading skills and apply them to their learning efforts.

ii) Teaching guides' availability: The study further evaluated the availability of teaching guides in the classrooms. The purpose of this observation was to evaluate the reading curriculum's implementation. This observation also helped the study validate the fidelity of implementing a scripted lesson plan for reading curriculum teachers to follow.

iii) Availability of a well-stocked library: The study also observed the utilisation of the library resources, focusing on the records for lending the materials, use of the materials taken from the libraries, and the variation of titles in the library, as well as the levels of the reading materials that were available in the libraries or places designated by the school as libraries. The assumption underlying this factor is that access to a variety of titles aids in the development of pupils' vocabulary and reading skills. Therefore, the study expected that pupils who are exposed to more reading titles have a greater chance of learning to read more quickly than those who are not.

iv) Existence of teacher mentoring and coaching: Under this factor, the study observed how the schools utilised teacher mentors and coaches for peer support during classroom teaching or for other purposes.

v) Pupil caning: Under this factor, the study examined whether children were canned in schools or not, to check whether the children were free to attend lessons without fear and approach teachers for support on reading.

Sampling

Participants were randomly selected from a list of pupils who participated in the early nutrition supplementation programme in Lungwena, Mangochi. The selection was based on a simple random technique where 50 percent of early nutrition supplementation intervention participants were selected to form a sampling frame. This procedure led to a selection of 420 pupils from the population of 840 who had previously participated in the nutrition supplementation programme in their earlier years (0-36 months).

The study participants were oversampled in anticipation of sample attrition, as pupils in the sample had to be tracked down from their respective schools in the area of study, and the study was conducted seven years after the early nutrition supplementation programme was discontinued. In addition, the sampling was stratified because 50 percent of the sample was based on the nutrition levels that the pupils received during their first 36 months. The sample size therefore consisted of 105 pupils per level of nutrition intervention intensity across the four levels. The selection used a simple random strategy. This sampling strategy was implemented to determine the impact of early nutrition on a pupil's ability to acquire reading skills during their formative years.

After drawing a sample of the pupils per group of nutrition intensity, the pupils were tracked down to primary schools they were enrolled seven years after the implementation of the early nutrition supplementation programme. This allowed researchers to link the school endowment effect to the pupil's performance in reading fluency; the effects were experienced by all pupils at a given school. However, they differed across schools per the level of resources available to each school.

In total, 309 children were randomly selected and traced from a potential population of 420 pupils selected at random from a study population of 840 pupils. The sample size achieved represented 37 percent of the sampling framework. The split by level of intensity was as follows: 78, 85, 90 and 67 children from Groups A – D described above. These children were enrolled in a total of 17 schools in Lungwena, Mangochi.

Measurement and Data Analysis

Data were entered from the reading scores per individual student with their names blinded in the MS Excel database to maintain the privacy of pupils who participated. In addition, household and student-related information for each student was included in each record, along with information regarding school resources for sampled schools. Data entry for each record was categorised into four parts following the treatment levels described earlier to allow for inter and intra-analysis of the performance of pupils based on the levels of nutrition intensity for supplements received.

Having collected the data, an analysis involved a fixed effect regression model so that we could measure the effect of nutrition on the reading performance of children, holding the accessibility to school resources effect constant and vice versa. Therefore, the regression was identified as follows:

$Y_{it}=\beta_0+\beta_1 Xit+\beta_2 Z_i+u_{it}$. (1), where Xi are unobserved school effects across variables $_i = {}_{1,\ldots,n}$. In (1) above, the aim was to estimate β_1's (change) effect on reading performance based on the changes in Xi (group of nutrition intensity that a child belonged), holding the school effect (Zi) constant. Therefore, letting $\alpha_i = \beta_0+\beta_2 Z_i$ …(2), (1) was expressed as follows:

$Yit=\alpha_i+\beta 1X_{it}+u_{it}$. … (3), where α_i has individual specific intercepts i= 1,…,n, and each had a fixed effect on entity i . The dummy variables that were used to assess accessibility of school resources by the children, included availability of a school library, whether the school library was well stocked or not, school ability to distribute reading textbooks to children, whether the school had adequate teaching and learning materials, whether the school leadership provided instructional support to teachers and whether teachers canned the pupils or not. These variables for the school effect were identified based on their evidenced correlation with the teaching of reading as presented in the literature reviewed in this study. Thereafter, the fixed regression model was run based on the obtaining data collected during the study.

RESULTS

Results from the mixed effect regression model show that level of nutrition intensity that the children belonged to earlier in their lives had a positive effect on their ability to read fluently, holding school resources effect constant (p= .03), with a unit change in the group that children belonged having a potential to reduce their reading performance by a factor of -0.12. This implied that changing a child from a higher level of nutrition intensity to the other reduced their ability to read by 12% with statistical significance at 95%. Similarly, schools that had a library had children reading better by a factor of 0.48, holding every effect in the rest of the variables, inclusive of nutrition constant, with statistical significance (p=. 00), implying that children enrolled in schools where libraries are available improved their reading ability by 48%. In addition, children that had access to reading materials that were distributed to them, read better than those that did not had a chance to access reading materials beyond classroom lessons (p= .02) These children had an opportunity to increase their reading ability by a factor of -0.68 for a unit change between schools, holding everything else constant. Implying that children with access to reading materials could improve their ability to read by 68% on the overall reading score.

Results of data analysis showed that whether children had access to a school with well stocked library, adequate teaching materials, teachers providing reading instruction support, teachers were friendly or the teachers canned the children did not explain the variation in the children's ability to read for any unit change in these variables, since they were statistically insignificant (p=. 56, p=.3, p=.13, p= .2, p=.13 respectively). However, despite the statistical insignificance, children whose teachers were not supported with reading instruction underperformed by a factor of 0.74 and those that were canned underperformed by a factor of 0.41, holding everything else constant. This implies that these factors are worthy of attention, despite being found statistically insignificant.

From the results above, it is clear that designing and implementing a reading instruction programme requires focus beyond classroom instruction. Attendant factors such as nutrition of the children undergoing the reading instruction should be given due attention as there is a proven link between nutrition and cognitive ability, which affects how a child will handle and process the reading instruction. Similarly, resources available in schools have a larger effect on the performance of the children in reading tests. Obviously, in this study availability of school libraries and distribution of reading materials to children post-lessons matters more on how well they will read. As noted above, the reading instruction curricula must be complemented by a focussed attention on how the school leadership supports the ability of teachers to teach. In addition, children that are not canned in schools have potential to approach teachers for reading support and improve their reading skills.

Table 1: Mixed effects model on children's ability to read

Mixed-effects ML regression				Number of obs. = 284	
Log likelihood = -389.16134				Wald chi2(8) = 21.25	
				Prob > chi2 = 0.0065	
	Coef.	Std. Err.	z	P > z	[95% Conf. Interval]
Reading score					
Level of nutrition intensity	-.1145563	.0518366	-2.21	0.027**	-.2161542 -.0129583
Availability of library at school	.4774212	.160216	2.98	0.003***	.1634036 .7914388
Well stocked library available at school	.11372	.1925811	0.59	0.555	-.263732 .4911721
Reading textbooks distributed to children	-.6822961	.2793358	-2.44	0.015**	-1.229784 -.134808
Adequacy of teaching materials	.2018808	.1977753	1.02	0.307	-.1857517 .5895133
Reading instruction support provided to teachers	-.7352397	.4853232	-1.51	0.130	-1.686456 .2159763
Teachers' friendliness to children	.256875	.2067419	1.24	0.214	-.1483317 .6620816
Children caning in schools	-.4099865	.2685412	-1.53	0.127	-.9363175 .1163445

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]
Var (Residual)	.9072799	.0761372	7696797 1.06948

The findings above show that the support teachers provide to pupils in their learning to read, the availability of various reading materials, and the utilisation of libraries could be influential in developing reading skills of children. However, these factors found statistically insignificant were rarely available in the study area. Therefore, the study cannot conclusively state that these factors are less influential in explaining variation in the ability of children to acquire reading skills. It remains an area that requires further academic inquiry to complement theory or inform practices in teaching reading.

From the analysis of the factors stated above, the study was able to assess the association of reading ability of children to the level of nutrition intensity received in their first thirty-six months, and assess other school related factors that may have affected the children's ability to read as they grew, having been subjected to a principally homogenous teaching of reading approach. The results offer practical curriculum development implications as well as implementation context consideration. Therefore, implementation of curriculum should be leveraged by the context. If

possible, considerations for investments in the key contextual factors noted above should be made to sustain learning gains from the curricula implementation.

It is apparent that early nutrition supplementation and school resource endowment affect the ability of children to learn to read. However, several factors such as household level support to reading, pupil physiological factors and peer support have potential to affect how well children read. These are aspects that have implications for further studies.

DISCUSSION OF THE RESULTS

Results of the study above show that student performance was not affected by how friendly the teachers were in delivering reading instruction, nor did the school practices and leadership on reading instruction matter. Instead reading performance of students was primarily influenced by three key factors, namely: - 1) student nutrition status, 2) availability of text at home and 3) utilisation of libraries in schools. These findings discount earlier findings by Gurr (2015), Dimmock (2015), Day, Sammons and Gorgen (2018) who have claimed that teacher instructional delivery positively correlates to learning outcomes. In this study, this phenomenon was proven marginal. In the context of the home environment and the support students get at home has more leverage on their performance than otherwise.

Results show that students continue to learn beyond instruction received during class. In particular, reading practice supported in home environments have a more significant effect on their performance. Therefore, while accepting the role of reading instruction in the acquisition of reading skills as advanced by Graaff et al. (2009); and Torgerson et al. (2019), the findings clearly show that investments in reading instruction must be supplemented with a clear focus on the nutrition of the students, preferably early nutrition supplemented between 0-5 years, and the home support system for continued support for students during reading practices, and the ability to pay for supplementary reading titles so that text is available in homes and libraries, including those managed by the communities

CONCLUSION

The findings of the study indicate that pupils with good access to early nutrition supplementation have better chance to read well based on their developed cognitive ability. In addition, the study results showed that availability of well utilised school libraries and the adequacy of teaching materials contribute to the ability of children to learn to read. Therefore, curriculum developers and implementing agencies should carefully consider the nutrition stature of the pupils targeted when programming implementation of a reading curriculum and assess leverages where possible. This should be extended to the contextual analysis on the implementation sites, otherwise, there is potential to erode reading gains if the context is not well invested.

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