

How Does Governance Impact Malnutrition? A Close Look at Factors Associated with Underweight in Children Under 5 Years in Ghana

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ABSTRACT

Undernutrition remains a barrier to achieving the sustainable development goals in most developing countries. The United Nations identified that, the right mix of policies and actions that, addresses the numerous, interrelated causes of hunger and undernutrition will be able to achieve Zero Hunger thereby ending hunger and undernutrition. In Ghana, 11% of all children under the age of 5 years are underweight. Nutrition programs are traditionally funded through the government of Ghana budgetary allocations, to pay salaries and for the supply of logistics, and training. The objective of the study was to evaluate the effect of human resource capacity and budgetary expenditure on nutrition program outcomes for children less than five years using in depth interviews, anthropometric data on age and weight and data on nutrition human resource and expenditure in three regions from 2014 to 2017 in Ghana. The paper finds using linear mixed effects modelling that human and financial resources are not significant predictors of underweight besides, there are externalities in the implementation of nutrition programs for children under 5 years due to poor targeting and information asymmetries, resulting in excludability in consumption of nutrition services, therefore nutrition programs may not be well coordinated, and implemented pointing to government failure. Mother support groups contributed in reducing under nutrition in children less than 5 years through the cultivation and consumption of nutrition sensitive agriculture value chain products. This paper concludes that the allocation of resources for program implementation alone without local governance within the social cultural context will not result in adequate care and feeding practices to engineer a change in prevalence of underweight in children less than 5 years.

Keywords: Governance; Malnutrition; Food security; Underweight

INTRODUCTION

Undernutrition remains a barrier to achieving the sustainable development goals in most developing countries. To realize the totality of the 2030 Agenda for Sustainable Development, the United Nations identified that, the right mix of policies and actions from governments, civil society, and the private sector that addresses the numerous, interrelated causes of hunger and undernutrition will be able to achieve Zero Hunger, thereby ending hunger and undernutrition [1]. It is estimated by the World Bank that around US \$ 10.3 billion is needed annually for funding of nutrition activities globally thus rendering the current disbursements levels by the international community, national governments and non-governmental organizations woefully inadequate [2,3].

Among the main factors that impact the implementation of disease prevention and health promotion programs in children are the human and financial resource available [4]. Applying too little resources in a health and nutrition program will not be able to protect the health and nutrition of the target group and be able to expedite the management of sickness. Ensuring the right

number and mix of human resource needed for service provision is most likely to impact positively on organizational commitment and ultimately, on quality of care which is critical for advancing the quality of service provision, however realizing this objective remains a challenge [5]. Programing for nutrition should focus on strengthening the knowledge and skills of health workers as well as advocacy for funds to support scale up of the programs [6]. To this end, increasing the number of resources for a program (resources per person) will be imperative in achieving desired results, while maintaining the right balance between human resources, finances and consumables (drugs, and equipment), the main health system inputs, to ensure success [7,8].

According to World Health Organization report, the level of one's education influences the affinity to look for better opportunities which invariably causes health professionals to leave their less endowed or developed areas to where there are better opportunities especially from rural to urban areas and this results in the inadequate number and mix of certain categories of health professionals in one area and an excess in other areas. This puts a heavier workload on the already overstretched staff in the rural

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areas [9].

It is also a well-known fact the world over that the absence of enough skilled and well-resourced workforce is a major obstacle in achieving improved nutrition and child survival. Workers at the peripheral levels are the mainstay of any population based intervention due to their outreach activities in communities cut off from static health facilities. More investment is therefore needed to boost the capacity and numbers of these category of frontline staff who are at the forefront in the fight against undernutrition for a successful nutrition program implementation [10].

A consequence of building the knowledge, and skills of the professional as well as the motivation of those individuals responsible for delivering nutrition services is the implementation of nutrition sensitive activities as part of health programs. The amount of money available for implementation will determine the quality of personnel to hire as well as the ability to retain the best staff and sustain effective practitioners. Therefore to provide high quality care for clients the human resource available needs to be managed properly which calls for the implementation of strategies that will yield better results [11].

At the heart of successful nutrition programs are community workers, their wages and inducements required for their motivation apart from their training and supervision. To realize widespread effects and better results adequate resources must be spent on each child [12].

Evidence from developing countries suggests that social support from government and NGOs in the form of conditional cash transfers for accessing nutrition services coupled with appropriate human and financial resources have increased uptake of nutrition services [13]. Inadequate staff, overstretched resource and time was often cited as a challenge in nutrition program implementation in Bangladesh as government health workers usually had to serve more people than had been estimated coming from a large catchment area in remote locations and often with very limited means of transport that had to be shared between competing activities. Equally worrying was the challenge of absenteeism among doctors and other high end service providers who often are not available on all working days and even went home early although they got to work late [14].

Examples from Ethiopia also suggest that nutrition programs because of their target audience relied more on female health workers than their male counterparts. High Staff turnover through marriages transfer and pregnancies of these health workers increased workload in the process and presented significant challenges to program operations. An insufficient material resource such as vehicles and motorbikes were among key challenges impeding nutrition program implementation coupled with that, were other systemic factors such as inadequate funding or the late release of the budget. To address this human resource constraint more of the male health workers, had to be recruited while the adequate provision of logistical support especially for routine functions and timely release of funds became important to guarantee reliable program implementation [15].

For 20 years, Senegal reduced significantly the prevalence of stunting from 33% to 19%. However, the lack of an adequate budget for nutrition made it difficult to employ and sustain nutrition staff as well as sustain nutrition outreach programs in the communities [16].

Despite the human resource constraint in implementing nutrition programs, there is also a lack of motivation for actors working in nutrition to collaborate. Once funding for nutrition programs are transparent and properly matched for the activities and ownership is strong especially at the implementation stage, it is likely that an improvement in nutrition governance will be observed [3].

According to Thrall, there are externalities in the management of resource, as well as poor targeting leading to information asymmetries and excludability in consumption in market transactions resulting in poorly coordinated programs, with weak implementation that is disposed to rent seeking and corruption which is a cause of government failure [17].

A source of government failure as far as implementing nutrition program is concerned is the under provision of services as a result of failure to spend assigned funds due to government bureaucracies and lack of capacity to absorb and utilize these funds [18,19]. Therefore a key governance challenge is the management of funds allocated for program implementation especially in the implementation of social safety net programs [19].

The capacity to track expenditures used to implement nutrition activities is important to better account for nutrition actions and it starts with an appreciation of budget allocated for nutrition specific activities. However, more often than not such budgetary analyses do not include recurrent expenditure such as staff costs [20].

The problem

In Ghana 11% of all children under the age of 5 years are underweight. The worst incidence of malnutrition among children under 5 years can be found In the Northern region where 20% of all children under age 5 years are underweight according to GSS [21,22]. The highest rate of stunting can also be found in the Northern Region while it is lowest in Greater Accra region (UNICEF 2019) This is followed by Central regions with 13.9% underweight among children under age 5 years [23]. Greater Accra region has relatively better indices for malnutrition with 8.7% of children under age 5 who are underweight, however factors that would account for the relatively better indices are not well documented [23]. It is also the second most populous region and the capital city of Ghana being densely populated with populations spread in more urban than rural areas [24]. The Central region has the fastest growing population in Ghana followed by the populations of Greater Accra and Northern regions [25]. Ghana's population is estimated at 29.4 in 2018 [26].

Among the determinants of under nutrition is the poor financial access to nutrition services delivered through the health system as well as inadequate human capacity and governance for handling and delivering nutrition services [27].

The relevance of the study again stems from the concerns of making the best use of existing human and financial resources in terms of its efficiency as well as the fiscal liability for program implementation and the need to make appropriate decisions to resolve problems of implementation based on how nutrition service indicators are impacted through the implementation of nutrition programs [28].

Studies that identify governance challenges and their effect in the implementation of nutrition programs in Ghana are hard to come by. The governance issues inherent in nutrition program implementation provoked the researcher to explore the governance challenges of implementing nutrition programs from a budget and human resource stand point in Ghana. The study also evaluated

the transmission effect of governance policies being implemented and was carried out using repeated cross sectional data from 2014 to 2017 complemented by in-depth interviews with stakeholders in three purposively sampled regions in Ghana namely the Northern region; Central region and Greater Accra regions. It is expected that this research will contribute to academic learning and serve as a resource material for research purpose.

Objective of the study

The study aimed to evaluate the effect of governance on nutrition program outcomes especially for children under five years with specific reference to the human resource capacity and budgetary expenditure used for service delivery in Ghana.

Research questions

To realize this objective of evaluating the effect of governance on nutrition program outcomes the research questions will guide the study are as follows:

- What are the quantitative outputs in relation to the inputs in program implementation?
- How do health personnel and expenditure for service provision affect the achievement of nutrition program outcomes?
- What are the positive and negative impacts of nutrition human resource and expenditure on nutrition indicators?

Structure of the paper

The paper is divided into three sections. The first section will present the introduction and brief notes on the research methods and the limitations of the study. The second section presents the

findings from the analysis of the effect of human resource and budget expenditure on nutrition outcomes for children less than 5 years in three selected regions as a case study. The concluding section discusses the findings and its effect on underweight for children under 5 years. It then draws conclusions to guide the local governance architecture in order to sidestep identified governance challenges

Conceptual framework

This paper will adopt a conceptual framework based on the authors' own illustration. Below Figure 1 depicts a conceptual framework that illustrates the relationship between nutrition programs that are implemented to address nutrition sensitive or nutrition specific problems and the resultant governance challenges associated with the demand side and supply side factors of nutrition program implementation, which themselves are caused by some fundamental governance challenges such as the lack of resources, both human and financial and information asymmetry. The framework represents the key foundations for analyzing the interrelationships between the government, the private sector NGOs and CBOs with the community or caregivers for that matter. Key areas supported by these foundation elements include inter sectoral collaboration, decentralization, program management quality, workforce development and community engagement. This framework can be used to assist the systematic assessment of governance challenges and the evaluation of nutrition activity within public health and community nutrition practices. Intersectoral collaboration, as well as decentralization, is important elements of any nutrition program where governance issues of budgeting and decision making roles are transferred from central to local levels of government [29].

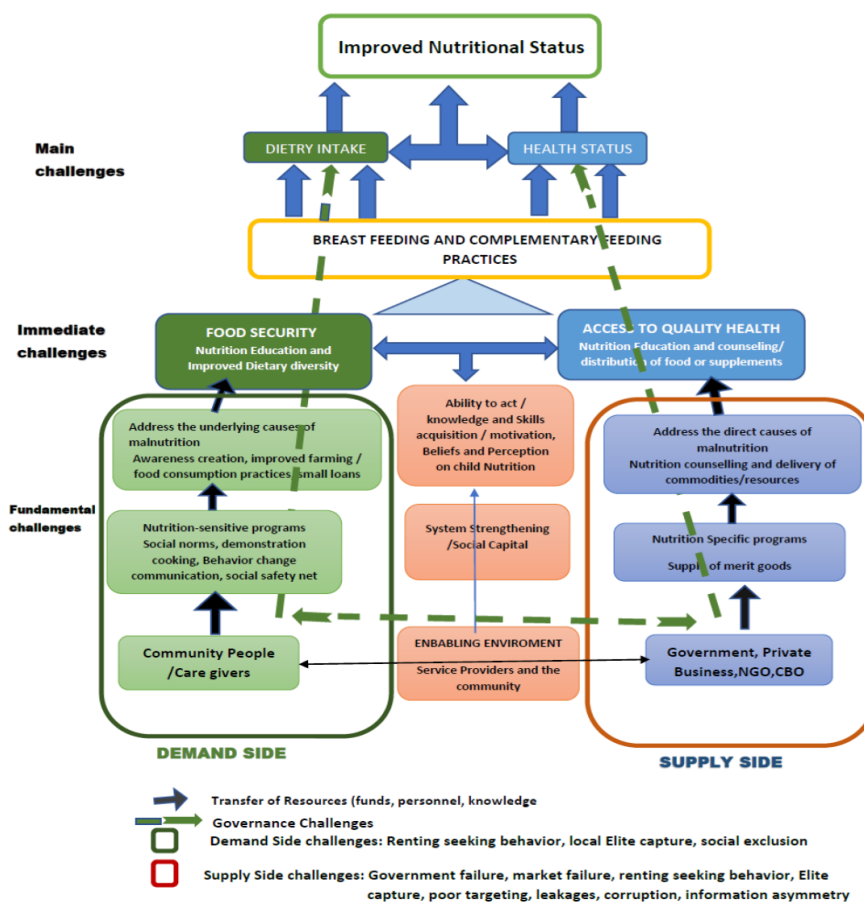


Figure 1: Conceptual framework.

Governance issues in nutrition programs happen during the development and delivery of public health programs therefore, nutrition programs need to be planned in parallel with other strategies. The assessment of governance challenges in programs would involve various stakeholders at different levels be it from the community side or the government and private sector side on resource availability and use. A wide range of settings are used to deliver nutrition program services which require good governance to ensure an efficient and effective program. Strategies that can be adopted to ensure program delivery can be home visits, clinic and/or community based outreach programs as well as behavioural change communication strategies.

Nutrition programs could also be funded by government or non-governmental organizations and implementing it would require regulations and protocols to be put in place to ensure transparency which strengthens accountability and reduces transaction cost and is essential in ensuring that program benefits target population.

The dimensions of governance in public project implementation are the effectiveness of the government with respect to the resources such as human and financial that can be harnessed to achieve success in putting together and running government social programs [30]. Accountability by way of decentralization of programs as an avenue to make governments more accountable to the people they serve; the rule of law in a transparent environment which deals with formal and informal mechanism in place for economic activity to thrive, the creation and enforcement of laws and regulations and how organizations set up for this purpose go about carrying out their mandate [31]. Transparency and information which mirrors societal values, culture and traditions which is essential in ensuring that planned program implementation benefit target populations will be applied to this framework to assess program coverage, service provision, the impact of the program and its efficiency to avoid the immediate and long term consequences of the causes of undernutrition for children under 5 years [32]. Strong ownership of program implementation is likely to yield improvements in nutrition governance for better nutrition outcomes.

From Figure 1, child undernutrition stems primarily from nutrition specific causes and nutrition sensitive causes. These are complemented by community behavioral change. Nutrition programs to address child undernutrition are implemented by the government nutrition service providers, as well as the private sector organizations made up of private businesses, Non-governmental organization (NGO) and community based organization (CBO) all from the supply side. On the demand side, the role of community social support groups, caregivers and community norms and informal laws impact child nutrition habits. The government faces governance challenges in their implementation of nutrition specific and nutrition sensitive programs where nutrition counselling and distribution of commodities are given to caregivers in such programs. Health workers also take advantage of the enabling environment to organize demonstration cooking for caregivers in the communities they serve taking advantage of community social support groups who act as change agents for the health providers. In the implementation of these activities, challenges encountered are fundamental challenges due to limited capacity in terms of human and financial resource as well as due to the large scale of the program being implemented. There is also the issue of alleged bribery and political interference in public procurement processes in the supply of items leading to substandard quality of items apart from the reduced quantities that will be available and

these governance challenges are similar to what NGOs face in the provision of nutrition goods and services.

Community based organizations (CBO) also face fundamental governance challenges of their own in the implementation of behavior change communication or social support strategies targeted at imparting nutritional status of children less than 5 years. The benefits accruing from social support groups may not be non-excludable in consumption such that other community people may benefit from nutrition counselling, lessons from demonstration cooking and other safety net programs undertaken even though they do not attend the sessions thereby creating little incentive to belong to a social group within the community. Governance challenged faced by CBOs is social exclusion and local elite capture, where perceived “rich” members of a social group get to benefit more at the expense of the poor members in the group. There could also be challenges by the composition of households as well as cultural practices within the community that often results in poor or wrong targeting of program beneficiaries. This leads to food insecurity, an intermediate governance challenges as a result of inadequate nutrition education and counselling and poor targeting resulting in a lack of dietary diversity for children less than 5 years. The main governance challenge encountered is the poor breastfeeding and complimentary feeding practice which ensures that the dietary intake of the children remains poor which makes them undernourished affecting their nutritional status.

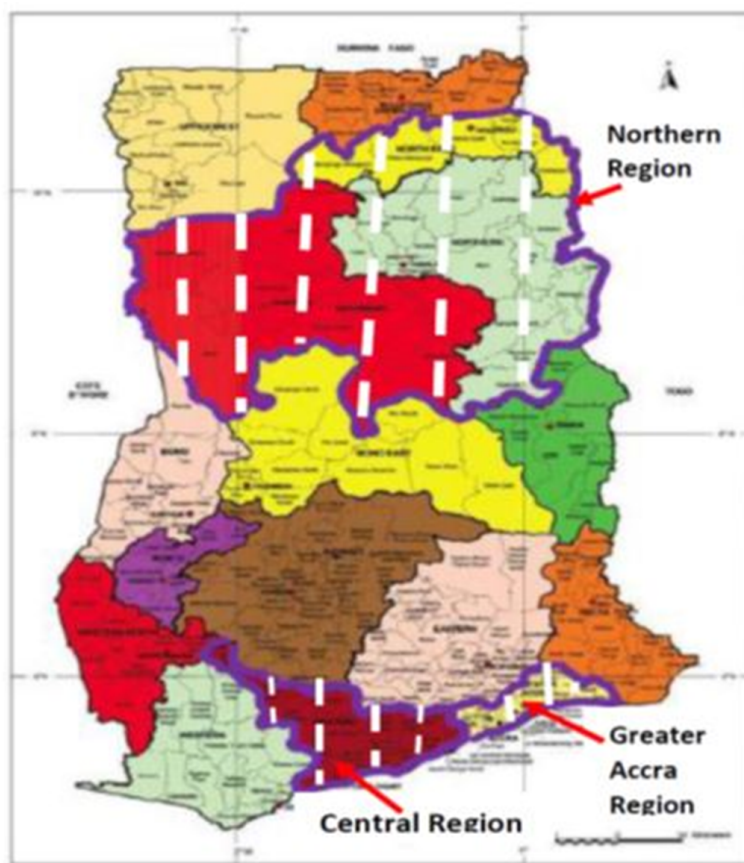
MATERIALS AND METHODS

Study sites selection and criteria

Table 1 provides a summary of key attributes of the selected study sites. Within the period under review, the Northern Region, in terms of land area was the largest region of Ghana with Tamale as its capital (Figure 2). The region is characterized by dry climate and has a single rainy season with about 750 mm to 1050 mm of rain from May to October. Agriculture, constitute the main economic activity [24]. The Central Region lies within the dry equatorial zone and moist semi-equatorial zone (Figure 2). The annual average rainfall in the region is about 1,500 mm with the peak of the rainy season from May-June and September-October while the period from December-February is characterized by dry season with a brief period of rains in August [24].

Table 1: Study Sites and their key attributes [21,23].

Region	Key attributes
Northern	has the highest under-5 mortality rates in Ghana
	Children in the region are more likely to be underweight than in other regions of Ghana with 33% stunting in children under 5 years
Central	has the second highest under 5 year mortality rates after Northern region
	Has one of the worst weights for age with mean Z-score below -2 of the standard deviation. 25% of children under age 5 are stunted and wasted
Greater Accra	nutritional status of children under 5 years in the region are among the best in the country
	much lower percentage of children under age 5 classified as malnourished according to anthropometric indicators of height-for-age, weight-for-height, and weight-for-age as 19% of children 0-59months are stunted and wasted



Source : own illustration based on (Ghana Statistical Service 2019)

Figure 2: The Selected regions of Ghana.

The Greater Accra Region is the smallest region in Ghana in terms of land area, yet the second most populated region with a population of over 4 million people (Figure 2). The region falls within the dry coastal equatorial climatic zone and so has a relatively dry climate. Rainfall is heavier in the northern parts of the region than along the coast with June being the peak of the major rainy season, while October is the peak for the minor rainy season. The main farming season coincides with the main rainy season between April and July [24].

Data collection

A 4 year repeated cross sectional data (2014-2017) comprising anthropometric measurements of weight and age of children under age 5 years reached by nutrition programs as recorded during routine community and facility based Growth Promotion activities in a total of 78 districts each year disaggregated as Northern=29 districts, Central=22 districts and Greater Accra=27 districts was sourced from the Ghana Health service nutrition and child health reports. Data for the nutrition and child health report is collated monthly from the child welfare clinic registers in each of the 2,692 health facilities in total located in the 78 districts in the three surveyed regions. Details of the child's weight, the age as well as other details of children under age 5 years who were provided with nutrition and growth promotion services in the surveyed regions and districts are recorded in the child health form which is compiled into a report. The nutrition and child health reports are uploaded onto the online District Health Information Management Systems (DHIMS) where the data is available from the 25th day of every month for viewing or download for research, planning, and other management purposes. All children from 0-59 months who attended a child welfare clinic in a health facility in

the 78 districts in the three regions over the four year period were part of the data pooled at one-month interval from January of the calendar year. This data was complemented by data taken on the human resource distribution from the Ghana Health Service, and financial disbursements for nutrition services sourced from United Nations Children Fund (UNICEF); the main development partner in the nutrition space in Ghana, for the three regions. In-depth interviews were held with Ghana Health Service Regional Nutrition officers of the sampled regions as well as with sampled community mother to mother support group members to know how nutrition sensitive and nutrition specific programs were implemented from the demand and supply sides and their role in the process as well as the challenges encountered during the implementation process and how they were overcome.

Data analysis

The time series anthropometric data on weight and age sourced from the Ghana Health Service monthly nutrition and child health report was collated from each of the 78 districts in the three sampled regions and their Z-score means calculated to identify children who are underweight (-2 Standard Deviation of the mean) using this formula:

$$z = \frac{X - \mu}{\sigma}, \text{ Where}$$

X is the individual wt; μ is the mean weight and σ is the standard deviation

Weight for age is an indicator that combines height for age and weight for height. It measures both acute and chronic malnutrition. According to the World Health Organization Multicenter Growth Reference study, as cited in the Ghana demographic and health

survey 2015, Children whose weight for age is below 2 standard deviation (SD) from the median of the reference population are classified as underweight while children whose weight for age is below 3 SD from the median are also said to be severely underweight [33]. The proportion of children less than 5 years of age registered in well child clinics with global malnutrition (weight for age) less than 2 Standard Deviation below the standard mean was computed for each of the health facilities in 78 districts in three regions to get the prevalence of underweight (weight for age) by dividing the total children underweight by the total number of children weighed percent in the survey regions over the four years thereby establishing a trend in underweight in children under 5 years for the study regions. This indicator measures the performance of child health programs. To better understand the variables accounting for the observed trend in reduction in the underweight, a linear mixed effect model was used to predict the effect of human resource and expenditure for nutrition program implementation as covariates on nutrition program outcome (prevalence of underweight in children under 5 years) using SPSS (Statistical package V21).

The choice of using the Linear mixed effects (LME) model for this analysis stemmed from its strengths in handling correlated data and unequal variances especially in cases of repeated measurements of the experimental units as is the case with this data and this clearly differentiates the mixed effect models from the General Linear Models GLM. It also has an advantage over linear regression models for data that are collected and summarized in groups. LME can also handles more complex situations in which experimental units are nested in a hierarchy, for example, a sample of children under age 5 years attending child welfare clinics selected from a sample of static or outreach clinics in a district as is the case with the data used for this study.

In the general model $y=X\beta+Zu+\epsilon$

Where y is the outcome/dependent variable (percent underweight); X is the predictor variables nutrition human resource and expenditure; β is a vector of the fixed effects regression coefficients (the β s); Z is the random effects (the random complement to the fixed X); u is a vector of the random effects (the random complement to the fixed β); and ϵ is the error term, a vector of the residuals, that part of y, the outcome variable that is not explained by the model, $X\beta+Zu$ [34].

In using this model our objective is to test if nutrition human resource and budgeted expenditure for nutrition programs in all the 78 districts in three sampled regions over a 4 year period is an important predictor of percent underweight in children less than 5 years. Total nutrition human resource and budget expenditure for nutrition computed for the sample is therefore used as fixed effect factors for the model. We also use human resource and budget expenditure as random effect to correct for possible sampling difference due to variation in human resource capacities in order to identify all different human resource capacities in the different categories. It also adjusts for the variation in these factors due to different expenditures for nutrition programs. Percent underweight in all districts in the three regions are followed for four years. The region and year are also used as fixed effect to adjust for possible trends during this period. We also model the possibility of correlation of the residual errors within each child under 5 years in the sample.

Given the adopted model:

$$y_i = \beta_0 + \beta_1 \chi_{i1} + \beta_2 \chi_{i2} + \epsilon_i \quad i = 1, \dots$$

β_0 -is the intercept which is the mean percent underweight per child under age 5 per year by a region with no expenditure on nutrition programs or no human resource for nutrition services.

β_1 -is the change in underweight given a 1% change in total nutrition human resource

β_2 -is the change in underweight given a 1% change in expenditure for nutrition

ϵ -the error term or the unobservable or unimportant errors of measurement in the data; approximation due to linear function; and random behaviour that may be present in each individual.

The number of children reached by nutrition programs is recorded in the Child Welfare Clinic (CWC) registers and aggregated onto the Monthly Nutrition and Child Health report form. To be part of the numerator a child was counted as having been reached by nutrition programs if s/he receives one or more of the following nutrition specific interventions directly or through the mother/caretaker (Table 2).

Table 2: Nutrition specific intervention offered during child welfare clinics.

1	Behavior change communication interventions that promote essential infant and young child feeding behaviors including: - Immediate, exclusive, and continued breastfeeding, - Appropriate, adequate and safe complementary foods from 6 to 24 months
2	Vitamin A supplementation in the past 6 months
3	Zinc supplementation during episode of diarrhea
4	Multiple Micronutrient Powder (MNP) supplementation
5	Treatment of severe acute malnutrition
6	Treatment of moderate acute malnutrition
7	Growth monitoring and promotion
8	Direct food assistance (rations, food vouchers)

Source: Ghana health service standard operation procedure 2018 (unpublished).

The denominator is the population of children under age 5 years in each facility of the 78 districts in the three regions. Again Child Welfare Clinic (CWC) coverage, therefore, represent the percentage of children 0-59 months who receive one or more nutrition specific interventions in the targeted population.

Limitations of the study

The quantitative data used in this study was derived solely from children age 0 to 59 months of age registered in well child clinics. Therefore, only children who attended routine health service nutrition programs were captured as the surveyed population. It is plausible that conditions of such children could be better than children within the community who are undernourished but do not attend child welfare clinics and also not reached by any nutrition program. Data from children seen at health facilities only, may not provide a consistent assessment of the nutritional status as a representative sample of the population would give during a survey. It was also not possible to obtain financial data on expenditure for nutrition programs from actors in the nutrition

space in Ghana because as Picanyol asserted nutrition programs were often combined with mainstream health delivery, therefore, it was very difficult to divorce nutrition specific expenditures from the aggregated expenditure without making assumptions which may partly explain the difficulty in getting such information from non-governmental stakeholders [20]. Financial data on actual disbursements for nutrition programs that were obtained from a major development partner in nutrition interventions in Ghana, United Nations Children Fund (UNICEF) Ghana office, was used as a proxy to capture expenditure for nutrition program implementation in Ghana. The study did not also control for the effects of the level of effort of the human resource for nutrition, instead the proportion of children reached with nutrition programs per region was used as a proxy indicator to gauge the level of effort put in by the health workers. Again, due to data limitations to the researcher, other socio economic indicators that could potentially change from year to year and therefore impact on the results could not be used apart from government human resource deployment for nutrition programs and expenditure for nutrition services.

RESULTS

The second section presents the findings from the analysis of the effect of human resource and budget expenditure on nutrition outcomes for children less than 5 years in three selected regions as a case study

What are the quantitative outputs in relation to the inputs in nutrition program implementation?

Nutrition interventions are carried out typically at the static health facilities and during community outreach programs. During the first seven days of postnatal care the midwife is responsible for supervising the welfare of the new born by reinforcing breast feeding education provided during antenatal care and provides the mothers, advice on dietary requirements when she visits the new born at home or during routine postnatal care at the facility. When the midwife ceases to visit the new born after the seventh day, the professional nurse takes over supervising the welfare of the baby until the child is five years old. The professional nurse discharges this duty by supervising weighing at Child Welfare Centers and providing advice to mothers on their baby's diet and on choices of weaning foods and other requirement for the healthy development of the child including recognizing signs of disease and prompt reporting to clinic for treatment. The Community Health nurses who man health facilities at the peripheral level known as Community Health Planning and Services (CHPS) compounds are trained to carry out outreach nutrition interventions such as vitamin A supplementation; food based strategy for micronutrients; community based promotion of breast feeding; maternal nutrition and complementary feeding; community based growth promotion including nutritional status assessment and also promoting the essential nutrition actions at the community level. While they embark on their routine outreach programs in the communities, another category of nurses, the Enrolled nurses who are also stationed at the CHPS compound stay in the facility to provide curative services including nutrition related disease conditions and nutritional rehabilitation to mother and baby who call at the facility. Nutrition officers are core members of the district health management teams and play a supervisory role for all nutrition related interventions and serve as master trainers building the capacity of the district staff and community health workers in nutrition program interventions.

In total, enrolled nurses make up the highest number of staff cadre in the three regions over the 4 year period while Nutrition Officers were the least staff cadre over the same period as depicted in Table 3. The period 2014-2017 saw a reduction in the numbers of all the listed staff cadre of between 43% (for midwives) to 81% (for nutrition officers) involved in nutrition program implementation in Greater Accra region, however the same cannot be said for the Northern region where the health worker categories involved with nutrition programs such as nutrition officers, midwives, Professional nurses and Community Health Nurses had consistently increased (Table 3).

Table 3: Nutrition human resource distribution by Cadre (2014-2017).

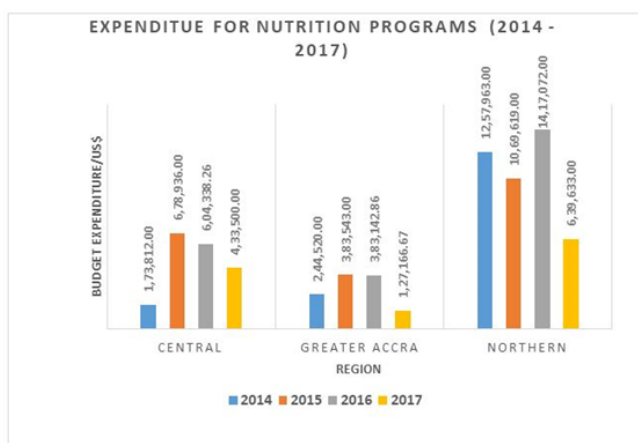
	Total enrolled nurses	Total nutrition officers	Total midwives	Total professional nurses	Total community health nurses
Central	9217	40	3400	6868	8155
2014	2251	8	718	1464	2045
2015	1684	9	536	1265	1568
2016	2495	17	1018	2147	2455
2017	2787	6	1128	1992	2087
Greater Accra	10357	119	5980	11469	11471
2014	4095	75	2081	4684	4971
2015	2323	10	1390	2749	2243
2016	2057	20	1316	2023	2293
2017	1882	14	1193	2013	1964
Northern	3128	19	462	924	939
2014	130	2	11	15	63
2015	1003	1	95	253	262
2016	921	10	147	304	275
2017	1074	6	209	352	339
Grand Total	22702	178	9842	19261	20565

Source: District Health Information Management System data, Ghana health Service Performance Review Meetings 2017.

Apart from the traditional universities that offer degree programs in nursing and nutrition, there are 27 public nursing training institutions with 6 of them training solely Community Health Nurses while the remaining train all category of nurses (community health nurse, midwives Professional nurse, enrolled nurse) just one institution trains nutrition officers. There are also a few private nursing training institutions dotted around the country that partner government in training health workers. Enrolled nursing and community Health nursing are at the lower end of the nursing profession in terms of certificate awarded and length of training therefore entry requirements are lower than what is demanded for entry to professional nursing or midwifery. Because of that, the intake for community health and enrolled nursing training is much higher therefore large numbers of these categories of nurses are graduated by the training institutions at shorter intervals than the other cadres and this explains their large numbers than the midwives, nutrition officers and professional nurses.

Over the 4 year period from 2014 to 2017, almost seven and a half million United States Dollars (USD) (USD 7,413,245.79) was spent implementing nutrition programs in the three regions altogether. It is evident from Figure 3 that most of the resources which are equivalent to about 60% (USD 4,384,287.00) of the total expenditure for nutrition programs was in the Northern region,

while another 25% (USD 1,890,586.26) of the expenditure was in the Central region leaving the remaining 15% as expenses made in implementing nutrition programs in the Greater Accra region.

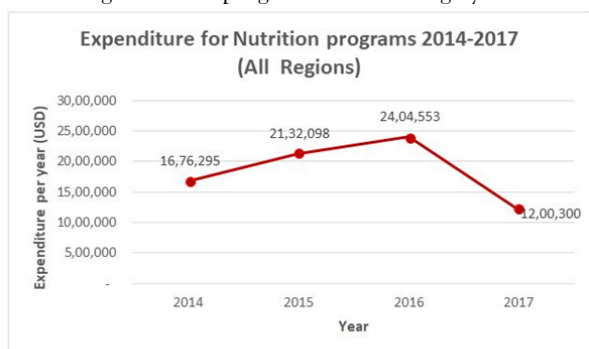


Source: Own Illustration based on data from UNICEF-Ghana and Ghana Health Service Performance review meetings.

Figure 3: Estimated expenditure on nutrition programs in the three regions (2014-2017).

How does health personnel and expenditure for service provision affect the achievement of nutrition program outcomes?

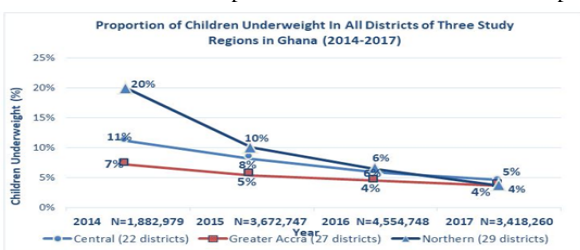
The total resources expended on nutrition programs annually for the three regions grew by a little over 40% (43%) from 2014 to 2016 but fell by 50% from 2016 to 2017 (Figure 4). which affects program funds including nutrition programs that are largely donor driven.



Source: Own illustration based on data from UNICEF-Ghana 2018.

Figure 4: Trends in total expenditure for nutrition program in all three regions (2014-2017).

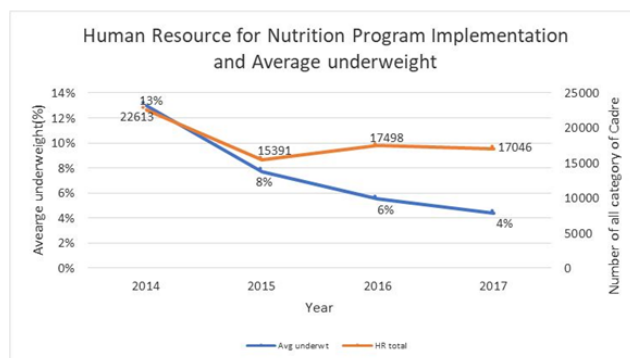
Despite the inherent differences in the expenditure for nutrition program implementation, the proportion of children under 5 years who are underweight in the three regions has seen a consistent improvement between 2014 to 2017 as depicted in Figure 5. Although the quantum of reduction in underweight differed from one region to the other, which could partly be attributed to the level of effort in the implementation mix of nutrition programs in



Source: Own illustration based on Ghana Health Service Annual Performance review meetings data (2015-2018)

Figure 5: Children underweight as an outcome of nutrition program implementation (2014-2017).

The Northern region achieved an 81% reduction in underweight of children under age 5 years from 19.86% to 3.69% (95% CI: -1.20%-21.25%) representing the highest reduction in underweight over the period (2014-2017). Central region obtained a 59% reduction in underweight from 11.13% to 4.6% (95% CI: 2.89%-11.98%) while Greater Accra had the lowest reduction (49%) of underweight from 7.21% to 3.71% (95% CI: 2.81%-7.61%) over the same period. This indicator measured the performance of child health programs.



Source: Own illustration based on data from Ghana Health Service Annual Performance review meetings

Figure 6: Human resource for nutrition programs and average underweight in all regions (2014-2017).

From Figure 6, putting the nutrition staff cadre for the three regions together, there is an overall reduction of 25% (24.6%) in nutrition staff over the four years. However, the proportion of children less than 5 years who were underweight also declined. A disaggregation by staff cadre for each of the region as earlier shown in Table 1 shows a steady reduction in nutrition related staff in Greater Accra while that of Northern and even Central region has increased over the 4 years.

One plausible reason for the observed trend could be the usual administrative reposting from the Greater Accra region to other regions, while some of them may also have proceeded on study leave or retired from active service. But despite that, the Greater Accra region still maintains the highest number of all cadres of staff and this could be due partly to the affinity to stay and work in urban areas as opposed to rural areas where amenities are scarce. Northern region in absolute numbers has the lowest number of cadres for nutrition compared with the numbers in the two other regions but notwithstanding, the staff cadre for nutrition program implementation increased by almost 800% from 2014-2017 in the region. This could be a response to the several nutrition interventions being implemented by several development partners in the region as well as the geographic size of the region being the larger administrative region in Ghana compared to the two other regions. This is also agrees with the move by the government to allocate newly trained health workers to regions based on critical staff need.

The government also instituted incentive packages such as allocation of motorbikes to staff working in hard to reach areas, faster promotions and job progression, study leave packages as well as financial incentives meant to encourage especially midwives and community health nurses to be posted to rural areas and peripheral health facilities [35]. The government strategy, therefore, to improve the availability of trained staff for child health and nutrition may have achieved some success in the northern region and to a greater

extent in the Central and Greater Accra regions.

When all the values were plugged into the model, the results of the linear mixed effect model produced a “Type III Tests of Fixed Effects” (Table 4). Both total nutrition human resource “HRTOT” and expenditure on nutrition services “AMTSPENT” are not significant at the 0.05 level while the years reviewed “YEAR” was significant at the 0.05 level. This means that human resource and expenditure for nutrition services are not potentially important predictors of the dependent variable (underweight) however the percent of underweight in children under 5 years reduced over the 4 year period. Tables 5 and 6, gives estimates of individual parameters as well as their standard errors and confidence intervals. From Table 3, the effect of expenditure for nutrition services (AMTSPENT) on the percent underweight is larger than that for human resource

capacity (HRTOT) although both are not significant.

Table 4: Type III Tests of Fixed Effects.

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	152.04	46.701	0
AMTSPENT	1	72.014	0.926	0.339
HRTOT	1	150.708	0.004	0.947
Region	2	89.557	0.871	0.422
YEAR	3	106.514	17.215	0

Table 5: Estimates of fixed effects.

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Intercept	3.710933	0.700173	118.61	5.3	0	2.324475	5.097391
AMTSPENT	0.02667	0.027715	72.014	0.962	0.339	-0.028578	0.081918
HRTOT	-0.008334	0.12563	150.708	-0.066	0.947	-0.256558	0.23989
[Region=1]	1.021657	0.928097	55.41	1.101	0.276	-0.837981	2.881296
[Region=2]	-0.265441	0.866776	87.559	-0.306	0.76	-1.988098	1.457216
[Region=3]	0 _b	0	-	-	-	-	-
[YEAR=1]	5.771402	0.850038	120.866	6.79	0	4.088509	7.454294
[YEAR=2]	2.669876	0.767891	161.881	3.477	0.001	1.1535	4.186251
[YEAR=3]	0.929314	0.543169	104.915	1.711	0.09	-0.147701	2.006329
[YEAR=4]	0 _b	0	-	-	-	-	-

Note: a. Dependent Variable: % underweight.

b. This parameter is set to zero because it is redundant.

The model also produces an estimate of the residual error variance and its standard error (Table 4) and the “rho” value which is significant at the .05 level implies that the covariance structure was properly specified.

Table 6: Estimates of Covariance Parameters.

Parameter	Estimate	Std. Error	Wald Z	Sig.	95% Confidence interval	
					Lower bound	Upper bound
Var: [Region=1]*[YEAR=1]	81.685163	22.588878	3.616	0	47.50676	140.45298
Var: [Region=1]*[YEAR=2]	45.906539	12.033234	3.815	0	27.463361	76.735342
Var: [Region=1]*[YEAR=3]	21.083749	5.409674	3.897	0	12.75106	34.861765
Var: [Region=1]*[YEAR=4]	15.07452	4.192371	3.596	0	8.740093	25.999856
Var: [Region=2]*[YEAR=1]	27.933385	8.941682	3.124	0.002	14.915839	52.311773
Var: [Region=2]*[YEAR=2]	17.034787	5.118128	3.328	0.001	9.453484	30.695982
Var: [Region=2]*[YEAR=3]	10.262663	2.500235	4.105	0	6.366292	16.543734
Var: [Region=2]*[YEAR=4]	8.815132	2.242591	3.931	0	5.354034	14.513646
Var: [Region=3]*[YEAR=1]	46.452801	12.689342	3.661	0	27.195202	79.347185
Var: [Region=3]*[YEAR=2]	59.09973	16.180066	3.653	0	34.557893	101.07034
Var: [Region=3]*[YEAR=3]	26.309951	7.486335	3.514	0	15.063152	45.954094
Var: [Region=3]*[YEAR=4]	4.685435	1.240289	3.778	0	2.788861	7.87178
ARH1 rho	0.694228	0.048288	14.377	0	0.587199	0.777399

Note: a. Dependent Variable: % underweight

The results suggest that there are other associated factors that contributed to the reduction in underweight. According to this survey data, the community health nurses and regional nutrition officers from the three regions, during Ante Natal Care (ANC) visits and during Postnatal care (PNC) visits, provide nutrition education to mothers including promotion of exclusive breast feeding for the neonates, maternal nutrition and complementary feeding after weaning among other interventions. The health workers, during ANC and PNC, facilitate the formation of support groups known as the mother to mother support groups taking advantage of members of already existing social support groups within the community. The mother support groups are composed of small groups of 3 up to about 15 mothers in each group, of any age, with a common interest of learning about and discussing issues of infant and young child nutrition.

According to the survey data from regional nutrition officers in the three regions, mother to mother support groups are active mostly in rural communities where social bonding is stronger than in urban communities. The challenge encountered in the Greater Accra and the Central regions with the organization of the mother to mother support group is that, there are more urban communities than rural which does not encourage the proper functioning of these support groups. Again, members of these mother support groups rather than work as volunteers knowing that this support groups are founded on the values of volunteerism, began to demand for incentives and payments in return for their services as nutrition change agents which cannot be sustained.

The data suggest that In the Greater Accra region mother to mother support groups are usually formed out of existing women's groups such as police women's association, Muslim women's association and other like groups. The activities of the mother support groups are then integrated into the women's groups however in many instances, the objective of these women's associations differed from that of the mother's support group making it difficult to sustain the mother's groups within these associations. The mother to mother support groups are therefore active in few communities in the region. Same reasons hold for the relative inactivity of the mother support groups in the Central region.

According to the survey data derived through interviews with Ghana Health Service regional nutrition officers, in the urban areas, it is also more difficult to send information to all residents in locality especially poor urban communities, about the holding of outreach child welfare clinics due to logistical constraints and lack of consultation in the planning of such activities. Therefore, parents in such areas commonly complained of the lack of awareness about the holding of such outreach activities which impacted uptake of services among urban dwellers in general.

The poor targeting of under 5 year old children in urban areas effectively ensures that mostly children in rural communities formed part of the children whose nutritional status are assessed and would largely accounts for the trend in underweight of children under 5 years in the central and the Greater Accra regions. The incidence of poor targeting for nutrition services suggest that there could be a potentially large cohort of children under age 5 years with poor nutritional status among the population in mostly poor urban communities who have been missed.

Survey data from interviews with the regional nutrition officer in the Northern region of Ghana suggest that mother to mother support groups are very active in most communities in every

district in the region. Members of mother support groups are the mouth piece of the community health nurses in the communities and they act as change agents with respect to maternal and child nutrition education, sharing their experiences in breastfeeding and complementary feeding practices among themselves in the community. The mother support groups also run small loans and saving schemes within the group and assist each other with small loans to meet their basic needs including hiring additional hands in clearing communal farm lands in preparation for planting during the farming seasons or for ploughing their lands. The successes of this support group in the region had led to the formation of so called father to father support groups in communities in 17 of the 25 districts in the region to teach maternal and child nutrition to fathers who are usually household heads and decision makers in the home to obtain their buy in as far as nutrition and health needs of children under 5 years and mothers is concerned.

The community health nurses work closely with these groups in the areas of nutrition education to mothers where nutrition counselling is tailored to the consumption of nutrition sensitive agriculture nutrient rich value chain products. The mother to mother support groups in the northern region commonly provide communal labor to their members to plough small fields in the communities for planting of leguminous crops high in protein such as soybeans and vitamin A rich Orange Fleshed Sweet Potatoes to support the consumption of nutrient poor staple foods. Members of mother support groups are also assisted to cultivate culturally core leafy green vegetables rich in iron and calcium such as "Alefú" (Amaranth), "Ayoyo" (Cochorus) using small scale drip irrigation systems especially during the dry season. Cooking demonstrations are also held in the communities facilitated by nutritionist and community health nurses using the mother support groups to teach soy utilization to promote improved complementary feeding, such as improved porridge for children and the preparation of diverse nutritious diets. The boiled potato chips are used to prepare "mpotompoto", a local meal as diet for the household which could also be sold to generate income for the mothers.

In depth interviews with the monitoring and evaluation officer of the erstwhile United States Agency for International Development (USAID)/Resilience in Northern region (RING) project that was implemented in the Northern region confirmed that from 2015 to 2017, using small plots and better farming practices to get better yields more than 17,834 acres of land was ploughed with fund assistance from the USAID channelled through the district assemblies for the cultivation of soybeans in the Northern region by these mother support groups which yielded more than 5,200 metric tons of soybeans (about 1,730 metric tons per year). While over 10,000 women were also assisted through the same source with vines to cultivate about 1,000 metric tons of orange flesh sweet potato. Over 3,400 women were also assisted to cultivate 2,500 acres of groundnuts adopting farming practices that prevented the growth of aflatoxins.

From the survey data from the northern region, by the end of 2017, cooking demonstrations to teach how soy and orange flesh sweet potato is utilized also benefited more than 47,300 community members in 3,300 households in over 1,200 communities. Almost 50,000 women altogether benefited from small loans because of belonging to mother to mother support groups in about 1,200 communities.

Nutrition related behavior change engineered through the promotion and consumption of nutrition sensitive agriculture

nutrient rich value chain products through community support groups would largely account for the reduction of underweight in children less than 5 years especially in northern region of Ghana. Other support activities of the mother to mother support group's members such as demonstration cooking during outreach child welfare clinics and community management of under nutrition would also partly account for the significant reduction in underweight in the northern region as shown in Figure 5.

What are the positive and negative impacts of nutrition human resource and budget expenditure on nutrition indicators?

During routine nutrition program implementation nutrition workers promote good infant and young child feeding (IYCF) practices, including breastfeeding, and participation in community based growth monitoring and promotion. This is essential in preventing malnutrition and improving child survival.

Nutrition programs are therefore programs that promote good infant and young child feeding and/or growth promotion programs.

The proportion of children reached by nutrition programs as shown in Figure 7 that an increase in the proportion of children reached with nutrition programs in at least two of the three regions (Northern and Central regions) from 2014-2017 with child welfare (CWC) coverage in the northern region being the highest while coverage in Greater Accra region was the lowest over the period which speaks volumes of the work of health workers and the work of mother support groups, as well as injection of liquidity in the Northern region nutrition activities.

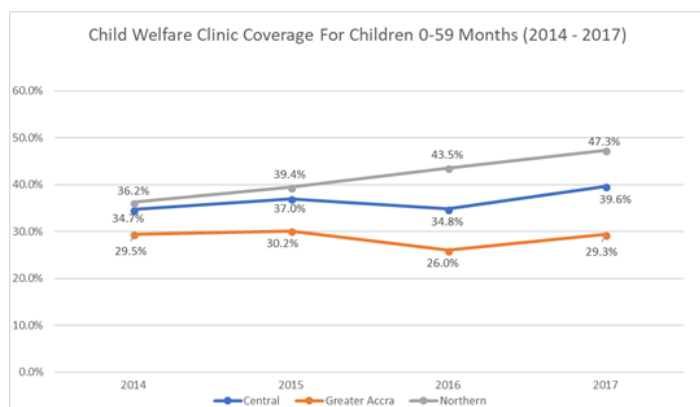


Figure 7: Proportion of children 0-59 months covered by nutrition programs (2014-2017).

The trend in coverage of children under age 5 reached with nutrition programs appear to have remained at the same level in Greater Accra region. This could partly be because of the reduction in nutrition human and financial resource in the Greater Accra region between 2014-2017 as compared with the two other regions. However, the slow increase in coverage is a pointer to the limited capacity in terms of human and financial resources with respect to the expanse of nutrition programs being implemented per region.

DISCUSSIONS

This paper makes the finding of negative externalities faced by urban dwellers due to difficulty by the health workers to send information to all residents in locality especially poor urban communities as a result of a lack of consultation with residents and inadequate logistics which contributes to a situation of low uptake of services in urban areas. This conforms to findings by Crocker-Buque et

al. and World Health Organization, who advance the argument, that, lack of awareness of the importance of health interventions and poor access to health care are among the reasons accounting for the low coverages among other factors for poor urban dwellers which could improve if the interventions are designed with their involvement [36,37].

The paper makes the finding of rent seeking behavior by members of mother support groups in urban areas who demand for incentives and payments in return for their services which conforms with similar finding by Mercier in her study of United States food aid programs found that, when these programs initially commenced they provided rents to implementing partners through their purchasing and shipping preferences which moved more of the program resources to producers of requested commodities, non-governmental organizations and shipping companies often raising program cost and resulting in the achievement of suboptimal program goals [38]. Findings by Washio et al. attest to financial incentives provided to experimental subjects in a randomized control trial in the special supplemental nutrition program for women infants and children to significantly increase breastfeeding rates [39]. However rate increases obtained were contingent on any level of breastfeeding rather than exclusive breastfeeding which would have been the ultimate. Findings by Ogwang et al. provide evidence that rent seeking behavior could even yield less than expected results [40]. It could have undesirable social impacts including corruption and food insecurity among others.

This paper makes the findings about poor targeting of under 5 year old children in urban areas in nutrition programs implementation thereby missing out a potentially large cohort of children under age 5 with nutritional problems that could have been addressed. Findings by Dabone et al. point to poor targeting as a cause for the malnutrition and micronutrient deficiencies widely prevalent in schoolchildren in cities in Burkina Faso, a neighbouring country to Ghana and advocated for nutrition interventions to target children in cities as well [41]. Findings by Ruel et al. also suggest improving targeting as a way to enhance nutrition programs [42].

This paper makes the finding that underweight in children under 5 years in the three focus regions in Ghana is declining but at a slow pace due to the limited capacity in terms of human and financial resource as well as due to the large scale of the nutrition program being implemented. This conforms with findings by Aryeetey et al. who state that barriers to optimize nutrition services include limited financial resources, personnel and the need for quality service delivery [43]. This is also coherent with findings by Frempong et al. who held that the health of children in Ghana has currently seen improvement however the number of children with improved nutritional status is still below the global benchmarks [44].

This paper makes the findings that the amount of reduction in underweight differed from one region to the other, which could partly be attributed to the level of effort by way of deployment of resources and asserts to implement nutrition programs. This finding is upheld by Nestel et al. and Mason et al. who opine that such improvements could be attributed to nutrition sensitive interventions put in place as well as the fundamental social and health changes that have occurred in those environments [45,46]. This position is also in sync with (Government of Ghana 2013) that the level of improvement in nutritional status of children under age of 5 years will depend among others on the design and implementation of feeding interventions including changes in Social norms regarding types of foods, who should consume them

and the required quantities [27].

The government also instituted incentive packages to encourage especially midwives and community health nurses to be posted to rural areas and peripheral health facilities [35]. This assertion is confirmed by Brenner et al. in their findings that instituting an incentive package leads to improved child health and nutrition outcomes [47].

This paper however makes the finding that human resource and expenditure for nutrition services although important, are not significant predictors of underweight. Other authors such as Adhikari et al. and Gödecke et al. upheld this finding to the effect that although the public health system, especially growth monitoring is relevant in reducing underweight, other associated factors significantly contribute to the decline in underweight [48,49]. This is contrary to findings by Ayogu et al. who argue that weekly food expenditure is a major predictor of underweight among school children aged 6-15 years in their study to predict the prevalence of underweight among school children from poor rural communities in South-eastern Nigeria [50]. This study however, focuses on underweight for children 0-5 years which was not the focus age group of Ayogu et al. however they advocated the need for an effective community based interventions among others [50].

This paper finds that other associated factors such as nutrition education and behavior change activities implemented through mother support groups significantly influenced underweight which is in sync with Chowdhury et al., Tette et al. and Alasfoor et al. in their submission that, other socio economic factors including mother's education level, care for the child, monthly family income as well as environmental sanitation which results in behavioral change, is significantly associated with reduction in underweight even after huge improvements in health services [51-53].

Mother support groups are characterised by Hockstein, as groups where, members Share breastfeeding and complementary feeding information as well as their personal experiences as mothers as they learn from each other which help reinforce or change certain attitudes and practices of these mothers [54]. The women also support each other as they care for their fewer than 5 year old children.

This paper's assertion that the mother support groups are more effective and sustainable in rural settings where there is stronger social bonding and shorter distances to meeting places than urban settings is supported by findings by Hockstein, who also opined that mother support groups thrive on existing community groups with meeting times not interfering with activities of the members including market days, while meeting place should be a short distance away within the community, a description which better explains rural setting within the African context [54].

This paper again found that the cultivation and consumption of soybeans and Orange Fleshed Sweet Potatoes was used as a strategy to manage problems of malnutrition in the communities which is supported by findings made by Julianti et al. to the effect that the high nutritional value of Orange Fleshed Sweet Potatoes and soya bean makes their consumption suitable in the management of malnutrition problems, a view shared by Adetola et al. who also add that consumption of soybeans and Orange Fleshed Sweet Potatoes is useful for purposes of supplementary foods for infants [55,56].

This paper makes the findings of cooking demonstrations by mother support groups to teach how soy and orange flesh sweet

potato is utilized which engineered nutrition related behavior change among the community people which positively impacted undernutrition levels among children under 5 years especially in the northern region. This is in sync with earlier findings by FAO, from the integrated nutrition agriculture intervention in Burundi where women brought their children to the nutrition rehabilitation facilities and were provided with basic training that integrates agriculture assistance, nutrition rehabilitation and nutrition education in vegetable and soybean production including cooking demonstrations in infant and child feeding knowledge and practices [57]. This resulted in decreased incidence of malnutrition of the children attending these facilities. They advocated for the protection and improvement of approaches that contribute towards nutritional wellbeing.

This study made a finding on the impact of community women support groups in fostering behavioral change to impact undernutrition through the cultivation and consumption of nutrition sensitive agriculture value chain products. The first part of the finding on nutrition improvement through women support groups conforms to findings by Undlien et al., Muruka et al. and Tobe et al. in the use of trained community support groups including women groups to improve nutritional status of children and health seeking behavior of pregnant women [58-60]. similar findings were also made by SUN Movement, on the use of the community level Social mobilization, advocacy and communications strategy by SUN countries to empower individuals to take action to improve nutrition however no specific findings on the role played by mother support groups in reducing undernutrition in children under 5 years through galvanizing communities to cultivate and consume nutrition sensitive agriculture value chain products has been made by any researcher so far which makes it a novelty in sub-Saharan Africa [61].

With the advent of the corona virus pandemic, health and nutrition services have been disrupted and in the case of inadequate care, childhood illnesses will increase along with an increase in the incidence of malnutrition [62]. However the full extent of the devastation that COVID-19 has caused with respect to the incidence of malnutrition is not fully known [63].

According to the finding of this paper, despite efforts, Ghana made at fiscal consolidation, less than expected revenue (including grants) could be mobilized especially in 2017. According to findings made by The World Bank, there were expenditure cuts on recurrent and capital expenditures [64]. This is against the backdrop of Ghana attaining lower middle income status in 2010 [21]. Findings by the International Monetary Fund, in their review under the extended credit facility arrangement stated that Ghana's lower middle income status has reduced the amount of donor funding available to the country [65]. However the government was expected to put measures in place to avoid the risk of payment delays Finding by Ecker, makes the case that the limited financial resources allocated to implement nutrition programs in Ghana was identified as among the myriad of reasons for the inability to adequately address malnutrition [66].

The finding of this paper that nutrition interventions are carried out typically at the static health facilities and during community outreach programs. This is in sync with findings by Mason et al. who argue that such community based programs are even instrumental in promoting social demand for services [45]. They go on to say that these community programs could be an important contributory factor to the fast improvement in health and nutrition

especially in developing countries.

CONCLUSION

There are externalities in the implementation of nutrition programs for children under 5 years because of poor targeting and information asymmetries in urban areas, resulting in excludability in consumption of nutrition services by urban dwellers, indicating that nutrition programs may not be well-coordinated and implemented in urban settings and this is tantamount to Government failure.

Rent seeking behaviour by social support groups in urban settings is associated with nutrition program implementation. On the other hand volunteerism which forms the basis for community services is gradually going down especially in urban areas in Ghana which has the potential of impacting underweight in children under 5 years in the long run.

The proportion of children reached with nutrition programs is increasing but at a gradual pace due to the limited capacity in terms of human and financial resource as well as due to the large scale of the program being implemented.

There is a study decline in underweight in children under 5 years in the study regions. Maintaining the right balance between human resource and expenditure on nutrition contributes to achieving success in implementing nutrition programs, however human resource and expenditure for program implementation alone are not significant predictors of underweight in children under 5 years.

Community governance through community support groups in leveraging human capital, organizational resources and social capital to solve shared problems is vital in promoting adherence to nutrition regimen. Therefore, improving community governance systems is likely to build community ownership of nutrition activities which is associated with improvement in nutritional status of children under 5 years in resource challenged settings. This is critical knowing that the total amount of resources, financial and human expended by the state for implementing nutrition programs has decreased. This is against the backdrop of dwindling donor inflows for nutrition programs that are largely donor driven and this has affected funding for nutrition related activities.

Related to that is the achievement of nutrition related behavior change through the promotion and consumption of nutrition sensitive agriculture nutrient rich value chain products which are vital in engineering a reduction in underweight in children less than 5 years.

Social innovations through community demonstration cooking and small farms in the community, helps foster socialization, which is a positive externality for communities and a catalyst in reducing underweight for children under 5 years old.

Therefore the allocation of resources, both human and material, for nutrition program implementation alone without adequate governance structures by both state and community actors within the socio cultural context will not result in adequate care and feeding practices that is required to change the prevalence of underweight in children less than 5 years.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Secondary cross sectional data on anthropometric measurements of weight and age with no unique identifiers was used in this study so there was no direct measurement of underweight. Health

provider's views were sought on their role as health workers in nutrition program implementation and not as individuals in their private capacity.

There are no physical risks associated with the study. However, there is a potential social risk due to the invasion of the privacy of the subjects enrolled in the in depth interviews. Enough education was given to the subjects to minimize the social risk associated with the invasion of their privacy. There are also no immediate benefits to participants, but long term benefits could result from the study in terms of the adoption of efficient approaches in mitigating the effects of governance challenges in nutrition program implementation which may improve nutritional status of beneficiaries in the long run.

All data collected through quantitative and qualitative methods and recordings of the discussions will be kept confidential and was used only for the purposes of the research.

Participation in the study was voluntary and one was not obliged to participate. One was free to withdraw from the study at any point during the study without any penalty. No compensation was due any person who participated in the study.

At the community, facility and institutional levels, entry protocols was followed, and permission was sought from the respondents directly and also through their heads of institutions or in case of community, from assembly men and opinion leaders before interviews were conducted. Participants who for good reasons could not sign the consent form were asked to thumbprint against their names.

AVAILABILITY OF DATA AND MATERIALS

The datasets generated during and/or analysed during the current study are not publicly available due to the fact the online Ghana Health Service data repository contains client personal records and other sensitive health information of patients and is not available for public use and is password protected but are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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AUTHORS' CONTRIBUTIONS

GW collected analyzed and interpreted the patient data regarding the anthropometric data on children under age 5 and in depth interviews. RB contributed the methodology and method of analysis, and was a major contributor in determining the scope of the manuscript. All authors read and approved the final manuscript.

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