Effects of the community-based health planning and services on anemia and acute malnutrition amongst under-fives in Ghana: A comparative study

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Abstract

Background: Ghana implemented a community-based health planning and services (CHPS) in 2000 with the aim of bringing health services to the doorsteps of the deprived in the communities. Japan International Cooperation Agency (JICA) supported the implementation of the project with a distinct approach in the Upper West region, employing supportive supervision.

Objective: To investigate the impact of the JICA CHPS model on anemia and acute malnutrition prevalence amongst children less than five years of age.

Methods: This is a quasi-experimental study design that compares the upper west region with the two other regions of the North implementing the traditional model of CHPS. We used the Ghana demographic and health survey dataset for 2003 as the baseline and 2014 as the follow-up year and employed the difference-in-difference approach. We find a reduction in the likelihood of anemia and acute malnutrition prevalence among children less than five years by 17 and 8 percentage points respectively. We find the project to be cost-effective, at a cost of $7 per each anemia prevalence averted.

Conclusions: The results indicate that the JICA model of CHPS is cost-effective in the reduction of anemia and acute malnutrition prevalence compared to the traditional model. We recommend a nationwide expansion of the JICA model to enhance the reduction of anemia and acute malnutrition in Ghana

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Introduction

Anemia is an endemic problem, causing adverse long-lasting impact to individuals through poor health, cognitive problems, early death and reduced physical activity.[1] The global prevalence rate is 47% in children less than five years.[2] Africa and Asia accounts for more than 85% of the anemia burden among the high-risk groups. Although the principal cause is iron deficiency it rarely exists in separation. More commonly it coexists with other causes including worm infestation, malaria, genetic disorders, most of which could be prevented if appropriate strategies are implemented. The prevalence of anemia in Ghana is 66 percent among children less than five year of age.[3] It accounts for about eighth causes of institutional deaths and the second causes of hospital admissions in Ghana.[4]

The persistent or untreated anemia will adversely affect human capital development of affected individuals or children and thus impeding economic development. Preventing or reducing anemia prevalence can mitigate these effects as revealed by a randomized experiment in Peru, that iron supplementation improves school performance among adolescents.[5] The results also reveal that iron supplementation is effective for reducing iron deficiency anemia.

Most countries have implemented several strategies to combat anemia and some of these strategies require the services of trained health personnel to render the services to the populace. The Community Based Health Planning and Services (CHPS) expansion in Ghana is one means used to reach people in deprived communities with both curative and preventive activities. In order to supplement Ghana's effort, the Japan International Cooperation Agency (JICA) implemented a project for scaling up CHPS in the upper west region of Ghana that employs a distinct approach.[6] Studies have shown the effectiveness of community interventions in the reduction of anemia in children. For instance, a randomized experiment amongst Kenya's school pupil using antihelminth finds an improvement in hemoglobin levels.[7]

Additionally, previous study aimed at improving mother's knowledge on child nutrition show an improvement in infant diet, household consumption and children's physical growth.[8] Thus, we expect that the activities of the community health officers through the supportive supervision with active involvement of the community to rigorously enhance mothers' knowledge on health issues, improve household consumption on iron rich diet and early health care seeking behavior and thus, reduce anemia and acute malnutrition since the main cause of anemia is iron deficient in daily food intake.

This paper serves to provide empirical evidence on CHPS contribution to anemia and acute malnutrition prevalence using the JICA model as a case study. To the best of our knowledge, this paper is the first study that investigates the policy impact on anemia and acute malnutrition among children less than five years of age. The fact that implementation had been ongoing since 2006 in the region allows a sufficient time frame for households to gain adequate knowledge on good nutrition, sanitation, and healthy living, especially the deprived. We therefore, hypothesize that the CHPS model implemented by JICA will improve preventive health services, thus reducing the prevalence of anemia and acute malnutrition amongst children less than 5 years of age in Ghana.

Using the difference-in-difference model, thus comparing the upper west region with the two other regions of the north (upper east and the northern regions) with the conventional model, we find a reduction in the probability of anemia and acute malnutrition prevalence amongst children under-five by 17 and 8 percentage points respectively.

We have established in our finding that lack of nutrition information and disease environment is the main cause of anemia among the poor. Addressing anemia and acute malnutrition in children can be achieved by changing behaviors of the community through active participation of the community members in health planning and delivery, a key contribution to policy. This paper contributes to two strands of literature. First, our findings contribute to literature on the effectiveness of health investment on child health. Second, our findings contribute to literature on the effect of community interventions on anemia and acute malnutrition prevalence.

Community-based health planning and services (CHPS)

Community-based health planning and services (CHPS) was adopted nationwide in 2000 after a successful pilot in two districts of the country in 1994. It was initiated with regards to the fact that over 70% of Ghanaians live more than 8 kilometers from health facilities, compounded by poor road networks and lack of transport thus worsening health indicators of the country.[9] The CHPS operations are managed by a community health officer (CHO) and assisted by a volunteer drawn from the community of service. The CHO is a community health nurse who is reoriented with the requisite skills to fit into the CHPS zone. A CHO engages each community within the catchment area when planning for health activities for the community. The services rendered by the CHO includes family planning, immunizations, treatment of minor ailments, antenatal and post-natal care, and health promotion and education: nutrition education and care and community and household level education.[10]

JICA project of scaling up of CHPS in the Upper west region of Ghana

Japan International Cooperation Agency (JICA) implemented a project for scaling up of CHPS in the upper west region of Ghana in March 2006, which ended in March 2010. The projects incorporate facilitative supervision (FSV), community health action plans (CHAPs) and refresher training for CHOs into the CHPS strategy. The Project revised the conventional monitoring within the CHPS implementation system to Facilitative Supervision (FSV). Traditionally, the supervisor visits the clinic, collects data, and reports issues or problems. But with FSV the facilitator guides staff in new approaches of improving quality and enables them to implement it.[11]

The project also implemented a community health action plan (CHAP), an action plan introduced with the support of community members to improve the condition of a CHPS zone.

CHAPs enhanced community participation and cooperation in CHPS activities and established a Community Emergency Transport Fund, a fund contributed by members of the community to assist members with transport fare in cases of health emergency referral situations.[6]

Evaluation of the project shows an increase in case referral rate from the CHPS centers to the health facilities by 80%. It also shows an increase in the number of functional CHPS zones and an increase in households visited by Community health officers.[6] However, there are rare studies that examine the project impact on disease prevalence. Our study investigates the project impact on anemia and acute malnutrition prevalence in under-five.

Materials and Methods

Data source and description

The Ghana Demographic and Health Survey (GDHS) is used for this study. Is a comprehensive survey data set conducting every five years. The Surveys is designed to provide data to monitor the population and health situation in Ghana. The 2014 and 2003 waves are used for the study. The 2014 survey consists of a national representative sample of 12,831 households (DHS, 2014). The survey used women questionnaire to obtain information on anemia and acute malnutrition in children less than years of age. A total number of 4,916 eligible women were interviewed. Anemia was ascertained during the survey by taking capillary blood samples of children less than five years using hemocue to obtain hemoglobin level. Blood hemoglobin of less than 7 g/dl is severe anemia, 7 to 9.9 g/dl moderate anemia and 10 to 10.9 g/dl as mild anemia and 11 and above is considered not anemia for children.[3] We used this information to create the outcome variables interest, anemia in children for the analysis. The dataset also contains a child's weight for height which we used to create the variable acute malnutrition.

In Table 1, we present summary statistics and description of variables. We use 4,102 observations in our analysis, 1,023 for the treatment region and 3,079 for the control region. About 78% of children under5 are anemic in the JICA CHPS region whereas 79% are anemic in the two traditional CHPS regions. Most of the women are rural residents (86% in JICA CHPS and 79% two traditional CHPS) and mostly Christians (62% in JICA CHPS and 59% in the two traditional CHPS regions) and of the poorest households and had their secondary education (33%). Majority of the households are within the poorest wealth quintile and mainly from the two traditional CHPS regions (71%) and 67% in the JICA CHPS region.

Identification strategy

The distinct model implemented by JICA makes it appropriate to investigate the model that yields the desired effect on disease burden using the difference-in-difference approach. The upper west region is the treatment region and the other two regions of the north (Northern and the upper east) with the traditional model as control regions, since the three regions have similar demographic characteristics. We used the DHS data set for 2003 as the baseline and 2014 as the post year. The model below is used to estimate our results:

$$Y_{ijt} = \beta_1 X'_{ijt} + \delta\ \text{Treatment}_j * \text{post}_t + \gamma_i + T_i + \varepsilon_{ijt}$$

where i denotes individual children under five and j represents region and t denotes year. Y_{ijt} is the outcome variable of interest;

anemia and acute malnutrition in children less than five years of age. Anemia is an ordinal variable ranging from mild, moderate, severe, and not anemic. We created a binary variable equal to one if anemic and zero if otherwise. Acute malnutrition equal to 1 if child Weight-for-height is less than negative 2 and zero otherwise. δ is the project effect.

Mathematically:

$$\delta = (Y2014_{JICA\_CHPS} - Y2014_{Traditional}) - (Y2003_{JICA\_CHPS} - Y2003_{Traditional})$$

$Treatment_j$ * $post_t$ is the interaction term for treatment region with post (survey year 2014). X'_{ijt} is the vector of individual, mother, household, and community variables used for the study. γ_i accounts for birth year-specific shocks that can influence maternal and child anemia. T_i represents region fixed effects, which help purge any time-invariant region characteristics that might influence anemia in children. ε_{ijt} is the error term. We adjusted the standard errors by clustering at the primary sampling level. [Note: The Primary sampling units contains 427 groups, and we cluster the error term at this level].

Empirical results

Project effect on anemia and acute malnutrition among under-fives

We present the results of our analysis of the effect of JICA project on anemia and acute malnutrition using both OLS and probit marginal effect in Table 2. In column 1, holding all other covariates constant, the project significantly reduces the probabil-

Table 1. Summary statistics.

Variables	JICA CHPS		Traditional CHPS	
	Mean	Std. Dev.	Mean	Std. Dev.
Anemia in under 5	0.784	0.412	0.789	0.408
Low-weight-for age	0.113	0.316	0.084	0.278
Treatment (=1 if upper east)	1.000	0.000	0.000	0.000
Post (=1 if survey year is 2014)	0.492	0.500	0.468	0.499
Rural	0.863	0.344	0.792	0.406
Mother religion:				
Christian (=1 if Christian)	0.618	0.486	0.586	0.493
Islam (=1 if Islam)	0.261	0.439	0.264	0.441
Traditionalist	0.035	0.184	0.049	0.217
Noreligion	0.018	0.132	0.025	0.156
Mother education:				
Primary	0.138	0.345	0.116	0.320
Secondary	0.101	0.301	0.106	0.308
Higher	0.019	0.135	0.013	0.113
Mother age	30.983	7.342	31.059	7.196
Wealth index:				
Poorest	0.673	0.470	0.711	0.453
Poorer	0.152	0.359	0.129	0.336
Middle	0.077	0.267	0.081	0.273
Richer	0.071	0.258	0.057	0.231
Richest	0.027	0.163	0.022	0.146
Twins (=1 if child is a twin)	0.031	0.174	0.039	0.194
Mother Ethnicity				
Ga dan (=1 if woman is Ga/dangwe)	0.001	0.035	0.006	0.077
Mole/dagbani (=1 if Mole/dangbani)	0.795	0.404	0.612	0.487
Other tribe (=1 if is other tribe)	0.196	0.397	0.303	0.460
Akan (=1 if woman is Akan)	0.005	0.070	0.019	0.137
Mother Literacy	0.091	0.288	0.109	0.312
Partner primary education	0.139	0.346	0.086	0.281
Partner secondary education	0.171	0.377	0.130	0.336
Partner higher education	0.031	0.174	0.046	0.209
Partner age	40.098	11.560	40.562	11.722
Household head age	43.689	15.292	43.062	13.766
Household head sex	1.096	0.294	1.096	0.295
Household head education	1.358	1.050	1.290	1.011
Observations	1,023		3,079	

This table reports the summary statistics of the key variables data used for the analysis. JICA CHPS is the project region (Upper west) and the traditional CHPS represents the other two regions of the north (Northern and upper east regions).

ity of anemia prevalence in under five by 17 percentage points in the treatment region. In column 3, holding all other covariates constant, the project reduces the probability of acute malnutrition among children under five by 8 percentage points. We report the marginal effect after probit in Column (2) and Column (4), which confirms the OLS findings as they are negatively related in magnitude and same significance level, indicating the robustness of the findings. Thus, in column 2, children under the project have 17 percentage points lower probability of being anemic and 9 percentage points lower probability of being acutely malnourished.

Mechanisms of project impact

In Table 3, we explore the mechanisms through which the JICA project reduces anemia and acute malnutrition. In Panel A, we investigate the project impact on CHPS facility utilization by pregnant women. In column 1, we find that the project increases the probability of antenatal uptake at the CHPS centers by 21 percentage points and In column 3 of Panel A, the project increases delivery at CHPS centers by 10 percentage points. Column 2 and 4 reports the marginal effects after probit estimation and the results are consistent with the OLS results in terms of sign and significance level, however the probit results in column 4 are bigger in magnitude compared to the OLS results. In Table 3 of Panel B, we examine the project impact on skilled antenatal care services rendered by the CHOs. In column 1 of Panel B, the project increases the probability of ANC services rendered by a CHO/Nurse by 21 percentage points and delivery assistance by a CHO/Nurse by 10 percentage points in column 3. Our results show that an increase in CHPS antenatal attendance, CHPS delivery care and the quality of services rendered by CHOs at CHPS level translated into a reduction in anemia and acute malnutrition prevalence in children under-five. Estimates indicate that improved sanitation increases hemoglobin level among rural women in Cambodia.[12] A comparison of under-five cohorts exposed to improved sanitation with those exposed to poor sanitation show a surge in hemoglobin levels amongst cohorts exposed to improved sanitation.[13] The presence of the community health officers within the community and the home visiting couple with health education is expected to improve community toilet facilities and drinking water sources in the JICA project region. We investigate this by estimating the project effect on improved toilets and improved drinking water sources employing the WHO & UNICEF criteria for improved water and toilet facilities.[14] We present the results in Table 3 of Panel C. In column 1, Holding all other variables constant, the project increases the probability of improved household toilet facilities by 14 percentage points. In column 3, the project increases the probability of improved household drinking water sources by 24 percentage points. The probit marginal effect results in column 2 and 3 confirms the OLS results as the similar in sign and significance level. We expect these increases to translate into soil helminth and water drinking source contamination reduction with correspondence reduction in worm infestation and subsequent reduction in anemia.

Robustness checks

The validity of our identification strategy rests on the fact that the outcome variables of interest did not experience differential trends before the implementation of the project in 2006. However, the variable anemia is not in the DHS dataset for 1998 and thus we could not show the parallel trend for anemia in children under 5. In order to tackle this issue, we conduct a balancing test to determine the correlations between the treatment status and the covariates used for the analysis. We present the results of the balancing test in Table 4. Significant differences in the covariates indicates that the treatment and the comparison regions are distinct at baseline, and this may bias our results. However, almost all the covariates were balanced at the baseline except for mother primary education and place of residence and partner primary education, with the mean difference above the accepted threshold of 5 %. Since most of the covariates are balanced at baseline (below a threshold of 5%), it supports parallel path theory. Thus, we have no course of concern about differential trend at the baseline.

We estimate the parallel trend for Low-weight-for height

Table 2. Project effect on anemia and acute malnutrition in children under-five.

Variables	(OLS) Anemia in under 5	(Probit) Anemia in under 5	(OLS) Low- weightfor-height	(Probit) Low- weightfor-height
Treatment	0.13***	0.12	0.00	0.07
	(0.04)	(0.09)	(0.00)	(0.09)
Post (2014)	0.14	0.07*	-0.01	0.06***
	(0.12)	(0.04)	(0.06)	(0.02)
Treatment*post	***-0.17******	***-0.17******	***-0.08******	***-0.09******
	(0.05)	***(0.01)***	***(0.03)***	***(0.00)***
Constant	0.94***	–	0.14	–
	(0.17)	–	(0.11)	–
Observation	2322	2286	2321	2223
R-squared	0.14	--	0.14	–

This table reports the effect of the project on child anemia and acute malnutrition. Treatment*post is the project effect. We report both the OLS and the Probit marginal effect. The main outcomes variables are Anemia in children under-five, acute malnutrition (low weight for height). We control for the following in all the models: Individual covariates: Child: gender, twin and birth year. Mother controls: age, education dummies, religion dummies, ethnicity dummies, literacy, place of residence(rural). Household level variables: wealth index, household head age, sex and education, partner age and education. We also control for region fixed effects in all the models. Statistical significance is indicated by ***, **, and * at 11%, 5%, and 10% respectively. Standard errors in the parentheses and are clustered at the primary sampling unit.

Table 3. Mechanisms of project impact.

Panel A: Maternal uptake of community-based health planning and services (CHPS)				
Variables	**(OLS) Antenatal attendance at CHPS center**	**(Probit) Antenatal attendance at CHPS center**	**(OLS) Delivery at CHPS facility**	**(Probit) Delivery at CHPS facility**
*Treatment*post*	*0.21***	*0.24***	*0.10***	*0.43***
	(0.07)	*(0.07)*	*(0.03)*	*(0.08)*
Observations	2,272	1837	3,549	1314
R-squared	0.17	–		0.12
Panel B: Skilled community health service at the community level				
	(OLS) Antenatal attendance by community health officer/nurse	**(Probit) Antenatal attendance by community health officer/nurse**	**(OLS) Deliveries assisted by community health officer/nurse**	**(Probit) Deliveries assisted by community health officer/nurse**
*Treatment*post*	*0.21***	*0.20***	*0.10***	*0.02*
	(0.05)	*(0.06)*	*(0.03)*	*(0.03)*
Observations	2,511	2335	3,547	2725
R-squared	0.21	–	0.11	–
Panel C: Impact on improved toilet and drinking water sources				
	(OLS) Improved toilet	**(Probit) Improved toilet**	**(OLS) Improved drinking water**	**(Probit) Improved drinking water**
*Treatment*post*	*0.14***	*0.11***	*0.24***	*0.35***
	(0.05)	*(0.04)*	*(0.06)*	*(0.08)*
Observations	3545	3467	3549	3491
R-squared	0.440	–	0.635	–

Panel A of this table reports the project effect on antenatal care and delivery services at the CHPS centers. Panel B reports the project effect on anemia and acute malnutrition. It shows the services rendered by the community health officer (CHO) or nurse. Panel C reports project effect on improved toilet and drinking water sources. Treatment*post is the project effect. We report both the OLS and the Probit marginal effect. We control for the following in all the models: Individual covariates: Child: gender, twin and birth year. Mother controls: age, education dummies, religion dummies, ethnicity dummies, literacy, place of residence(rural). Household level variables: wealth index, household head age, sex and education, partner age and education. We also control for region fixed effects in all the models. Statistical significance is indicated by ***, **, and * at 11%, 5%, and 10% respectively. Standard errors in the parentheses and are clustered at the primary sampling unit.

Table 4. Cost-effectiveness analysis of JICA CHPS project on anemia.

Cost ($) (1)	**Population (2)**	**Health benefit (Anaemia prevalence averted) (3)**	**CER calculation (Total cost/health benefit) (4)**	**CER ($ per anaemia prevalence averted) (5)**
$592,301.71	49, 2019	492,019*0.17= 3,643.23	$592,301.71/ 83,643.23	$7.0813

If an intervention CER is less than cost-effectiveness threshold then the intervention is deemed cost-effective.

(acute malnutrition) in children under 5 using DHS 1998 and 2003 and present the results in Tables 5 and 6. The results of the interaction term; Fake treatment*pseudo-post show insignificant results indicating the existence of a common trend in acute malnutrition before the introduction of the JICA CHPS project.

Simple cost-effectiveness analysis

We conduct cost-effectiveness analysis of the project impact on anemia. We present the analysis in Table 6. The project is for the entire populace of upper west region, and it cost US$ 4,043,549 and since our analysis is limited to only children less than 5 years of age, we obtained the actual amount spent on each individual per year by dividing the total amount by the total population of the implementing region for the period 2006-2010. We then calculated the total cost for under 5 (column 1) by multiplying cost per person per year ($1.2 038) by the under-5 population or the implementing region in Panel A and B respectively. Column3 is anemia prevalence averted which is 17% for our study estimate in column 1 of Table 2, multiplied by the total population of under-five (column 2). Column 4 and 5 is the cost-effectiveness ratio of the intervention, which is obtained by dividing total cost (column 1) by the health benefit (column 3). Our results show that the JICA CHPS project averts anemia prevalence at a cost of $7.0813 per year. If cost-effectiveness ratio (CER) is less than the cost-effectiveness threshold for Ghana, then it is cost-effective. An assessment of the productivity of the Ghana health system revealed that an estimated cost of US$432 is needed to avert 1 DALY.[15] Our results are far less than their estimates, indicating that the JICA CHPS project is very cost-effective. Our estimates are also far below the cost-effectiveness threshold estimates (US$ 104 – 951) for Ghana.[15] Clearly, the JICA CHPS project is highly cost-effective.

Notes

Project cost is obtained from Ampiah, K. (2017). Page 125.

Is sourced from https://bit.ly/3DeLVri From the Ghana Statistical Service, (2020). Population by sex and district 2010 and 2019 (https://bit.ly/3WeUSJU), the average Population for JICA project region is 2.85% of the total Ghanaian population. We use this percentage to calculate under 5 population out of the total under 5 Ghanaian population obtained from the population pyramid. Cost-effectiveness ratio refers to the amount of money that an intervention needs in order to avert 1 DALY. Is the measure for cost-effectiveness. It shows 'value for money'. Cost-effectiveness threshold refers to the productivity of a country's healthcare system or the opportunity cost of healthcare spending.

Discussion and conclusions

This study examines the effect of the JICA project of scaling up CHPS in the upper east region on anemia and acute malnutrition amongst children under-five years. We use the Ghana demographic and health survey which is a nationally representative dataset making our results generalizable to the entire population of the country and employing the difference-in-difference estimation strategy. Based on available data, this is the first paper that examines the policy impact on anemia and acute malnutrition prevalence.

The results reveal that the policy strongly reduces the probabil-

Table 5. Balancing test of covariates.

Variable(s)	Mean control	Mean treated	Diff.	t	Pr(T>t)
Place of residence: Rural	0.13	0.06	-0.07	4.37	0.0000***
Woman religion:					
Christian	0.71	0.70	-0.01	0.43	0.6688
Traditional	0.00	0.00	0.00	1.17	0.2418
Other religion	0.00	0.00	0.00	-	-
Islam	0.14	0.16	0.02	1.20	0.23
Woman education:					
Primary	0.07	0.13	0.06	4.05	0.0001***
Secondary	0.05	0.05	0.00	0.35	0.726
Higher	0.01	0.00	-0.01	1.66	0.0975*
Wealth index					
Poorer	0.15	0.15	-0.01	0.50	0.618
Middle wealth	0.09	0.08	-0.01	0.89	0.3723
Richer	0.05	0.05	0.00	0.23	0.8161
Richest	0.02	0.02	-0.01	0.80	0.4212
Partner education					
Primary	0.05	0.17	0.12	8.44	0.0000***
Secondary	0.11	0.12	0.01	0.86	0.3902
Higher	0.02	0.01	-0.02	2.05	0.0404**
Child's gender (female)	0.49	0.46	-0.03	0.99	0.3203
Woman Literacy	0.05	0.03	-0.02	1.40	0.1616
Household head education	1.37	1.37	0.00	0.01	0.9901

This table reports balancing test of covariates selected covariates Table 5: Parallel Trend – Project impact on acute malnutrition.

Table 6. Parallel Trend – Project impact on acute malnutrition.

Variables	(OLS) Acute malnutrition	(Probit) Acute malnutrition
Pseudo-Post	-0.02 (0.02)	0.02 (0.03)
Fake treatment	0.01 (0.01)	0.02 (0.04)
Fake treatment*pseudo post	***0.01*** ***(0.03)***	***0.02*** ***(0.05)***
Constant	0.16*** (0.04)	– –
Observations	1539	599
R-squared	0.07	–

This table reports the parallel trend for Low-weight-for-height (acute malnutrition). We report the OLS and probit marginal effects. Pseudo-post is equal to 1 if the interview year is 2003 and zero if 1998. Fake treatment*pseudo-post is the pre-project effect. We control for the following in all the models: Individual covariates: Child: gender, twin and birth year. Mother controls: age, education dummies, religion dummies, ethnicity dummies, literacy, place of residence(rural). Household level variables: wealth index, household head age, sex and education, partner age and education. We also control for region fixed effects in all the models. Statistical significance is indicated by ***, **, and * at 11%, 5%, and 10% respectively. Standard errors in the parentheses and are clustered at the primary sampling unit.

ity of anemia prevalence among children under-fives by 17 percentage points. Our results are consistent with previous studies on the folic acid supplementation program on anemia.[16] It is in line with the study on exposure to better environmental sanitation on hemoglobin level amongst children in Peru that shows an improvement in hemoglobin level for children exposed to better environmental sanitation in Peru.[13]

The results also show that the policy decreases the likelihood of acute malnutrition prevalence among children under-fives by 8 percentage points. A maternal and child nutrition project in Uttar Pradesh that employed the services of community-based volunteers to counsel families "at risk" resulted in a significant reduction of severe malnutrition,[17] which is consistent with our estimates. Our results are valid given that the balancing test for anemia and the parallel trend for acute malnutrition support the robustness of our results.

We explore mechanisms through which the project increases the prevalence of anemia and acute malnutrition amongst under-fives in Ghana. The results reveal an increase in the probability of CHPS antenatal attendance, CHPS delivery care, services rendered by community health officers and improved household toilet facilities and drinking water sources. We have no doubt that the increase in the above channels translated into a reduction in anemia and acute malnutrition prevalence amongst children under-fives.

Our results suggest that the JICA model of CHPS is effective in disease prevention. We have established in our estimates that active community participation and response is a key determinant factor in the prevention and reduction of anemia and acute malnutrition prevalence. Second, our findings on CHPS contribute to literature on child health. We have also discovered in our findings that lack of nutrition information and disease environment is the main cause of anemia among the poor. Our findings suggest that, addressing anemia amongst children can be achieved by changing behaviors of the community through active participation of the community members in health planning and delivery, a key contribution to policy. All front-line health professionals involved in primary health care delivery in all levels of the health system need to be trained in facilitative supervision to ensure effective health outcomes.

Our simple cost-effectiveness analysis shows that the JICA project is very cost-effective, and our estimates provide strong support for replicating the JICA model of CHPS in all the regions of the country. Countries intending to reduce disease (anemia and acute malnutrition) prevalence should adopt the JICA model of CHPS to ensure value for money. Our paper is not without limitations, our baseline data set did not contain anemia, one of the outcome variables and thus we could not show the pre-trend for anemia.

References

1. Haas JD, Brownlie T. Iron Deficiency and Reduced Work Capacity: A Critical Review of the Research to Determine a Causal Relationship. The Journal of Nutrition. 2001 Feb 1;131(2):676S-690S.
2. McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B. Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993–2005. PHN. 2009 Apr;12(04):444.
3. Ghana Statistical Service, Ghana Health Service, ICF Macro. Ghana Maternal Health Survey 2014. Accra, Ghana: Ghana Statistical Service; 2014.
4. Ghana Health Service. Ghana Health Service 2019 Annual Report. Ghana Health Service; 2019.
5. Chong A, Cohen I, Field E, Nakasone E, Torero M. Iron Deficiency and Schooling Attainment in Peru. American Economic Journal: Applied Economics. 2016 Oct;8(4):222–55.
6. Ampiah K. The Discourse of Japanese Development Assistance and the Scaling-up of Community-based Health Planning and Services (CHPS) in Ghana. 2017;42.
7. Friis H, Mwaniki D, Omondi B, Muniu E, Thiong'o F, Ouma J, et al. Effects on haemoglobin of multi-micronutrient supplementation and multi-helminth chemotherapy: a randomized, controlled trial in Kenyan school children. Eur J Clin Nutr. 2003 Apr;57(4):573–9.
8. Fitzsimons E, Malde B, Mesnard A, Vera-Hernández M. Nutrition, information and household behavior: Experimental evidence from Malawi. Journal of Development Economics. 2016 Sep;122:113–26.
9. Nyonator FK, Awoonor-Williams JK, Phillips JF, Jones TC, Miller RA. The Ghana Community-based Health Planning and Services Initiative for scaling up service delivery innovation. Health Policy and Planning. 2005 Jan 1;20(1):25–34.
10. Ministry of Health M. National Community-Based Health Plaining and Services Policy (CHPS). 2016.
11. Aikins M, Laar A, Nonvignon J, Sackey S, Ikeda T, Woode G, et al. Evaluation of facilitative supervision visits in primary health care service delivery in Northern Ghana. BMC Health Serv Res. 2013 Dec;13(1):358.
12. Green TJ, Karakochuk CD, McLean J, Janmohamed A. Improved Sanitation Facilities are Associated with Higher Body Mass Index and Higher Hemoglobin Concentration Among Rural Cambodian Women in the First Trimester of Pregnancy. The American Journal of Tropical Medicine and Hygiene. 2016 Nov 2;95(5):1211–5.
13. Coffey D, Geruso M, Spears D. Sanitation, Disease Externalities and Anaemia: Evidence From Nepal. The Economic Journal. 2018 Jun 1;128(611):1395–432.
14. WHO, UNICEF, editors. Progress on sanitation and drinking-water. Geneva: World Health Organization; 2010. 55 p.
15. Woods B, Revill P, Sculpher M, Claxton K. Country-Level Cost-Effectiveness Thresholds: Initial Estimates and the Need for Further Research. Value in Health. 2016 Dec;19(8):929–35.
16. Berry J, Mehta S, Mukherjee P, Ruebeck H, Shastry GK. Implementation and effects of India's national school-based iron supplementation program. Journal of Development Economics. 2020 May;144:102428.
17. Vir S. Community based maternal and child health nutrition project, Uttar Pradesh: An innovative strategy focusing on "at risk" families. Indian J Community Med. 2013;38(4):234.