The Effects of Information Provision about Infants' Nutrition: Experimental Evidence in Ghana

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March 2021

Abstract

In this paper, we study the effects of updating mothers' beliefs about their children's nutritional status. To identify the effects, we distribute message cards written about children's nutritional status to mothers. The contents of the message differ depending on the weight of children. We confirm that the mothers with low-weight children tends to overestimate their children's nutritional status as the results of baseline interview. Econometric analysis shows that warning messages have positive impacts on children's physical growth and its effect size is large enough to bring the children out of underweight level. However, we also find that a reassuring message has a negative effect on the weight of children. Although effect size of that undesirable effect is small in our context, the results suggest that providing information to improve mothers' perceptions does not always lead to good responses of the mothers.

Key words — child nutrition, mother's perception, information provision, Ghana

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1. Introduction

End of undernutrition during infancy is one of the important development goals because it causes poor physical and mental growth of children in the long-run. Children's undernutrition can be observed in not only poor households but also wealthier households in the context of sub-Saharan Africa (Brown et al., 2019). Our study country, Ghana, also faces the same issue. Stunting rates of children under 5 are 24.8 percent in the lowest wealth quintile but 14.4 percent in the fourth quintile and 8.5 percent even in the highest quintile (GSS et al., 2015). This fact indicates that factors other than budget constraint have important roles for improving children's nutrition in sub-Saharan Africa.

In this paper we focus on mothers' beliefs about their children's nutritional status as the factor affecting children's nutrition. If mothers overestimate their children's nutritional status, they may underinvest in nutrition than the case where they correctly perceive. This could happen because if other children living in the same area are stunted, the mothers would feel that it was normal (Christiaensen and Alderman, 2004).

To test the above hypothesis, we provide the information about children's nutritional status for randomly selected mothers. At the baseline survey we measured weight and length of children aged from 6 to 18 months. We calculate weight-for-age Z-score (WAZ) and send message cards written about children's nutritional status to the randomly selected mothers. The messages are based on WAZ. If WAZ is higher than -1, then our message is "Good". If WAZ is lower than -1 and higher than -2, our message is "Caution". If WAZ is lower than -2, our message is "Danger". We evaluate the impacts of the message cards on children's physical growth.

The results are as follows. First, mothers with low-weight children tend to overestimate their children's nutritional status. About 30% of mothers whose children are underweighted think that their children are nutritionally good. Second, the negative messages, "Caution" and "Danger", have positive impacts on child's weight but the positive message, "Good", has negative impacts. These results indicates that a warning message prompts mothers to improve children's nutrition but a reassuring message discourages mothers from engaging in parenting efforts. Finally, the message "Caution" has positive impacts on child's height but there is no significant impact of the other

messages, “Danger” and “Good”. Although the results of child’s height are not distinct than child’s weight in terms of statistical significancy, point estimates on the height are qualitatively similar to the weight.

Our study contributes to the field of intrahousehold distribution. In this field, the theoretical model shows parents determine nutritional inputs for their children depending on children’s initial endowments (Pitt et al., 1990). It means that the model implicitly assumes that parents correctly perceive children’s nutritional status. But our study asks whether this implicit assumption is true or not.

Second, we also contribute to the literature on the role of parent’s belief. Growing literature shows parent’s belief is an important determinant of human capital investment in education for a child (Boneva and Rauh, 2018; Dizon-Ross, 2019; Kinsler and Pavan, 2021). Nutrition is also another aspect of human capital but little study focuses on the role of parent’s belief.

This paper consists of the following sections. In Section 2, we explain the data and the experimental design. Then we present an estimation strategy and the results in Section 3. Finally, we conclude in Section 4.

2. Research Design and Data

2.1 Sampling Frame and Data

In Ghana, there is a public health service for children below 2 years old provided free by Ghana Health Service (GHS) throurgh Child Welfare Clinic (CWC). CWC mainly provides three services: weighting children, immunization, and consulting with mothers. Since CWC is provided in local level, there are many CWCs covering areas in one district. Our study site is Asokore Mampong district located in Ashanti region of Ghana. Asokore Mampong is located next of Kumasi, the district capital of Ashanti region and the second largest city in Ghana. Asokore Mampong can be regarded as a peri-urban area or a dormitory town. There are more than 40 CWCs in Asokore Mampong and we conduct a baseline survey in 14 CWCs of those CWCs. Our target population is mothers with children aged 6-18 months. We collect data about basic household characteristics and child’s anthropometry. For feasibility of the survey, we interview all mothers who come

to the sample CWCs on the day of the survey. We conducted the baseline survey in March-April 2019 and a follow-up survey in November-December 2019.

2.2 Experimental Design

To test the effects of updating mothers' perception about their children's nutritional status, we provide an objective information about child's nutrition to the mothers. We use child's weight as an indicator of child's nutritional status. We calculate weight-for-age Z-score (WAZ) using child's weight measured in the baseline survey. We divide child's nutritional status into three categories based on WAZ: "Good", "Caution", and "Danger". If WAZ is higher than -1, lower than -1 and higher than -2, or lower than -2, we regard child's nutritional status as "Good", "Caution", and "Danger" respectively. We send a message card written about child's nutritional status to randomly selected mothers. The design of the message card is shown in Figure 1. The message card includes not only one of the three messages: "Good", "Caution", and "Danger", but also interpretation of the messages. We distribute the message cards to the randomly selected mothers in August 2019.

2.3 Descriptive Statistics and Balance

Table 1 presents summary statistics and tests for balance across the treatment and control groups. Mean of household size is 4.39. Average age of mother is 29.8 and its standard deviation is 14.5. It indicates that our sample includes mothers of all ages, from teens to 40s. Average levels of mothers' education are not low, at 7.8 years. It means that mothers at least finish primary schools on average. At the baseline, an average of weight-for-age Z-score (WAZ) of children is -0.42, and an average of length-of-age Z-score (LAZ) is 0.45. At the follow-up, both WAZ and LAZ get worse: -0.48 and -0.11. The worsening trend of LAZ is more rapid. These worsening trends in child nutrition are not a peculiar case in our study, but common in Ghana.[1] Last column in Table 1 shows *p*-values for *t*-test on difference in the sample means between control and treatment. There

[1]See GSS et al. (2015).

is no statistically significant difference even at 10 percent level. Therefore the baseline characteristics are well balanced between control and treatment groups. However we cannot observe significant impacts of the information provision on child's nutrition in simple difference tests.

3. Results

3.1 Mothers' Beliefs about their Children's Nutritional Status

Our hypothesis stands on mothers' misperception about their children's nutritional status. If mothers misperceive, particularly overestimate, their children's nutritional status, correcting their beliefs may adjust mothers' feeding behaviors to more efficient levels by providing objective information. To collect mothers' beliefs, we ask mothers to rate their children's nutritional status on a five-point scale: 1=Very Bad, 2=Bad, 3=Normal, 4=Good, 5=Very Good.[2]

Figure 2 presents distributions of mothers' beliefs. We divide full sample into three groups: children's WAZ at the baseline > -1, -1 > WAZ > -2, and -2 > WAZ. This definition is identical to the message types: "Good", "Caution", and "Danger" but we include not only treated mothers but also control mothers in the sample. Panel A shows that most of mothers whose children are well nourished correctly perceive their children's nutritional status in terms of child's weight. Since WAZ of children is larger than -1, normal and positive perceptions are appropriate and 80 percent of the mothers has such perceptions. In panel B, although the proportion of mothers with negative perceptions increases, many mothers have positive perceptions. It is difficult to regard these positive perceptions as misperception because WAZ of children is larger than -2 which is underweight level.[3] But we think that it is not appropriate to regard them as good nutritional status because their WAZ is below -1 and "Normal" is more appropriate. Panel C indicates that most of mothers with underweighted children overestimate their children's nutritional status. About 30 percent of the mothers perceive their children as good nutritional status but the

[2]A question is "What do you feel about current nutritional condition of your child?".

[3]WHO defines that a child is underweighted if her WAZ is below -2. This definition is the reason why we use the term "Danger" when child's WAZ is below -2.

children are underweighted in fact. Of course mother's perception builds on not only child's weight but also other factors. However when using the criterion of weight, we find that some mothers misperceive the nutritional status of their children.

3.2 Econometric Analysis

We estimate intention-to-treatment effects of the information provision about child's nutritional status. Our identification strategy stands on a difference-in-difference estimation by using a first difference estimator. The specification is as follows:

$$\Delta Y_{ij} = \beta D_{ij} + \mu_j + \epsilon_{ij} \quad (1)$$

where ΔY_{ij} is a difference in our outcome variables between the baseline and the follow-up. We use child's weight-for-age Z-score and length-for-age Z-score as the outcomes. D_{ij} is a treatment dummy. μ_j indicates CWC fixed effects. ϵ_{ij} is an error term and clustered at the CWC level.

Table 2 shows the results. The results of equation (1) without CWC fixed effects are in column (1) and (3). The outcomes in column (1) and (3) are the difference in WAZ and LAZ respectively. We find positive but insignificant point estimates of the information provision. In column (2) and (4), we add CWC fixed effects and obtain insignificant results again.

The results indicates that the information provision does not have an impact on child's physical growth. However, as we explain in previous sections, the messages differ depending on child's nutritional status at the time of the baseline survey. Therefore we divide the treatment dummy into three categories by following the message types. We estimate effects of three message types on child's weight in column (3) and child's length in column (6). In column (3), we find a negative and significant coefficient of the message "Good" and positive and significant coefficients of the messages "Caution" and "Danger". These opposite effects cause the insignificant point estimates of the whole effects. The results in column (3) indicate that the negative messages prompt mothers to improve their children's nutrition but the positive message discourages mothers from making an effort to improve by reassuring the mothers. Although the effect of the positive message is

negative, its point estimate is -0.19. In addition, WAZ of children assessed as "Good" are, by the definition, higher than -1. It means that child's nutritional status is far from underweight level even after the negative effect.[4] Therefore we think its effect size is small. On the contrary, point estimates of "Caution" and "Danger" are 0.45 and 1.03 respectively and these effect sizes are large enough to pull children's nutritional status away from the underweight level.

In column (6), we find a positive and significant coefficient of the message "Caution" but positive and insignificant coefficients of the messages "Good" and "Danger". Comparing to the case of WAZ, the results of LAZ is not distinct in terms of statistical significancy. One possible reason is that the treated mothers may pay attention to their children's weight because our information provision is based on child's weight. In addition, mothers can check weight growth in CWC every month but they cannot confirm change in child's height. Another possible reason is that a period between the intervention and the follow-up survey may be too short. Since we distributed the report cards in August 2019 and conducted the follow-up survey in November-December, the period between those is about three months. Three months may be too short to observe the effects on child's height.

4. Conclusions

This paper presents the effects of updating mothers' beliefs about their children's nutritional status. At the time of the baseline survey, mothers with low-weight children tend to overestimate their children's nutritional status. Although the whole effects of information provision about their children's nutrition status are insignificant, we find that the effects of the information vary depending on contents of the messages. The negative messages improve child's physical growth but a positive message has a negative effect on child's weight. However, the size of the negative effect of positive message is small in our context and the positive impacts of the negative messages are large enough to put children away from underweight.

[4]In other words, a lot of the children whose mothers receive the positive message still remain in "Good" nutritional status after the negative effect of the information provision.

Our results give evidence that when mothers misperceive their children's nutritional status they adjust their behaviors in response to the objective information about children's nutrition. However it is important to note that the reactions are not always a good one. Although a warning message has positive impacts, a reassuring message may induce undesirable results. As a matter of development policy, sending only a warning message may be a better option. What kind of design is desirable as a way to provide information is a question of future research.

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A. The message card of "Good"

Report Card of Child Nutrition

CWC Location : _____
Household ID : _____
Mother's Name : _____
Child's Name : _____

Child's Nutrition Status : **Good**

Note:
The definition of "Nutrition Status" is based on child's weight (weight-for-age Z-score: WAZ), specifically, "**Good**" if WAZ is above -1. WAZ was **measured in the Baseline Survey**, that is, March-April (NOT measured in August).
"Good" can be interpreted as your child's weight was **good** when it was measured, again that is in March-April.

B. The message card of "Caution"

Report Card of Child Nutrition

CWC Location : _____
Household ID : _____
Mother's Name : _____
Child's Name : _____

Child's Nutrition Status : **Caution**

Note:
The definition of "Nutrition Status" is based on child's weight (weight-for-age Z-score: WAZ), specifically, "**Caution**" if WAZ is below -1 but above -2. WAZ was **measured in the Baseline Survey**, that is, March-April (NOT measured in August). "Caution" can be interpreted as your child was **relatively underweighted** when he/she was measured, again that is in March-April.

C. The message card of "Danger"

Report Card of Child Nutrition

CWC Location : _____
Household ID : _____
Mother's Name : _____
Child's Name : _____

Child's Nutrition Status : **Danger**

Note:
The definition of "Nutrition Status" is based on child's weight (weight-for-age Z-score: WAZ), specifically, "**Danger**" if WAZ is below -2. WAZ was **measured in the Baseline Survey**, that is, March-April (NOT measured in August).
"Danger" can be interpreted as your child was **underweighted** when he/she was measured, again that is in March-April.

Figure 1. Designs of the Report Cards

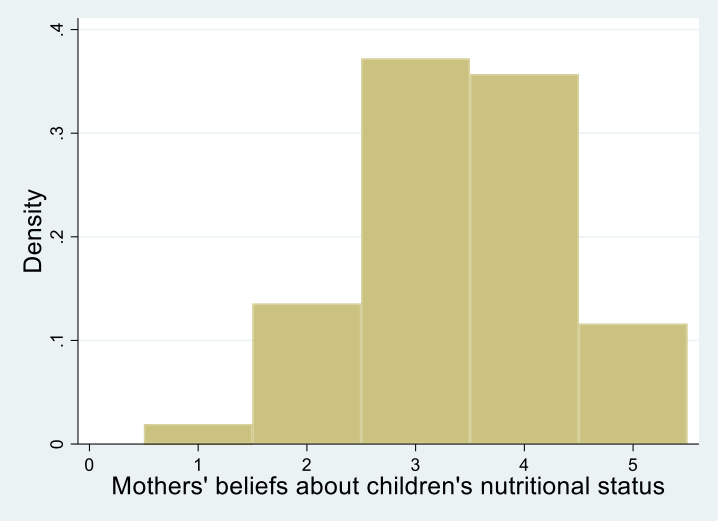
Table 1. Summary statistics and balance tests

	Full sample			Control		Treat		Control - Treat		
	Mean	SD	N	Mean	N	Mean	N	Mean	SE	*p*-val C=T
Panel A. Baseline mothers' and children's characteristics										
Household size	4.39	1.59	693	4.37	278	4.41	415	-0.033	0.123	0.788
Age of mother (years)	29.8	14.5	671	29.1	269	30.3	402	-1.176	0.969	0.226
Education of mother (years)	7.83	4.58	684	8.14	271	7.63	413	0.508	0.358	0.156
Belief about child's nutrition†	3.31	0.97	689	3.34	274	3.28	415	0.061	0.075	0.418
Child is female	0.496	0.500	692	0.502	277	0.492	415	0.010	0.039	0.792
Age of child (months)	10.66	3.65	693	10.79	278	10.57	415	0.219	0.284	0.442
Panel B. Baseline children's nutrition										
Weight-for-age Z-score (WAZ)	-0.423	1.263	635	-0.436	249	-0.415	386	-0.020	0.102	0.843
Length-for-age Z-score (LAZ)	0.454	1.435	604	0.418	238	0.478	366	-0.060	0.120	0.620
Panel C. Follow-up children's nutrition										
Weight-for-age Z-score (WAZ)	-0.480	1.112	635	-0.511	249	-0.460	386	-0.051	0.089	0.565
Length-for-age Z-score (LAZ)	-0.112	1.220	604	-0.208	238	-0.049	366	-0.159	0.100	0.114

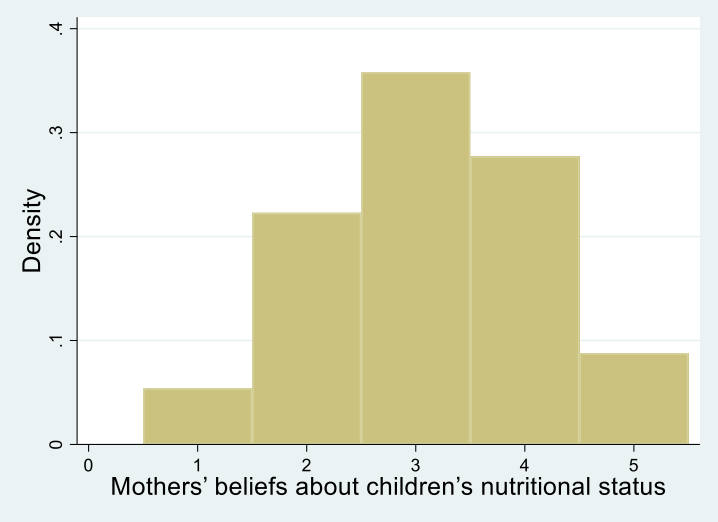
Notes: Data source of Panel A and B is baseline survey and data source of Panel C is follow-up survey.

† We ask mothers “What do you feel about current nutritional condition of your child?” to collect their beliefs about children’s nutrition in the baseline survey. We use five scales: 1=Very Bad, 2=Bad, 3= Normal, 4=Good, and 5=Very Good.

Panel A. Children's WAZ > -1 at the baseline



Panel B. Children's WAZ >-2 and < -1 at the baseline



Panel C. Children's WAZ < -2 at the baseline

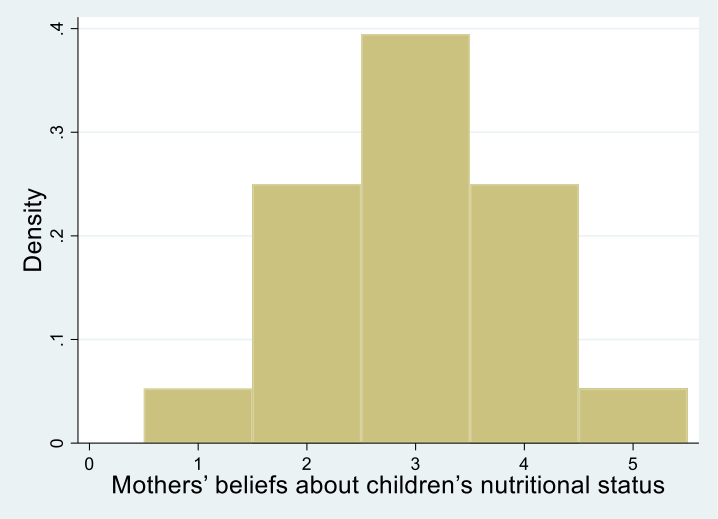


Figure 2. Distributions of mothers' beliefs about their children's nutritional status

Notes: We ask mothers "What do you feel about current nutritional condition of your child?" to collect their beliefs about children's nutrition in the baseline survey. We use five scales: 1=Very Bad, 2=Bad, 3= Normal, 4=Good, and 5=Very Good.

Table 2. The effects of the information provision on child's physical growth

	ΔWAZ			ΔLAZ		
	(1)	(2)	(3)	(4)	(5)	(6)
Information Provision	0.0311	0.0773		0.0994	0.1213	
	(0.0897)	(0.0928)		(0.0894)	(0.0942)	
By message types						
"Good"			-0.1908*			0.0396
			(0.0911)			(0.1060)
"Caution"			0.4526***			0.2562*
			(0.1103)			(0.1435)
"Danger"			1.0352***			0.3061
			(0.2411)			(0.2018)
CWC fixed effects	No	Yes	Yes	No	Yes	Yes
Observations	635	635	635	604	604	604

Notes: WAZ and LAZ mean weight-for-age Z-score and length-for-age Z-score respectively. "Good" means that a treated mother receives the message "Good" by the report card and her child's WAZ is larger than -1 at the time of the baseline survey. "Alert" means that a treated mother receives the message "Caution" by the report card and her child's WAZ is lower than -1 and larger than -2 at the time of the baseline survey. "Danger" means that a treated mother receives the message "Danger" by the report card and her child's WAZ is lower than -2 at the time of the baseline survey. *** $P < 0.01$. ** $P < 0.05$. * $P < 0.1$. Standard errors clustered at the CWC level in parentheses.