

RESEARCH ARTICLE

Analysis of Rural Indonesian Mothers' Knowledge, Attitudes, and Beliefs Regarding Stunting

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Abstract:

Background: Stunting affects 36% of children in Indonesia. While the biological causes and physiological effects of stunting are well documented, research on the determinants of caregiver understanding of stunting is limited.

Objective: The purpose of this study was to explore factors associated with rural Indonesian mothers' attitudes, knowledge, and beliefs regarding stunting. These findings can support the efforts of policy-makers and program planners in Indonesia to reduce the prevalence of stunting.

Methods: Researchers conducted 1-hour, in-home interviews with 2100 mothers of children 6-23 months of age throughout five rural regions in Indonesia. These regions were selected because of the high prevalence of stunting, representativeness, and accessibility. The interviews assessed socio-economic and educational level, feeding practices, nutritional and stunting knowledge, sources of nutrition and stunting knowledge, and acute child health status. Regression analysis was performed to identify factors associated with respondent attitudes, knowledge, and beliefs toward stunting.

Results: A negative relationship was found between having received information about stunting more than six months prior and knowledge of stunting ($\beta=-0.24$, $P=0.001$). Having never received information on child nutrition was negatively associated with stunting beliefs ($\beta=0.20$, $P<0.0001$). Although there was no significant difference in amount of knowledge between those who had received their knowledge about stunting from a professional versus the internet, having primarily received information from a neighbor/friend, was negatively associated with knowledge of stunting ($\beta=-0.20$, $P=0.007$). This finding was the same for stunting beliefs ($\beta=-0.40$, $P<0.0001$).

Conclusion: Caregiver knowledge, attitudes, and beliefs toward stunting can be significantly impacted by their exposure to both accurate and inaccurate information. From this research, initiatives aimed at reducing stunting in Indonesian children should consider ways to integrate new education systems that increase the range of exposure and incorporate use of the social network in order to impact health behavior change.

Key Words: Stunting, Child Nutrition, Theory of Planned Behavior, Indonesia

1. Introduction

Stunting is the most prevalent form of child malnutrition, affecting more than 161 million children under the age of five worldwide.^{1,2} It is defined as having a height/length below two standard deviations from the “WHO Child Growth Standards” median for homogenous age and sex.³ In Indonesia, where the children are considered some of the most disadvantaged in the world, approximately 9.2 million (37%) children under the age of five experience stunting.^{4,5}

A recent review regarding risk factors for stunting conducted by Corsi, Mejía-Guevara, and Subramanian⁶ identified three major risk factor areas or predictors for stunting. The first area of risk identified was poverty, as defined by maternal height, BMI, education, and household wealth variables. A second area of risk associated with stunting included dietary diversity and poor nutrition. The third group of risk factors included sanitation, household air quality, and vaccination.

Socioeconomic status (SES) shares an inverse relationship with stunting.⁷ An in-

creased prevalence of stunting has been observed among the rural and urban poor, those less educated, and those living in low-income neighborhoods.⁸ For low SES families and children, both the poor quality and low quantity of available foods contribute to the high incidence of stunting.⁹ More specifically, nutritional deprivation and severity of stunting are plainly correlated.¹⁰

The period of 6-24 months has been identified as a critical time for infant growth, and is the period in which incidence of stunting is highest.⁹ Mothers frequently mistake “short” child height as a normal genetic circumstance, however child growth and stunting is a key indicator of nutritional health status among children.¹¹ Educating mothers and potential mothers regarding the causes and risk of stunting is an essential step in reducing the prevalence of stunting. A systematic review found that educating mothers about complementary feeding led to extra weight gain of 3.0 kg and a gain of 0.49 cm in height when compared to control groups.⁹ These results suggest that maternal nutritional counseling can

lead to a significant increase in weight and height among children 6-24 months of age.

Family dynamics also play a role in risk of stunting. Studies suggest that the familial influence can impact stunting incidence as much or even more than national and territorial factors.¹² One study in Pakistan found that maternal empowerment (and increased decision-making in the home) was associated with reductions in child stunting.¹³ A study in Nigeria identified an association between mothers who work outside the home and are unable to bring children to work with an increased risk of child stunting.¹⁴

The Theory of Planned Behavior (TPB) hypothesizes that intention is the best predictor of behavior. According to the TPB, three primary factors influence an individual's intentions, including attitudes toward behavior, social subjective norms, and perception of behavioral control. Interventions targeting one or more of these determinants are predicted to impact an individual's behavioral intentions and subsequent behavior.¹⁵ The TBP has been used to evaluate the effect of maternal knowledge, attitudes and beliefs on childhood health. A study of mothers in Hong Kong concluded self-efficacy, or perceived behavioral control, was a significant predictor of prolonged breastfeeding.¹⁶ Penafiel *et al.*¹⁷ found that increased knowledge related to the health benefits of traditional foods among mother's in Ecuador decreased child malnutrition. A cross-sectional study in Indonesia and Bangladesh concluded that increased maternal education resulted in significantly reduced stunting risk in both countries.¹⁸

Interventions targeting knowledge, attitudes and beliefs have the potential to dramatical-

ly impact health behavior and decrease rate of stunting among Indonesian children. Programs designed to influence key constructs of the TPB have the potential to improve current health behaviors and decrease rates of stunting among Indonesian children. The purpose of this study was to investigate and identify risk factors associated with Indonesian mothers' knowledge, attitudes, and beliefs related to stunting.

2. Methods

2.1. Design. This study utilized data from a survey conducted by the National Nutrition Communication Campaign (NNCC). The survey was designed to assess the impact of nutrition-related attitudes and behaviors of mothers in rural Indonesian provinces. Data were collected to inform a future media campaign effort. The current study includes cross-sectional data collected prior to the mass media campaign.

2.2. Sample. The study sample consisted of mothers of children under two years of age. Respondents who did not qualify for this category were excluded. Women were recruited from five regions in Indonesia, including Sumatera, Java, Kalimantan, Nusa Tenggara and Sulawesi. These regions were selected for the larger effort because of the high prevalence of stunting, representativeness, and accessibility. The number of respondents within each region was determined using the 30 Cluster Method.³ A village within a district was considered a cluster, and 30 were selected from each district. Respondents within clusters were then randomly selected to participate. The sample for the current study included 2,100 respondents that reported using or not using the internet to acquire stunting/nutrition

information. Participants without a response were excluded from analyses.

2.3. Procedure. Participants were recruited to participate in a 60-minute interview. An interview guide was developed for each component of questionnaires and each question was addressed. The questionnaire was piloted prior to data collection to ensure moderator calibration and resolve problems. After a participant's home was randomly selected for participation, an interviewer traveled to the home, acquired consent to participate and then conducted a face-to-face interview. Interviewers used a structured interview guide to ask questions and collect responses. Participant responses were recorded on the actual interview guide and then transferred to an electronic database for data cleaning and analyses. Participants were compensated for their time in the form of soap, detergent, and tooth paste. All study procedures were approved by FPH-UI Ethic Clearance no 104/H2.F10/PPM.00.02/2014.

2.4. Measurement. Demographic information was gathered as respondents were asked to report their age, education level, floor material type, commodity ownership, and work status. Additional information gathered by the questionnaire included: infant feeding practices; health practices during pregnancy and use of local health services; access to clean water and adopted sanitation; acute health status of the children in the household; decision making in the home in regards to the purchase of medicines, expensive goods, daily necessities, and food; knowledge of stunting and attitudes toward nutrition; media consumption habits, household revenue, and household expenditures.

In measuring attitudes, responses for items "Nutrition and child health are mother/women issues," "Not every house must have a latrine," "Because husband is responsible to sustain the family, he does not need to help his wife take care of their children," and, "Boy child needs better nutrition than girl child" were combined to form a composite variable. Each item response was recoded as either zero or one to indicate positive or negative attitude. These responses were then summed, with a higher value indicating a more negative attitude toward stunting. Several items were excluded from the composite variable after factor analysis. An additional item was also excluded as it was determined to represent knowledge rather than attitudes.

Respondent knowledge was evaluated using the item, "In your opinion, what does it take to avoid stunting/shorty in under 2 y/o child?" Respondents provided answers such as vitamin intake, participation in sports, and hygiene practices. These responses were then recoded with correct answers equaling one and incorrect answers equaling zero. Numbered responses were summed, resulting in a "knowledge" variable with a range of 0-4, where higher numbers represent more knowledge.

Beliefs were measured using a similar technique where the item, "In your opinion, stunting/shorty in under 2 y/o child will cause what?" was used to create a beliefs variable. Responses included stupidity, illness, interrupted growth, and obesity. Correct answers then were recoded as 1 and incorrect answers were recoded as 0 resulting in a scale ranging between 0 and 4 with 4 representing correct beliefs.

Regression analysis was performed comparing respondent attitudes, knowledge, and beliefs to the following response items: source of information about stunting, who the women went to for prenatal care, whether or not they had utilized an Integrated Health Post and frequency of use, when they had last received information on stunting, acute health status of child, whether or not they had received information on child nutrition and when the last time they had received information on child nutrition was. Several of these variables were recoded to make analysis more efficient. Source of information on stunting was recoded to have three categories: professional, internet, and friend. Source of prenatal care was divided into two categories: trained provider (which included general practitioner, gynecologist, nurse, village midwife, private midwife, and health center midwife) and traditional birth attendant (which also included other and none.) For acute health status, several items were summed to create a composite variable where a high score represented more health problems.

2.5. Statistical Analysis. SAS version 9.4 was used to calculate all statistics. Descriptive statistics were calculated for demographics and decision making practices. Multiple regression analysis was used to identify factors associated with stunting knowledge, attitudes, and beliefs. A second regression model was run to adjust for the following variables: mother's age, wealth indicator, mother's education, and mother's occupational status.

3. Results

The respondents averaged 27.97 years of age with 88.60% not working (Table 1). Whereas educational status varied from none or less than primary graduate to at least some college, the majority of respondents' highest level of education was primary school graduate or less than senior graduate (55.45%), followed by senior graduates at 25.10%. Most respondents owned between two and five commodities (43.43%), with 6.57% owning fewer than two, and 14.1% owning six or more.

The decision-making status in respondent households was largely equal or in favor of the mother, with the husband and wife being equally responsible for purchase of child medication and purchase of expensive goods (49.1% and 46.7% respectively) (Table 2). Many respondents reported being responsible for deciding what food was purchased (68.2%) and cooked in the household (77.7%), as well as what food was given to the youngest child (83.9%).

There was no significant association between source of knowledge about stunting and attitudes about stunting (Table 3). There was also no association between attitudes and type of care the women received during pregnancy. Those who did not go to the Integrated Health Post were more likely to report negative attitudes toward stunting ($\beta = 0.18$, $P = 0.043$). There was also no relationship between how recently someone had received information about stunting/shorty and their attitude toward stunting. However, those who had never received information on childhood nutrition were more likely to demonstrate negative attitudes toward stunting ($\beta = 0.20$, $P < 0.0001$).

Table 1: Summary of Participant Demographics

	Percent (N=2100)
Average mother's age*	27.97 years
Ownership of House	
Privately owned or house belongs to parents/family/sibling	96.57
Does not own house	3.43
Wealth Index**	
Owens 0 Commodities	1.00
Owens 1 Commodities	5.57
Owens 2 Commodities	15.24
Owens 3 Commodities	20.62
Owens 4 Commodities	26.10
Owens 5 Commodities	17.33
Owens 6 Commodities	9.38
Owens 7 Commodities	3.05
Owens 8 Commodities	1.29
Owens 9 Commodities	0.38
Owens 10 Commodities	0.05
Mother's Occupation Status	
Working	11.40
Not Working	88.60
Mother's Education Status	
None or less than primary graduate	11.81
Primary school graduate or less than senior graduate	55.48
Senior Graduate	25.10
At least some college	7.62

*Mother's age is reported in years not percentage.

**Wealth Index includes a sum of all the commodities in the home. Commodities include: electricity, radio, telephone, mobile phone, refrigerator, TV, bicycle/canoe, motorcycle/motor boat, car/truck, and computer/laptop.

There was no significant difference in amount of knowledge between those who had received their knowledge about stunting from a professional versus the internet (Table 4). Having received information from a neighbor/friend, however, was negatively associated with knowledge of stunting ($\beta = -0.20, P = 0.007$). Those who utilized a birth attendant rather than a trained health professional were less likely to have knowledge about stunting ($\beta = -0.10,$

$P = 0.01$). There was no significant relationship between use of an Integrated Health Post and knowledge of stunting. There was a negative relationship between having received information about stunting more than six months prior and knowledge of stunting ($\beta = -0.24, P = 0.001$). No significant relationship was found between having received information on childhood nutrition and knowledge of stunting.

Table 2: Summary of Decision-Making Status within Participant Households

Question*	Percent (N=2100)					
	Respondent	Husband	Husband and Respondent	Other Person	Respondent and other person	Decision never been taken
Child medication	30.67	14.14	49.05	2.52	3.62	0
Buy expensive goods	12.10	33.24	46.67	2.86	3.05	2.10
Buy daily needs (besides food)	51.95	15.33	26.05	2.62	3.38	0.67
Buy household goods for food	68.24	9.43	13.19	4.71	4.00	0.43
Type of food to be cooked everyday	77.71	4.29	8.14	5.24	4.10	0.52
Type of food to be given for the youngest child	83.95	2.81	7.14	1.86	2.95	1.29

*All questions were in response to “Who in your family does the following:”

Although there was no significant difference between receiving knowledge about stunting from a professional or the internet and beliefs about stunting, receiving information from a neighbor/friend was negatively associated with beliefs about stunting ($\beta = -0.40, P < 0.001$) (Table 5). No signif-

icant relationships were found between beliefs about stunting and Integrated Health Post use, or having received information on stunting/shorty. Not having received information on child nutrition was negatively associated with stunting beliefs ($\beta = -0.14, P < 0.001$).

Table 3: Regression to Predict Attitudes about Stunting

Variable	Unadjusted		Adjusted*	
	Point Estimate	P-value	Point Estimate	P-value
Source of Knowledge About Stunting	1.5		2.4	
Professional	-	-	-	-
Internet	-0.03	0.83	0.10	0.52
Neighbor/friend	0.11	0.22	0.12	0.19
To whom did you check during your pregnancy?	1.8		1.8	
Trained Health Professional	-	-	-	-
Birth attendant or none	0.22	0.009	0.06	0.47
Did you ever go to Integrated Health Post	1.8		1.8	
Yes	-	-	-	-
No	0.22	0.013	0.18	0.043
Use on Integrated Health Post	1.8		1.7	
Did go to Integrated Health Post last month	-	-	-	-
Did not go to Integrated Health Post last month	0.14	0.043	0.10	0.16

When was the last time you ever got information about stunting/shorty?	1.5		2.5	
≤ 3 months ago	-	-	-	-
4-6 months ago	0.25	0.13	0.12	0.47
> 6 months ago	0.06	0.49	0.07	0.45
Child Acute Health Status **	1.8		1.8	
Illness Severity	0.03	0.11	0.016	0.44
Have you ever got information about child nutrition?	1.7		1.7	
Yes	-	-	-	-
No	0.31	<0.0001	0.20	<0.0001
When was the last time did you get information about child nutrition?	1.7		2.4	
≤ 3 months ago	-	-	-	-
4-6 months ago	0.06	0.59	0.06	0.59
> 6 months ago	0.06	0.41	0.10	0.18

*Adjusted for mother’s age, wealth indicator, mother’s education, and mother’s occupation status.

**Acute health issues can include: fever, cough, breathing problem, breathing faster or gasping, diarrhea more than 3 times in a day followed by soft/liquid feces.

Table 4: Regression to Predict Knowledge of Stunting

Variable	Unadjusted		Adjusted*	
	Point Estimate	P-value	Point Estimate	P-value
Source of Knowledge About Stunting	1.9		1.3	
Professional	-	-	-	-
Internet	-0.11	0.36	-0.19	0.15
Neighbor/friend	-0.18	0.009	-0.20	0.007
To whom did you check during your pregnancy?	1.9		1.8	
Trained Health Professional	-	-	-	-
Birth attendant or none	-0.099	0.008	-0.10	0.01
Did you ever go to Integrated Health Post	1.9		1.8	
Yes	-	-	-	-
No	-0.01	0.78	-0.009	0.83
Use on Integrated Health Post	1.9		1.8	
Did go to Integrated Health Post last month	-	-	-	-
Did not go to Integrated Health Post last month	-0.02	0.61	-0.02	0.51
When was the last time you ever got information about stunting/shorty?	1.9		1.4	
≤ 3 months ago	-	-	-	-
4-6 months ago	-0.21	0.11	-0.17	0.21
> 6 months ago	-0.24	0.0008	-0.24	0.001
Child Acute Health Status **	1.9		1.8	
Illness Severity	0.015	0.095	0.016	0.1089
Have you ever got information about child nutrition?	1.9		1.8	
Yes	-	-	-	-
No	-0.002	0.94	-0.004	0.88

When was the last time did you get information about child nutrition?	1.9		1.8	
≤ 3 months ago	-	-	-	-
4-6 months ago	-0.03	0.65	0.005	0.94
> 6 months ago	-0.05	0.24	-0.04	0.34

*Adjusted for mother’s age, wealth indicator, mother’s education, and mother’s occupation status.

**Acute health issues can include: fever, cough, breathing problem, breathing faster or gasping, diarrhea more than 3 times in a day followed by soft/liquid feces.

Table 5: Regression to Predict Beliefs about Stunting

Variable	Unadjusted		Adjusted*	
	Point Estimate	P-value	Point Estimate	P-value
Source of Knowledge About Stunting	2.4		1.8	
Professional	-	-	-	-
Internet	-0.16	0.27	-0.23	0.14
Neighbor/friend	-0.44	<0.0001	-0.40	<0.0001
To whom did you check during your pregnancy?	2.04		2.1	
Trained Health Professional	-	-	-	-
Birth attendant or none	0.059	0.19	0.08	0.099
Did you ever go to Integrated Health Post	2.05		2.07	
Yes	-	-	-	-
No	0.02	0.67	0.05	0.28
Use on Integrated Health Post	2.05		2.1	
Did go to Integrated Health Post last month	-	-	-	-
Did not go to Integrated Health Post last month	-0.04	0.26	-0.02	0.60
When was the last time you ever got information about stunting/shorty?	2.2		1.7	
≤ 3 months ago	-	-	-	-
4-6 months ago	0.22	0.18	0.25	0.13
> 6 months ago	-0.14	0.11	-0.14	0.12
Child Acute Health Status **	2.06		2.09	
Illness Severity	-0.016	0.13	-0.009	0.42
Have you ever got information about child nutrition?	2.1		2.2	
Yes	-	-	-	-
No	-0.16	<0.0001	-0.14	<0.0001
When was the last time did you get information about child nutrition?	2.1		1.98	
≤ 3 months ago	-	-	-	-
4-6 months ago	0.02	0.78	0.04	0.60
> 6 months ago	-0.05	0.36	-0.06	0.22

*Adjusted for mother’s age, wealth indicator, mother’s education, and mother’s occupation status.

**Acute health issues can include: fever, cough, breathing problem, breathing faster or gasping, diarrhea more than 3 times in a day followed by soft/liquid feces.

4. Discussion

The purpose of this study was to examine diverse factors influencing Indonesian mothers' knowledge, attitudes, and beliefs regarding stunting. Specific variables examined included source/recent receipt of stunting information, prenatal/pregnancy care, child acute health status, source/recent receipt of child nutrition information as relevant risk factors for stunting.

4.1. Knowledge. Mothers' knowledge regarding the causes of stunting was predicted by the primary source of stunting information. Mothers receiving knowledge from a professional/trained health agent had a more accurate understanding of stunting, compared to those who received information from a friend or neighbor. There was, however, no significant difference between mothers who received information from an internet source and those who received information from a trained health professional. As a result, internet sources should not be ruled out as a method of health knowledge communication.

Additionally, accuracy of stunting knowledge was predicted by the source that provided prenatal care to the mother. In fact, contact with health professionals in general (for both pre- and post-natal care) resulted in higher knowledge regarding stunting. Thus, the more interaction and contact Indonesian mothers have with trained health professionals, the more accurate their stunting-related knowledge becomes. This is valuable information for health and behavioral change agencies as it highlights the importance of the source where mothers receive health information.¹⁵ More accurate knowledge regarding stunting and general health could have a profound effect on fu-

ture behaviors regarding general health practices.⁶

In addition to the source of stunting information, the most recently received information regarding stunting had a significant impact on stunting knowledge. The more time that had passed since receiving information regarding stunting, the more inaccurate a mother was likely to be with regards to stunting knowledge. This negative influence of knowledge over time would suggest more frequent contact from trained health representatives could alleviate many of the misconceptions surrounding stunting.¹¹

4.2. Attitudes. Attitudes toward stunting describe the mothers' perceptions regarding the impacts of stunting on their children. "Negative" stunting attitudes represent the belief that stunting has negative consequences for the affected child. In effect, negative attitudes toward stunting represent the ideal belief system for Indonesian mothers.

The results of the survey indicated that the impacts of the chosen variables on stunting attitudes were contrary to what might be expected, namely that increased education regarding stunting produced increased caregiver understanding, and eventual decreases in stunting.^{16,18} For mothers surveyed, those who did not receive services at the Integrated Health Post were more likely to have negative attitudes regarding stunting as compared to mothers who did receive services. Mothers who had never received information about child nutrition also had a more negative view toward stunting as compared to those who had received information. The reason for these results is unclear, and necessitates further study and investigation. Potential research

questions include learning where mothers who were not utilizing the Integrated Health Post were receiving their information, and identifying what was taught to those mothers who received information, but still had a less negative view of stunting.

These findings suggest several potential opportunities to shaping attitudes related to stunting among Indonesian mothers. First, in order to increase correct maternal attitudes about stunting, it is important to design programs that provide as many mothers as possible with accurate information about child nutrition. Curriculum should be evaluated to ensure that information is presented in a way that is both understandable and culturally relevant, as well as personally relevant to mothers. Second, it is recommended that efforts focus on utilizing existing opportunities to provide education regarding stunting, including during visits to the Integrated Health Post (Posyandu). Efforts should likewise focus on creating additional education opportunities for Indonesian mothers, especially opportunities for mothers to challenge engrained cultural attitudes related to the causes of stunting. Finally, interventions should address existing barriers and work to increase supports to receiving services at the Integrated Health Post.

4.3. Beliefs. Source of knowledge about stunting was strongly associated with mothers' correct or incorrect beliefs about stunting. Mothers whose knowledge about stunting came from friends and family were more likely to possess incorrect or false beliefs about stunting when compared to knowledge attained from professional sources. There was, however, no significant

difference between mothers who received information from an internet source and those who received information from a trained health professional. These results suggest that having accurate information available through both professional and online sources would help ensure the development of correct beliefs about stunting that might otherwise remain incorrect if derived from family and friends. However, in many cultures advice from family can be more influential than from professional sources.¹⁹ Mothers generally receive information from a diverse network including family, friends, online and written sources. Thus, other potential avenues should be explored and utilized by professional health educators when seeking to disperse nutritional knowledge to mothers.¹⁹ Potential avenues include local published sources, and community programs and classes.

Beliefs about stunting were also found to be strongly associated with a mother's past exposure to knowledge of child nutrition. For those mothers who reported never having received information about child nutrition, false beliefs about stunting were significantly higher when compared to those who had received information about child nutrition. This finding agreed with previous research in Bangladesh, which found that a mother's "practical knowledge" of nutrition was more important to the overall health status of her child than her formal education, and that a mother's enhanced nutritional knowledge was found to decrease the risk of stunting.²⁰ These results suggest the importance of developing methods to inform expectant and current mothers about child nutrition to correct inaccurate beliefs about stunting.

5. Conclusion

The purpose of this study was to analyze the factors that influence Indonesian mothers' attitudes, knowledge, and beliefs regarding stunting. Findings indicate that receiving information on stunting and child nutrition is still an important influencer in the development of accurate knowledge, attitudes, and beliefs predictive of behavioral intent and subsequent health behaviors and outcomes. Furthermore, social connections are also shown to impact stunting knowledge and beliefs, but may not provide the most accurate messages about health and nutrition. No significant difference was shown in the dissemination of knowledge via the internet as opposed to in person. Efforts to decrease rates of stunting in Indonesian children may consider ways to integrate new education systems that incorporate use of social networks to create interventions that result in positive health behavior changes.

6. Conflict of Interest Statement

The authors declare no conflicts of interest regarding the publication of this paper.

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References

1. De Onis M, Branca F. Childhood stunting: a global perspective. *Matern Child Nutr.* 2016 May;12:12-26. doi:10.1111/mcn.12231
2. United Nations Children's Fund, W.H.O., & The World Bank. (2014).

WHO, and World Bank, 2014, 'Joint Child Malnutrition Estimates'. *New York: UNICEF, Geneva: WHO, Washington: The World Bank*

3. World Health Organization. Oral health surveys: basic methods. World Health Organization. 2013.
4. De Onis M, Dewey KG, Borghi E, Onyango AW, Blossner M, Daelmans B, Piwoz E, Branca F. The World Health Organization's global target for reducing childhood stunting by 2025: rationale and proposed actions. *Matern Child Nutr.* 2013 Sep 18; 9:6-26. doi:10.1111/mcn.12075
5. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B, International Child Development Steering Group. Developmental potential in the first 5 years for children in developing countries. *Lancet.* 2007 Jan 6;369(9555):60-70. doi:10.1016/S0140-6736(06)60032-4
6. Corsi DJ, Mejía-Guevara I, Subramanian SV. Risk factors for chronic undernutrition among children in India: Estimating relative importance, population attributable risk and fractions. *Soc Sci Med.* 2016 May1;157:165-185. doi:10.1016/j.socscimed.2015.11.014
7. Anderson NB, Armstead CA. Toward understanding the association of socioeconomic status and health: A new challenge for the biopsychosocial approach. *Psychosom Med.* 1995 May 1;57(3):213-225.
8. Mushtaq MU, Gull S, Khurshid U, Shahid U, Shad MA, Siddiqui AM. Prevalence and socio-demographic correlates of stunting and thinness among Pakistani primary school child-

- ren. *BMC Public Health*. 2011 Dec;11(1):790. doi:10.1186/1471-2458-11-790
9. Imdad A, Yakoob MY, Bhutta ZA. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC Public Health*. 2011 Dec;11(3):S25. doi:10.1186/1471-2458-11-S3-S25
 10. Koziel S, Lipowicz A. Concurrent effect of social factors and maturity status on height and BMI of adolescent girls. *J Life Sci*. 2009 Dec 1;1(2):133-137.
 11. World Health Organization Expert Committee. Committee on physical status: the use of and interpretation of anthropometry: report of a WHO Expert Committee. 1995.
 12. Frongillo Jr EA, Rauschenbach BS, Olson CM, Kendall A, Colmenares AG. Questionnaire-based measures are valid for the identification of rural households with hunger and food insecurity. *J Nutr*. 1997 May 1;127(5):699-705. doi:10.1093/jn/127.5.699
 13. Khalid H, Martin EG. Female-headed households associated with lower childhood stunting across culturally diverse regions of Pakistan: Results from a cross-sectional survey. *Matern Child Health J*. 2017 Oct 1;21(10):1967-1984. doi:10.1007/s10995-017-2314-z
 14. Ukwuani FA, Suchindran CM. Implications of women's work for child nutritional status in sub-Saharan Africa: a case study of Nigeria. *Soc Sci Med*. 2003 May 1;56(10):2109-2121. doi:10.1016/S0277-9536(02)00205-8
 15. Ajzen, I. Behavioral interventions based on the theory of planned behavior: Brief description of the theory of planned behavior. 2006.
 16. Shi L, Zhang J, Wang Y, Guyer B. Breastfeeding in rural China: association between knowledge, attitudes, and practices. *J Hum Lact*. 2008 Nov;24(4):377-385. doi:10.1177/0890334408319157
 17. Penafiel D, Termote C, Lachat C, Espinel R, Kolsteren P, Van Damme P. Barriers to eating traditional foods vary by age group in Ecuador with biodiversity loss as a key issue. *J Nutr Educ Behav*. 2016 Apr 1;48(4):258-268. doi:10.1016/j.jneb.2015.12.003
 18. Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *Lancet*. 2008 Jan 26;371(9609):322-328. doi:10.1016/S0140-6736(08)60169-5
 19. Carruth BR, Skinner JD. Mothers' sources of information about feeding their children ages 2 months to 54 months. *J Nutr Educ*. 2001 May 1;33(3):143-147.
 20. Jesmin A, Yamamoto SS, Malik AA, Haque MA. Prevalence and determinants of chronic malnutrition among preschool children: a cross-sectional study in Dhaka City, Bangladesh. *J Health Pop Nutr*. 2011 Oct;29(5):494.