Factors associated with food insecurity among women and children in rural Rajasthan, India

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Abstract
Food insecurity remains a significant problem in India, especially among women and children. The purpose of this paper is to measure food security and describe associated factors in rural Rajasthan, India. Pregnant women and women with young children belonging to self-help groups were surveyed for this study. Factors associated with food insecurity for both women and children included increased poverty, low dietary diversity, belonging to a tribe, and failing to save money to cover food expenses. For women, using more coping strategies and having a husband who made decisions about how money the woman earned was used were associated with food insecurity, while not having received food from an Integrated Child Development Service center was associated with food insecurity in children. These findings suggest that actions for improving food security may include facilitating saving for food needs, improving decision-making power among women, and increasing ties to organizations that cater to child development needs.

Key Words: Food security; India; maternal health; child health; Rajasthan; gender

Introduction
Eradicating world hunger and ensuring food security worldwide is a major public health priority. The United Nations World Food Programme (WFP) estimates that 795 million people globally, or one in nine, are considered food insecure (WFP, 2015). According to the World Health Organization (WHO), food security includes food availability and use and exists when populations "have access to sufficient, safe, nutritious food to maintain a healthy and active life" (WHO, 2015).

While global food security has improved over the last several decades, it is still a serious problem for countries like India, which ranked 68th out of 109 countries according to the Global Food Security Index (GFSI) study of food insecurity measured in both developed and underdeveloped nations (Nuru, 2015). The WFP reports that one in four hungry people in the world lives in India and 32.7 percent of its population lives on less than $1.25 a day (Nuru, 2015). India faces what has become known as the "Asian Enigma," which describes the paradox that exists where improvements in stunting and under-nutrition have not kept pace with economic growth and where Indian malnutrition rates are actually higher than some locations in Sub-Saharan Africa (Ramalingaswami *et al*., 1996).

Since 1975, India has run one of the largest child development programs through the Integrated Child Development Services (ICDS) scheme, whose objectives are to provide supplementary nutrition, pre-school and non-formal education, nutrition and health education, immunizations, health check-ups, and referral services through local ICDS centers, locally known as Anganwadi centers (Ram *et al*., 2014). In addition, Indian lawmakers have implemented legislation to address food security, including the 2013 National Food Security Act (NFSA). This act guarantees subsidized grain to a reported 70 percent of the population and contains provisions for children and pregnant women. Both the ICDS Scheme and the NFSA are not without criticism. Research has shown mixed impacts of the ICDS Scheme on malnutrition (Government of India, 2011) and it is unclear whether the NFSA will make a long-term impact on food security (Mahr, 2014).

Despite the attempts of the Government of India (GoI) to implement comprehensive programs designed to reduce malnutrition and food insecurity, malnutrition and food insecurity persist. Within the Indian state of Rajasthan, over half of women and adolescent girls suffer from anemia and 36 percent of children under the age of five are stunted (GoI, 2015). Stunting is highest among tribal children (54 percent) in the region compared to non-tribal children (45 percent), and severe stunting is greater among tribal girls (31 percent) compared to tribal boys (27 percent) (UNICEF, 2014).

While the definition of food security is simple and is often measured by household access to food (Webb *et al*., 2006), it is a complex concept. Leveraging a baseline assessment conducted among women living in predominantly tribal communities in rural Rajasthan, this paper seeks to 1) understand the factors that determine a woman's and her children's food security status, and 2) discuss implications for entities striving to increase food security in India.

Literature review

Widely reported socioeconomic factors associated with food insecurity include poverty, having large numbers of children, and living in rural locations (Furness *et al.*, 2004; Gundersen and Gruber, 2001; Hossain, Naher, and Shahabuddin, 2005). Women are also at a higher risk of food insecurity. For example, in one study among children in Brazil, females were 2.21 times as likely to be food insecure than males (de Souza Bittencourt *et al.*, 2013); in another study among adolescents in Southwest Ethiopia, being female was a significant independent predictor of food insecurity (Belachew *et al*., 2012). Food insecurity is also associated with under-nutrition (Kaiser *et al*., 2002) and other negative health outcomes, including low dietary diversity (Lo *et al.*, 2012; Faber *et al*., 2009).

Research of factors associated with food insecurity in India is consistent with these findings. For example, rural tribal groups in India, who are more likely to live in poverty, are more vulnerable to food insecurity and malnutrition (Das and Bose, 2015). Similarly, in a study of determinants of food insecurity in urban New Delhi, Chinnakali *et al.* (2014) found that households headed by an individual with a middle school or higher education were significantly more likely to be food secure, and those with a lower income were also more likely to be food insecure. Dietary

diversity is also associated with under-nutrition and food insecurity in India (Hoddinott and Yohannes, 2002).

Behaviors, including coping strategies, associated with food insecurity appear to vary across cultures. In one study of Aboriginal and Canadian children, social support and reducing food consumption were both commonly used in food insecure groups, while seeking institutional assistance was not (Tam *et al*., 2014). Comparatively, coping strategies in rural Nepal include selling agricultural and livestock products, collecting wild foods, and using savings (Khatri-Chhetri and Maharjan, 2006). In India, reported strategies include relying on less expensive foods, limiting food consumption, borrowing from friends, buying food on credit, relying on food aid, withdrawing children from school to save money, and sending children to work (Gupta *et al*., 2015; Mohapatra, 2012; Sabar, 2014).

While there is much research on prevalence of and factors associated with food insecurity globally, more studies are needed in countries like India, where food insecurity prevalence remains high. As Upadhyay and Palanivel (2011) argue, the causes of food insecurity in India are complex; they include traditional factors (unavailability of food and poor purchasing capacity), socio-demographic factors (illiteracy, unemployment, overcrowding, poor environmental conditions, and gender bias), and politico-developmental factors (lack of intersectoral coordination and political will, poorly monitored nutritional programs, and inadequate public food distribution systems). An understanding of unique factors associated with food insecurity assists practitioners in designing targeted and effective interventions.

Methodology

Background

The Freedom from Hunger organization, together with its Indian affiliate organization, Freedom from Hunger India Trust, New Delhi and its Indian implementing non-governmental organization (NGO) partners, Voluntary Association of Agricultural General Development Health and Reconstruction Alliance (VAAGDHARA) and Professional Assistance for Development Action (PRADAN), aim to improve resilience, food security, and nutrition among poor tribal households in rural Rajasthan with an integrated program that includes self-help groups of women that come together for financial transactions such as savings and loans, agricultural livelihoods, nutrition education, and gender dialogues. The baseline assessment is part of a simple pre-test and post-test assessment conducted with program participants.

Sampling and data collection

In May 2015, baseline data was collected from 403 clients belonging to PRADAN and VAAGDHARA to assess knowledge, attitudes, and behaviors associated with food security. Survey respondents were selected from Banswara and Sirohi districts and were self-help group (SHG) members who were either pregnant (in their 2nd or 3rd trimester of pregnancy) or had children of less than two years of age.

After conducting a census of all SHG members who fit these criteria, 1394 women were found to have children who were 0-2 years old, and 250 women were found to be pregnant. These numbers were used to establish the final distribution of the 400 interviews that were planned for the baseline: 85 percent of the total respondents were drawn from mothers with children between

the ages of 0-2 years and the remaining 15 percent were drawn from the SHG members who were pregnant. The census further revealed that out of 1394 women with children 0-2 years, 1022 were from Sirohi and the remaining 372 were from Banswara. Similarly, out of 250 pregnant women, 202 were from Sirohi and the remaining 48 from Banswara. The baseline therefore consists of 249 mothers and 48 pregnant members from Sirohi and 91 mothers and 12 pregnant members from Banswara.

The survey assessed basic demographic information including poverty, food security, dietary diversity, preventive health, water and sanitation, financial stress, curative care, household decision-making, breastfeeding, and infant/child feeding. Additional demographic information assessed included religious affiliation and affiliation with a tribe or caste, household size, marital status, and age and sex of children living in the household. In India, caste and tribal affiliations are defined by birth, reflect a social stratification of the population, and are often used to develop anti-discrimination policies and governmental quotas for disadvantaged castes or tribes (Krishna, 2003).

Poverty was measured using the Progress out of Poverty Index® designed for India (Schreiner, 2011). Dietary diversity was measured utilizing a standardized tool developed by the Food and Agriculture Organization (FAO) of the United Nations (Kennedy *et al*., 2011). Coping strategies were measured using the Coping Strategies Index (CSI) from CARE (Maxwell and Caldwell, 2008), which uses 13 variables to assess respondent's coping behaviors during a food shortage. Many of the health questions, such as the food security question, were drawn from a Health Outcomes Performance Indicators (HOPI) project conducted by Freedom from Hunger (Gray, 2015) or India's Demographic and Health Survey (IIPS, 2007).

Food security was measured by asking respondents to reflect on the prior twelve months and choose among four statements that would best describe the female respondent as well as the female respondent's perception of her children: "have enough food and of the kinds of nutritious foods we want to eat"; "have enough food but not always nutritious food"; "sometimes not enough food to eat and was sometimes hungry"; and "often not enough food to eat, was often hungry". This simple measure has often been used by Freedom from Hunger with microfinance practitioners who have resource constraints for collecting data for their programs. Despite its blunt measure of food security, it has been found to be correlated with poverty and other expected factors of well-being (Gray, 2015). Additionally, given that the dietary diversity index and the coping strategies index were both used in this survey, in combination it was believed all three measures would give different pictures of food security.

Data analysis

Poverty likelihoods were established per the guidelines set forth from the Progress out of Poverty (PPI) scorecard guidelines by Schreiner (2011). Scores from 10 variables were summed to obtain a composite raw PPI score for each individual. These questions, selected specifically for India, cover items such as number of people in the household, household type, primary source of energy used for cooking, etc. Raw PPI scores were then matched to a likelihood of poverty range found in the scorecard in order to obtain a mean likelihood of living below the national poverty line (NPL) using the 'National Tendulkar' poverty line (for example, if the PPI score was between 0-4, the likelihood of living below the NPL was 86.8 percent).

The food security questions used allow a practitioner to establish food security levels in the following ways, where "having enough food and of the kinds of nutritious foods we want to eat" is classified as "food secure"; "having enough food but not always nutritious food" is classified as "food insecure without hunger"; "sometimes not having enough food to eat and was sometimes hungry" is classified as "food insecure with moderate hunger"; and "often not enough food to eat, was often hungry" is classified as "food insecure with severe hunger." Survey respondents were asked to report both for themselves and for their children. For analysis purposes, clients were described as either food secure or food insecure, where food secure households were those who answered "had enough food and of the kinds of nutritious foods we want to eat" and food insecure households combined the food insecure with no hunger, with moderate hunger, and with severe hunger categories into one category. Their response to the question related to their children was scored similarly.

Dietary diversity scores (DDS) were generated from guidelines by Kennedy, Ballard, and Dop (2011). Food categories were coded so that an answer of 'no' to having consumed any food in the past 24 hours equaled a score of 0, and an answer of 'yes' equaled a score of 1. Food groups included starches, legumes, milk and milk products, fish, eggs, meat, organ meat, fruits, vegetables, and fruits and vegetables high in Vitamin A. The scores for DDS ranged from 0-9. A score of 0 indicated none of the food consumed in the past 24 hours by the household surveyed fell under the categories of interest, and nine indicated food from all nine of the food groups were consumed by the family.

For the CSI, raw coping scores were computed per the guidelines set forth by Maxwell and Caldwell (2008). New variable names were created for each of the sub-questions that asked about specific coping strategies, such as borrowing food, limiting portion size, etc. The answer selections were re-coded using the same 0/1 scheme mentioned above in order to compute a new coping score. After this was done, the individual coping scores were totaled to create a raw total coping score.

After the indices were calculated, statistical tests were run using SAS (version 9.4). Descriptive statistics were computed to describe the study sample. Unadjusted and adjusted logistic regressions were run for women and children separately to describe potential factors associated with food insecurity. Chi-square tests were conducted to compare both food insecurity in female heads of household and children to hypothesized factors of food security.

Results

Demographics

The majority of survey respondents (99.8 percent) were Hindu, members of a tribe (90.8 percent), married (96.5 percent), not pregnant (78.2 percent), and had children under the age of 2 (94.4 percent). Nearly 79 percent of the women in this survey were reported to be food insecure, compared to 77 percent of children of these households. The mean age of women sampled was 29.3 years. The mean number of children was 3.27, with the mean number of daughters slightly higher than that of sons. The mean age of the youngest child in each household was 1.09 years (Table 1).

Table 1: Sample demographics

Characteristic	*n*	Percent (%)	Mean
Religion			
Hindu	402	99.75	-
Muslim	1	0.25	-
Caste or Tribe			
Caste	37	9.18	-
Tribe	366	90.82	-
Marital Status			
Single	6	1.49	-
Married	389	96.53	-
Separated/Divorced	1	0.25	-
Remarried (was divorced or widowed)	7	1.74	-
Currently pregnant			
Yes	85	21.09	-
No	318	78.19	-
Any children under age 2			
Yes	373	94.43	-
No	22	5.57	-
Child food security			
Secure	94	23.33	-
Insecure	309	76.67	-
Female head of household food security			
Secure	85	21.09	-
Insecure	318	78.91	-
Age of participant	-	-	29.33
Age of youngest child	-	-	1.09
Number of children	-	-	3.27
Number of daughters	-	-	1.72
Number of sons	-	-	1.55

Factors associated with food insecurity in women

For women, the following resulted in an increased odds of food insecurity: i) increased poverty per the PPI NPL (OR=1.054, p<.0001); ii) higher number of coping mechanisms used (OR=1.33, p=.012); iii) lower dietary diversity (OR=0.58, p=.0005); iv) belonging to a tribe (OR=4.89, p=.0021); v) husband making decisions about how money a woman earned would be used (OR=2.27, p=.03); and vi) not having saved money to cover future food expenses (OR=4.79, p=.0005).

Having spoken to a spouse about household nutrition and food needs, confidence in affording nutritious foods, life satisfaction, and having received supplementary food from an ICDS center did not increase the odds of women being food insecure.

Table 2: Logistic regression, factors associated with food insecurity in women

Quantitative Variable	Unadjusted OR	P-value	Adjusted OR	P-value
PPI NPL	1.07	<.0001*	1.054	<.0001*
Raw coping score	1.43	<.0001*	1.33	.012*
Dietary Diversity Score	0.49	<.0001*	0.58	.0005*
Caste or Tribe	10.63	<.0001*	4.89	.0021*
Decisions about how money woman earns will be used	2.83	<.0001*	2.27	.03*
Spoken with spouse about household nutrition and food needs	2.96	.0012*	1.68	0.24
Confidence in affording nutritious foods	3.01	<.0001*	1.74	0.14
Life Satisfaction	3.99	<.0001*	1.82	.15
Received supplementary food from ICDS	1.4	.18	1.6	.19
Saved money to cover future food expenses	7.08	<.0001*	4.79	.0005*

**Indicates significance at the .05 level*

Factors associated with food insecurity in children

For children, as for women, increased poverty per the PPI NPL (OR=1.04, p<.0001), lower dietary diversity (OR=0.67, p=.0024), belonging to a tribe (OR=4.56, p=.0009), and mother failing to save money to cover future food expenses (OR=3.44, p=.0008) indicated an increased odds of food insecurity. Likewise, mother having spoken with spouse about household nutrition needs, confidence in affording nutritious foods, and life satisfaction were not associated with an increased odds of food insecurity.

Unlike for women, children whose households had received supplementary food from an ICDS Center had increased odds of being food insecure (OR=1.8, p=.05). Having spoken to spouse about household nutrition and food needs, confidence in affording nutritious foods, and life satisfaction did not increase the odds of children being food insecure.

Table 3: Logistic regression, factors associated with food insecurity in children

Quantitative Variable	Unadjusted OR	P-value	Adjusted OR	P-value
PPI NPL	1.05	<.0001*	1.04	<.0001*
Raw coping score	1.21	.005*	1.04	.63
Dietary Diversity Score	0.553	<.0001*	0.67	.0024*
Caste or Tribe	8.97	<.0001*	4.56	.0009*
Decisions about how money woman earns will be used	2.41	.0004*	1.4	.29
Spoken with spouse about household nutrition and food needs	2.33	.0048	1.35	.42
Confidence in affording nutritious foods	2.44	.0004*	1.3	.4
Life Satisfaction	3.61	<.0001*	1.9	.07
Received supplementary food from ICDS	1.56	.06*	1.8	.05*
Saved money to cover future food expenses	5.81	<.0001*	3.44	.0008*

**Indicates significance at the .05 level*

Coping strategies

As noted above, food insecure households utilized more coping strategies than food secure households. However, food secure households consumed seed stock held for next season at a higher percentage than food insecure households (61.2 percent vs. 41.5 percent; p=.001) (Table

4). Borrowing food or relying on friends or relatives for help, skipping entire days without eating, and taking children out of school were the only coping strategies with no significant difference between food secure and food insecure households. The top coping strategy for food secure households was borrowing food or relying on friends or relatives, whereas the most used strategy for food insecure households was relying on less expensive or less preferred foods.

Table 4: Chi-square tests of female head of household food security and coping strategies

Coping strategy	% Food secure	% Food insecure	Sig
Relying on less preferred and less expensive foods			
Yes	80	94.65	<.0001*
No	20	5.35	
Borrow food/or rely on help from friends or relatives			
Yes	89.41	91.82	.48
No	10.59	8.18	
Gather wild food, hunt, or harvest immature crops			
Yes	12.94	30.82	.001*
No	87.06	69.18	
Consume seed stock held for next season			
Yes	61.18	41.51	.001*
No	38.82	58.49	
Send household members to eat elsewhere			
Yes	1.18	9.43	.01*
No	98.82	90.57	
Limit portion sizes at mealtimes			
Yes	20	44.97	<.0001*
No	80	55.03	
Restrict consumption by adults in order for small children to eat			
Yes	4.71	22.64	.0002*
No	95.29	77.36	
Feed working members of the household at the expense of non-working members			
Yes	0	7.86	.008*
No	100	92.14	
Reduce number of meals eaten in a day			
Yes	22.35	38.99	.004*
No	77.65	61.01	
Skip entire days without eating			
Yes	16.47	22.96	.2
No	83.53	77.04	
Take children out of school			
Yes	1.18	4.72	.1380
No	98.82	95.28	

*Indicates significance at the .05 level

Discussion

The purpose of this study was to describe food insecurity in women and children and assess factors associated with food insecurity among these groups.

Factors associated with food insecurity: similarities between women and children

There was much overlap in those variables significantly associated with food insecurity for both women and children. This is unsurprising, as rural Indian culture emphasizes traditional gender roles; women are expected to be primary childcare providers, which means that women's time, activities, and rights are linked to their children's (Foundation for Sustainable Development, 2015). Common factors associated with food insecurity for women and children included being a member of a tribe, low dietary diversity, and an increased likelihood of living below the national poverty line, all variables associated with poverty. These results are consistent with other studies on food security in developing nations. Hoddinot and Yohannes (2002) found in an analysis of 10 countries, including India, that a 1 percent increase in dietary diversity was associated with a 0.7 percent increase in per capita food consumption, a 0.5 percent increase in staple foods, and a 1.4 percent increase in non-staple foods. Similarly, Faber *et al*., (2009) found that low dietary diversity scores in South African populations were associated with a higher frequency of food shortages and that dietary diversity was an effective indicator of food insecurity. Regarding the relationship between tribal status and food insecurity, it is known that tribes in India suffer high rates of poverty, illiteracy, and access to health facilities (Das and Bose, 2015).

For both women and children, failing to save money for food purchases was associated with an increased risk of food insecurity. Previous studies have also found such an association (Millimet *et al.*, 2015; Gundersen and Garasky, 2012; Nolan *et al.*, 2006; Foley *et al*., 2010). While other prominent food security factors include upstream social determinants such as economic factors and social and gender norms that may be difficult for organizations to impact, the finding that saving money is associated with food security may represent an opportunity for more actionable interventions, namely in the form of teaching households financial literacy or developing financial tools that help food insecure households plan for and build savings to cover future food costs. Studies on the value of savings groups in West Africa found that when women come together to save, household food security improved (Baro *et al*., 2013). Studies of the efficacy of financial literacy programs to improve food security are uncommon; however, other financial literacy programs undertaken in low-income countries appear successful in improving finance-related behaviors (Miller *et al.*, 2009). In India, for example, Seshan and Yang (2013) implemented and evaluated financial literacy workshops among migrant families in India and found a 72.4 percent increase in savings and increased female participation in joint decision-making as a result of their intervention.

Factors associated with food insecurity: differences

Women who indicated that decisions about their incomes were primarily made by their husbands were more likely to be food insecure. Other studies indicate that money in the hands of women is more likely to go towards food purchases than income in the hands of men (Quisumbing *et al*., 1995). Other research also demonstrates that the empowerment of women is important in improving health outcomes of both women and children, and researchers stress the importance of developing national health policies that aim to increase female empowerment (Scanlan, 2004). However, programs to increase female household decision-making are sometimes ineffective in the short-run, particularly among microcredit and lending programs for women (Banerjee *et al.*, 2015), due to patriarchal hold on assets and subsequent diversion of funds to less important purposes (Garikipati, 2008). This is an obstacle that must be considered when considering credit as a means to improve food security. Another variable associated with food insecurity in women but not children was the increased use of coping strategies. The impact of financial decision-

making and coping behaviors on women's food security but not children's may be because women in unstable environments will often sacrifice food for their children (Nalty *et al*., 2013). In our study, women also reported themselves slightly more food insecure than their children.

A unique factor associated with food insecurity among children included having received food from an ICDS center. This is likely because the primary purpose of ICDS centers is to support child development (World Bank, 2004). ICDS centers employ a holistic approach to child development, and food supplementation is only one of the eight main services offered through these programs. However, food supplementation has become the focus of many ICDS centers (Gragnolati *et al*., 2006). While this focus may temporarily improve food security in children, it comes at the expense of other program components. Other components such as nutrition education and family food budgeting may be cost-effective methods to improve children's food security, but are not currently being implemented to their full potential. ICDS centers often experience inconsistent food supply and may not always have the resources to help the children in the villages they serve (Gragnolati *et al*., 2006). The poorest states in India with the highest malnutrition rates have the lowest ICDS center coverage, and some research indicates that ICDS centers have very little impact on children's nutritional status across the country (Lokshin *et al*., 2005; GoI, 2011).

Coping strategies

In this study, we were interested in assessing differences in coping strategies used between food secure and insecure households. The use of coping strategies is so closely associated with food security that this is often used to measure it (Maxwell, 1996). Maxwell *et al*. (2003) argue that using coping strategies to measure food insecurity is cheaper and simpler than other measures (especially measuring actual food consumption) and that such indices are correlated with complex measures of food insecurity. However, coping strategies are still sometimes used by food secure households; Shariff and Khor (2008) reported in a study of a poor rural community in Malaysia that some coping strategies were used more often by secure households in times of food insufficiency, such as selling valuable assets, borrowing money, and receiving money from family. The relationship between coping behaviors and food security may vary greatly by culture and geographical location; consequently, coping strategies as a measure of food security may not always be an appropriate measure of food insecurity. In our study, the one coping strategy used more frequently by food secure individuals was consuming seed stock held for next season. This may be because individuals who have access to seed stock may also be more likely to farm or own land. Research indicates that female farmers in India are more likely to be in a medium-income bracket (Dwivedi, 2011), and the higher a family's income, the more likely they are to be food secure (Smith *et al*., 2000).

For food secure individuals, the most common coping strategies were first, borrowing food or relying on help from friends or relatives, and second, relying on less preferred foods. The most common strategies for food insecure families were the same, but in reverse order. It is not surprising that both food secure and insecure households commonly rely on less preferred and less expensive foods due to the widespread distribution of cheap grains to alleviate hunger in poor countries (Banerjee and Duflo, 2011; Mahr, 2014). Gupta *et al*. (2015) also found in urban-slum dwellers in Delhi, India that food insecure households relied on less expensive foods and limited their food consumption but unlike the women in our study, they relied heavily on purchasing food on credit. However, the most vulnerable participants in the study were unable to

purchase food on credit. In the same study, they found households relying on money they had saved by the family for times of need as well as food stored by the household.

The high percentage of borrowing from family and friends found in this study may be due to collectivist attitudes and a strong cultural reliance on family in Indian culture, especially in rural areas (Chadda and Deb, 2013; Desai, 2007). Interestingly, Indian women and children belonging to more traditional patriarchal extended families are reported to have better health outcomes, including better nutritional status and better antenatal care, than those belonging to westernized, nuclear families common in urban India (Allendorf, 2013; Kumar and Ram, 2013). Strong family bonds could be a protective health factor in rural India; comparing determinants of food security in urban Indian locations to the findings in this study could be of interest.

Limitations

Several indices exist to measure food security, such as the Global Food Security Index (GSFI) and the Household Food Insecurity Access Scale (HFIAS), and they tend to measure similar variables, such as food affordability, availability, quality and safety, quantity, and uncertainty (Coates *et al.*, 2007; Webb *et al*., 2006). This study used a one-question scale that has been used elsewhere (Gray, 2015; Gray and Gash, 2014) and has been found to be useful in gaining a quick understanding of the food security of the household, but it is not widely validated. Thus, food security in this study could have been inaccurately reported. However, Freedom from Hunger has found that in resource-constrained situations, this scale provides a useful blunt measurement of food security that is useful for practitioners.

Given one focus of the project is on gender dialogues between men and women, the role of other gatekeepers, such as mothers-in-law, was overlooked when assessing decision-making power within the household. This could potentially confound the reporting of decision-making factors since, in some cases, an "other" decision-maker was not offered as an answer option. This study may not report decision-making as a factor of food insecurity accurately; further research of this relationship and other third-party influences on food security could be interesting.

Conclusion

The results from this study suggest that food insecurity is widely experienced among tribal households in rural Rajasthan, India. Factors associated with food insecurity are consistent with findings from previous studies, especially socioeconomic factors. Other unique factors associated with food insecurity that warrant further research and could influence decisions related to integrated agriculture, nutrition, and gender programs implemented in this region include a strong emphasis on saving money for food, helping households reduce use of negative coping mechanisms during seasons of food insecurity, strengthening linkages to and operations of ICDS centers for food supplementation, and facilitating strong intra-household financial decision-making. These findings may be beneficial in guiding intervention efforts in this population, especially as understanding determinants of food security can help non-governmental and other health organizations more effectively assist India's most vulnerable populations in improving nutrition and associated health outcomes.

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