



Seasonal variations in household food security and dietary diversity and associations with maternal and child nutritional status in rural Ethiopia

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Background

- Low dietary diversity is associated with chronic under-nutrition in children (Mallard et al, 2014)
- Roba et al (2016) found infant dietary diversity also associated with maternal dietary diversity
- Generally in Ethiopia there is low dietary diversity amongst mothers and infants – e.g. Hirvonen and Hodidinott (2016) find only 3% of children aged 6-24 months in a large sample consumed WHO-recommended min. 4 food groups
- In Ethiopia food availability and access strongly affected by seasonality – many households face severe food scarcity during lean season (Hirvonen et al, 2016)
- Some studies show seasonality has an effect on dietary patterns (e.g. Tetens et al, 2003 (Bangladesh); Savy et al, 2006 (Burkina Faso))



Rationale and Aim

- Household food security indicators, e.g. dietary diversity, are often taken as proxies of nutritional status
- Relatively few studies have directly analysed relationships between food security indicators and direct measures of nutritional status based on anthropometric measurement and bio-markers
- Also, these measures may vary by season - but are such variations consistent?
- This study in rural Ethiopia addresses these issues: it measures nutritional status through anthropometric and bio-marker measurement and analyses their association with food security indicators in both seasons (post-harvest and “lean” season).
- The analysis is exploratory: to what extent are food security indicators adequate proxies for nutritional status? Do associations differ on a seasonal basis?



Study Design

- 2 study areas: East Hararghe Zone (Oromiya Region) and SE Tigray
- 400 households selected in each area: woredas (Districts) and kebelles (sub-Districts) selected by level of food insecurity, then households randomly selected proportionate to kebele population
- Detailed livelihood and food security data collected in two seasons: post-harvest and lean season
- Sub-sample of 183 households across both areas randomly selected from larger sample: comprised households with mothers + children 6-23 months old
- Detailed anthropometric measurement + blood tests for zinc, ferritin and haemoglobin
- “Standard” food security indicators calculated: HDDS, FCS, HFIAS; also IDDS and WDDS
- Analysis using correlations and regression analysis (ordered logit and probit)



Descriptive Statistics for Food Security and Nutrition Indicators by season (% figures indicate proportion below minimum food security/nutrition thresholds)



	Pre-harvest	%	Post-harvest	%	Paired t-test	
	Mean (SD)		Mean (SD)		Mean diff (SE)	P-value
HDDS	5.8 (1.6)	17.8	6.1 (1.63)	16.4	-0.25 (0.12)	0.042**
HFIAS	6.6. (6.0)	86.2	3.7 (4.0)	54.1	2.9 (0.5)	<0.001***
HFCS	33.11 (4.4)	64.9	31.7 (9.9)	60.1	1.32 (1.0)	0.22
IDDS	2.59 (1.33)	80.3	2.67 (1.32)	77.6	-0.07 (0.14)	0.60
WDDS	2.87 (1.7)	82.7	3.04 (0.85)	94.0	-0.17 (0.14)	0.25
LAZ	-2.02 (1.47)	48.1	-1.72 (1.47)	39.3	-0.3 (0.009)	0.009**
WAZ	-1.22 (1.5)	31.0	-1.3 (1.3)	27.3	0.12 (0.13)	0.37
Maternal haemoglobin	12.4 (1.7)	34.1	13.1 (1.3)	21.5	-0.76 (0.15)	<0.001***
Maternal BMI	18.6 (2.6)	51.5	19.1 (2.1)	45.4	-0.5 (-0.2)	0.012**



Seasonal Variations in Food Security and Nutritional Status

- Household food security indicators generally better post-harvest compared to pre-harvest
- IDDS and WDDS also better post-harvest – but major Regional differences (DD greater for East Hararghe than Tigray in both seasons)
- Maternal BMI, haemoglobin and anaemia worse in pre-harvest



Association between household food security indicators and women's nutritional status: pre- and post-harvest season (ordered logit and probit regressions)

	HFAS		FCS		HDDS	
	Pre-harvest	Post-harvest	Pre-harvest	Post-harvest	Pre-harvest	Post-harvest
WDDS (9 food groups)	-0.08***	-0.06	0.03***	0.05**	0.37***	0.21*
Min. dietary diversity (>4 food groups)	-0.05**	-0.07**	0.022**	0.22**	0.21**	0.04*
Maternal BMI	-0.02	-0.016	0.05**	0.04**	0.05	0.008
Maternal haemoglobin	-0.07	-0.06	0.004**	0.004**	0.21	0.21**
Maternal ferritin	n.a.	-0.03	n.a.	-0.01	n.a.	0.25***
n	183	183	183	183	183	183



Seasonal variations in women's food security and nutritional status

- Strong association between household food security and women's dietary diversity in pre-harvest season; less strong association post-harvest except for FCS
- Maternal BMI and haemoglobin associated with FCS in both seasons – quantity of food/frequency of consumption important as well as diversity
- Maternal haemoglobin and ferritin significantly associated with HDDS post-harvest – indicates improved household dietary diversity has positive effect on iron status of mothers



Association between household food security indicators and infant nutritional status: pre- and post-harvest season (ordered logit and probit regressions)

	HFIAS		FCS		HDDS	
	Pre-harvest	Post-harvest	Pre-harvest	Post-harvest	Pre-harvest	Post-harvest
IDDS (7 food groups)	-0.02	-0.05**	0.03**	0.005	0.38***	0.05
Min. IDD (> 3 food groups)	-0.02	-0.07**	0.03***	0.013	0.38***	0.13**
Stunting		-0.37		0.08	n.s.	0.44**
Weight-for-length Z score	-0.01**	-0.031	0.03**	0.38**	0.15	0.26**
n	183	183	183	183	183	183



Seasonal variations in infants' food security and nutritional status

- IDDS significantly associated with FCS and HDDS pre-harvest, but not with HFIAS
- Stronger associations between infant dietary diversity measures and HFIAS post-harvest
- Stunting significantly associated with HDDS post-harvest but not in pre-season; no significant associations of stunting with other food security indicators
- Weight-for-length significantly associated with FCS in both seasons, HDDS post-harvest only, HFIAS pre-harvest only.



Discussion: food security and maternal nutrition

- Significant levels of food insecurity in both seasons, particularly pre-harvest: magnitude of seasonal change greatest for HFIAS
- Both HDDS and FCS significantly associated with maternal dietary diversity in both seasons – suggests household dietary diversity may be important indicator for maternal nutrition
- Maternal BMI positively associated with FCS in both seasons, but not with other indicators
- HDDS positively associated with maternal haemoglobin and ferritin in post-harvest season only – increase in dietary diversity post-harvest may be linked to household food production and availability, whereas increased diversity pre-harvest may be due to mothers eating foods which are nutritionally inferior (e.g. wild foods)



Discussion: food security and infant nutrition

- Weight-for-length score (WLZ) of children had significant association with FCS in both seasons and with HDDS post-harvest
- Significant association of stunting with HDDS in post-harvest season only, not with other food security indicators
- No significant relationships found between food security indicators and serum zinc, ferritin or haemoglobin status of children – these biomarkers may not change measurably over a short period; also they are sensitive to dietary constituents which affect micronutrient bioavailability and absorption; also consumption of ASF very low in both seasons – may have higher impact on micronutrient status of children.



Conclusions

- Household FCS associated with maternal BMI and haemoglobin in both seasons, and associated with children's WLZ in both seasons – focus on FCS has positive impact on nutritional status of mothers and children
- Children's WLZ and LAZ associated with HDDS in post-harvest – suggests improved dietary diversity post-harvest improves nutritional adequacy of children
- Different food security indicators have different relationships with nutritional status of mothers and children and these relationships vary by season – suggests the need to use multiple indicators and measurements
- Need to do further work to assess associations between food security indicators and key measures of nutritional status, including micronutrient status.

