



# OVERVIEW OF ETHIOPIAN FOOD CONSUMPTION SURVEY: IMPLICATIONS FOR FOOD FORTIFICATION PROGRAM



Ethiopian Public  
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# Comparison of FCS in African countries

Points of comparison	Ethiopia
When	June-Sep 2011
Where	11 regions 324 EAs
Target groups	
-Children	6-36 m of age
-WRA	-15-49 yrs of age
-Men	-19-45 yrs of age
Method of selection	Randomly
How many	Child 8079 Women 8133 Men 380
Objective	-Individual-level data to inform fortification strategy and diet-related programs
Data collection method	24 hr dietary recall

Cameroon
2009
National 3 regions 90 EAs
12-59 m of age 15-49 yrs of age
Randomly
Child 882 Women 912
-assess consumption of key foods and compare diet/biochemistry
24 hr dietary recall

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ies

	Ethiopia	Uganda	Cameroon
Data collection beyond diet	-Demographic/ socio economic status, health, water, anthropometry	-Demographic/ socio-economic status, anthropometry, biochemistry	-Survey
Nutrient status indicators	- <b>Low intakes:</b> calcium, zinc, vitamin A; adequate iron	- <b>Low intakes</b> and frequent deficiency of iron, vitamin A, zinc	-Levels for minerals, vit. A, B-calcium
Commonly consumed foods	-Oil, wheat flour, salt, sugar	-Oil, wheat flour, sugar, bouillon	-our, and identified
Major finding	-Possibility for fortification -Vitamin A through oil -Simulation for fortification of flour and oil	-Fortification simulations inform national strategy	-minerals: iron, zinc, and
Immediate outcome	-Fortification simulations inform strategy	-Comparisons of diet to biochemical indicators informing national policies and programs	-or
Intermediate outcome	-Fortification protocols under development -Analyses to inform calcium, zinc, vitamin A programs		-in vehicles and sugar)-
Key result	National Food Fortification Plan- initiated		-vegetable

# Overview of Ethiopian NFCS

- First survey of this type in Ethiopia
- Second country in Africa conducting a national food consumption survey on a specific population group
- Financial assistance obtained
  - World Bank through FMoH, Irish Aid, Canadian International Development Agency, Micronutrient Initiative



# Technical and other support

- Central Statistics Agency
  - Sample size and distribution
  - Selection of enumeration area
- Micronutrient Initiative
  - 24-hour dietary data collection and analysis
- Support staff
  - Nearly 200 enumerators
  - 25 supervisors
  - 13 regional coordinators
  - 3 national coordinators
  - 24 coders/ editors
  - 19 data entry clerks
- GAIN –part of data analysis



# Steps toward the NFCS

- The FMOH gave the mandate to EPHI/EHNRI to do the NFCS preparation, implementation, analysis and reporting of the findings.
- This survey was conducted as part of the NNP implementation in order to provide evidence for development of food fortification programs.
- Survey was carried out by involving staff from the FSNRD , HSRD and TMRD of EHNRI.
- Enumerators, supervisors and coders were recruited through the CSA for the duration of the survey.
- The protocols were reviewed and approved by EPHI/EHNRI's SERC.



# Training

- Training of Trainers from EHNRI staff, ~10 days
  - April-May 2011
- Training of survey team, ~21 days, ~200 staff
  - May-June 2011
  - 24-hour dietary recall
  - Anthropometry (height/length, weight, wt/ht child, MUAC, BMI adults)
  - Ethics and professional conduct
  - Interview techniques and team responsibilities
  - Selection of survey clusters
  - Household and individual data collection
  - Quality control/ standardization





# Data collection

Packing for travel



Transporting supplies



Guest House





# 24 hour dietary recall

- Single day recall of all foods and amounts consumed in previous 24 hours
- Recipes of foods prepared and consumed
- Data collection on all 7 days of the week



# 24 hour dietary recall ...

- Source of foods consumed
  - home production
  - Purchased
  - Food aid / gift
- Preparation method, including if locally milled
- Age, sex and numbers noted for shared foods



# 24 hour dietary recall interview





# Anthropometry



**MUAC**



**WEIGHT**



**LENGTH**



**HEIGHT**



# Data preparation

## Steps to calculate the nutrient intakes

- Primary food composition data sourced from EPHI/EHNRI
- Missing data were sourced from:
  - Neighbouring African countries\*
  - Infods international data

\*The phytate food composition database Navarro-Rosenblatt & Ferguson Harvest Plus Challenge Programme



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# Findings

## INTAKES OF WHEAT AND OIL

NATIONALLY REPRESENTATIVE DATA WEIGHTED BY POPULATION SIZE





## Percentage of women of 15-45 years age consuming fortifiable wheat and geometric mean gram intake per day (95% CI)

	Total Population			
	Percentage	Mean	95% CI	
<b>Tigray</b>	<b>15.2</b>	<b>71.7</b>	62.2	82.6
<b>Afar</b>	<b>41.7</b>	<b>119.6</b>	99.5	143.8
<b>Amhara</b>	<b>11.0</b>	<b>43.7</b>	33.0	57.9
<b>Oromiya</b>	<b>26.6</b>	<b>71.9</b>	57.6	89.8
<b>Somali</b>	<b>49.2</b>	<b>94.7</b>	75.1	119.5
<b>Bensangul-Gumuz</b>	<b>12.7</b>	<b>51.4</b>	41.1	64.3
<b>SNNPR</b>	<b>9.5</b>	<b>54.1</b>	45.6	64.1
<b>Gambella</b>	<b>22.9</b>	<b>76.5</b>	52.8	110.9
<b>Harari</b>	<b>54.6</b>	<b>93.1</b>	69.6	124.7
<b>Addis Ababa</b>	<b>55.1</b>	<b>53.6</b>	49.3	58.3
<b>Dire Dawa</b>	<b>62.2</b>	<b>92.4</b>	76.1	112.3
<b>Ethiopia</b>	<b>20.2</b>	<b>64.8</b>	56.5	74.3

\*Fortifiable wheat flour includes reports of consumption of purchased products that contain wheat flour (e.g. white wheat bread, pasta) that could potentially be produced from fortified wheat flour;

**Percentage of women 15-45 years age consuming fortifiable edible oil and mean gram intake per day (95% CI)**

	Total Population			
	Percentage	Mean	95% CI	
<b>Tigray</b>	<b>51.1</b>	<b>7.0</b>	5.4	9.0
<b>Afar</b>	<b>66.5</b>	<b>24.4</b>	20.2	29.5
<b>Amhara</b>	<b>30.9</b>	<b>7.7</b>	5.9	9.9
<b>Oromiya</b>	<b>65.8</b>	<b>10.1</b>	7.3	14.0
<b>Somali</b>	<b>52.2</b>	<b>11.6</b>	9.5	14.1
<b>Bensangul-Gumuz</b>	<b>50.0</b>	<b>7.0</b>	4.7	10.6
<b>SNNPR</b>	<b>40.0</b>	<b>4.5</b>	2.6	7.6
<b>Gambella</b>	<b>61.9</b>	<b>9.8</b>	7.2	13.3
<b>Harari</b>	<b>68.9</b>	<b>15.1</b>	11.4	20.1
<b>Addis Ababa</b>	<b>67.4</b>	<b>11.6</b>	9.2	14.7
<b>Dire Dawa</b>	<b>78.6</b>	<b>16.5</b>	14.0	19.4
<b>Ethiopia</b>	<b>49.5</b>	<b>8.7</b>	7.0	10.7

## Comparison of urban and rural differences consumption of fortifiable wheat and edible oil in women 15-45 years

	Wheat				Oil			
	%	Mean	95%CI		%	Mean	95%CI	
<b>Urban</b>	<b>52.1</b>	<b>56.0</b>	45.8	68.3	<b>72.3</b>	<b>13.6</b>	10.8	17.2
<b>Rural</b>	<b>9.5</b>	<b>84.9</b>	68.8	104.6	<b>41.8</b>	<b>6.7</b>	5.4	8.2
<b>National</b>	<b>20.2</b>	<b>64.8</b>	56.5	74.3	<b>49.5</b>	<b>8.7</b>	7.0	10.7



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# Energy & Nutrient Intakes

Nationally representative data weighted by population size



# Energy intake of children 1-3 years (Kcal)

		Urban			Rural		
	G.Mean	95%	CI		G.Mean	95%	CI
<b>Tigray</b>	<b>644</b>	540	770		<b>607</b>	550	670
<b>Afar</b>	<b>647</b>	457	917		<b>650</b>	592	714
<b>Amhara</b>	<b>480</b>	438	526		<b>479</b>	404	569
<b>Oromiya</b>	<b>655</b>	576	745		<b>617</b>	565	675
<b>Somali</b>	<b>514</b>	485	545		<b>602</b>	549	659
<b>Benshangul-Gumuz</b>	<b>451</b>	420	484		<b>496</b>	409	602
<b>SNNPR</b>	<b>575</b>	482	685		<b>434</b>	390	483
<b>Gambella</b>	<b>507</b>	433	594		<b>428</b>	373	490
<b>Harari</b>	<b>703</b>	593	833		<b>777</b>	702	861
<b>Addis Ababa</b>	<b>651</b>	607	699				
<b>Dire Dawa</b>	<b>640</b>	575	712		<b>835</b>	644	1081
<b>Ethiopia</b>	<b>609</b>	565	656		<b>531</b>	498	567

# Energy intake of women 15-45 yrs (Kcal)

		Urban			Rural	
	G.Mean	95%	CI	G.Mean	95%	CI
<b>Tigray</b>	<b>1207</b>	1121	1300	<b>1428</b>	1280	1591
<b>Afar</b>	<b>1674</b>	1273	2202	<b>1830</b>	1686	1986
<b>Amhara</b>	<b>1112</b>	965	1280	<b>1234</b>	1105	1379
<b>Oromiya</b>	<b>1438</b>	1063	1947	<b>1253</b>	1132	1386
<b>Somali</b>	<b>1070</b>	1006	1137	<b>1254</b>	1152	1364
<b>Benshangul-Gumuz</b>	<b>950</b>	914	986	<b>977</b>	815	1169
<b>SNNPR</b>	<b>1250</b>	1208	1293	<b>1343</b>	1225	1473
<b>Gambella</b>	<b>1234</b>	1073	1419	<b>1128</b>	1025	1243
<b>Harari</b>	<b>1364</b>	1238	1501	<b>1547</b>	1249	1916
<b>Addis Ababa</b>	<b>1218</b>	1121	1323			
<b>Dire Dawa</b>	<b>1259</b>	1110	1427	<b>1612</b>	1171	2217
<b>Ethiopia</b>	<b>1295</b>	1109	1513	<b>1280</b>	1212	1352



# Calcium intake of children (1-3 years)

Geometric mean (mg) weighted for population size

Region	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	160	116 - 223		115	92 - 144	
Afar	152	74 - 311		255	177 - 368	
Amhara	131	116 - 148		109	92 - 129	
Oromiya	182	126 - 263		164	143 - 188	
Somali	142	120 - 169		150	121 - 186	
Benshangul-Gumuz	129	75 - 225		145	116 - 181	
SNNPR	173	148 - 204		135	115 - 159	
Gambella	227	166 - 310		151	111 - 204	
Harari	188	147 - 240		164	128 - 209	
Addis Ababa	202	168 - 242				
Dire Dawa	151	127 - 180		184	111 - 305	
<b>Ethiopia</b>	<b>171</b>	<b>144 - 203</b>		<b>137</b>	<b>126 - 149</b>	

Low Ca intakes  
EAR 417 mg

# Calcium intake of women 15-45 yrs (mg)

Low Ca intakes EAR 833 mg	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	287	261	316	275	206	368
Afar	407	309	537	494	425	574
Amhara	338	288	396	277	241	319
Oromiya	307	219	430	272	240	308
Somali	148	99	223	177	153	204
Benshangul-Gumuz	282	144	551	324	247	425
SNNPR	365	314	425	461	402	527
Gambella	402	319	507	329	251	430
Harari	257	226	292	213	155	291
Addis Ababa	271	246	297			
Dire Dawa	206	171	248	232	145	369
Ethiopia	306	267	352	308	286	332

# Zinc intake of children (1-3 years )

Geometric mean (mg) weighted for population size

Low Zn intakes EAR 6.9 mg	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	4.0	3.6 - 4.6		4.4	3.8 - 5.1	
Afar	3.5	2.7 - 4.5		4.0	3.6 - 4.5	
Amhara	2.8	2.5 - 3.3		3.5	3.2 - 3.8	
Oromiya	3.8	3.3 - 4.4		4.0	3.6 - 4.3	
Somali	2.4	2.2 - 2.5		3.0	2.7 - 3.4	
Benshangul-Gumuz	2.9	2.8 - 3.1		3.5	3.0 - 4.0	
SNNPR	3.7	3.1 - 4.3		2.8	2.5 - 3.0	
Gambella	3.0	2.7 - 3.4		2.9	2.7 - 3.1	
Harari	3.5	3.2 - 3.9		3.8	3.4 - 4.1	
Addis Ababa	3.6	3.4 - 3.8				
Dire Dawa	3.5	3.2 - 3.8		4.1	3.0 - 5.7	
<b>Ethiopia</b>	<b>3.6</b>	<b>3.3 - 3.9</b>		<b>3.5</b>	<b>3.4 - 3.7</b>	

# Zinc intake for women 15-45 yrs age

Low Zn intakes EAR 8.2 mg	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	7.0	6.6 - 7.4		8.9	7.4 - 10.7	
Afar	7.7	6.3 - 9.4		9.0	7.9 - 10.1	
Amhara	5.2	4.4 - 6.2		6.7	6.2 - 7.3	
Oromiya	8.4	5.6 - 12.4		6.8	6.1 - 7.5	
Somali	3.6	3.0 - 4.4		5.0	4.5 - 5.6	
Benshangul-Gumuz	5.4	4.8 - 6.1		6.1	5.0 - 7.3	
SNNPR	6.8	5.9 - 7.8		6.0	5.2 - 6.8	
Gambella	6.1	5.1 - 7.2		6.2	5.7 - 6.7	
Harari	6.3	5.5 - 7.2		6.7	5.5 - 8.3	
Addis Ababa	6.2	5.7 - 6.7				
Dire Dawa	6.0	5.2 - 6.8		7.2	4.8 - 10.8	
<b>Ethiopia</b>	<b>7.0</b>	<b>5.6 - 8.7</b>		<b>6.7</b>	<b>6.3 - 7.1</b>	

# Vitamin A intake for Children 1-3 years

Geometric mean (ug RAE) weighted for population size

Low Vit A intakes EAR 286 ug RAE	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	47.5	27.4	82.2	24.8	18.9	32.5
Afar	67.3	23.1	196.2	101.4	64.6	159.2
Amhara	31.7	17.5	57.3	32.4	25.0	41.8
Oromiya	89.7	67.9	118.5	51.0	39.4	66.0
Somali	38.4	21.1	69.8	53.2	38.4	73.8
Benshangul-Gumuz	41.2	17.2	99.1	46.2	32.4	65.8
SNNPR	65.0	34.2	123.5	44.0	31.7	61.1
Gambella	169.2	72.8	392.7	74.7	42.3	132.0
Harari	107.4	71.7	161.1	54.0	30.6	95.2
Addis Ababa	79.0	61.3	101.7			
Dire Dawa	76.2	60.6	95.7	51.1	30.4	85.9
Ethiopia	67.3	54.8	82.7	41.6	36.1	48.0

# Vitamin A intake of women 15-45 yrs age

Geometric mean (ug RAE) weighted for population size

Low Vit A intakes  
EAR 357 ug RAE

		Urban			Rural		
	G.Mean	95%	CI	G.Mean	95%	CI	
Tigray	84.9	47.8	150.8	69.5	49.5	97.6	
Afar	265.1	159.5	440.1	172.4	99.5	298.9	
Amhara	118.9	82.1	171.9	101.7	83.9	123.2	
Oromiya	175.7	144.2	214.0	75.6	54.1	105.6	
Somali	59.6	43.3	82.0	47.3	29.2	76.7	
Benshangul-Gumuz	98.9	45.3	215.9	111.6	75.0	166.2	
SNNPR	257.2	186.8	353.9	285.1	200.7	405.0	
Gambella	480.6	225.0	1026.6	213.6	99.6	458.1	
Harari	190.6	134.8	269.6	56.0	28.3	110.8	
Addis Ababa	101.1	75.9	134.6				
Dire Dawa	125.1	104.0	150.7	46.4	27.1	79.3	
Ethiopia	147.1	124.4	173.9	110.8	93.8	130.9	



# Iron intake of children (1-3 years)

Geometric mean (mg) weighted for population size

	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
<b>EAR 5.4 mg</b>						
Tigray	17.6	14.5 - 21.2		14.7	13.0 - 16.7	
Afar	12.1	9.1 - 16.3		11.2	9.9 - 12.8	
Amhara	13.9	10.9 - 17.6		15.1	13.1 - 17.4	
Oromiya	14.6	11.4 - 18.7		14.9	13.4 - 16.4	
Somali	6.0	4.0 - 9.0		8.0	6.9 - 9.3	
Benshangul-Gumuz	14.1	11.1 - 18.0		15.0	12.1 - 18.7	
SNNPR	13.1	10.2 - 16.9		10.9	9.5 - 12.6	
Gambella	8.8	6.9 - 11.3		9.0	7.5 - 10.7	
Harari	11.9	10.1 - 14.0		13.8	12.3 - 15.4	
Addis Ababa	14.3	13.0 - 15.7				
Dire Dawa	12.5	10.5 - 14.8		13.7	10.6 - 17.8	
<b>Ethiopia</b>	<b>14.2</b>	<b>12.7 - 15.9</b>		<b>13.8</b>	<b>13.0 - 14.8</b>	

# Iron intake of women 15-45 yrs age

Geometric mean (mg) weighted for population size

High Fe intakes UL 45 mg	Urban			Rural		
	G.Mean	95% CI		G.Mean	95% CI	
Tigray	39.3	35.1 - 44.0		34.6	30.0 - 39.9	
Afar	45.4	22.0 - 93.7		38.7	30.4 - 49.5	
Amhara	46.6	37.2 - 58.3		37.3	32.9 - 42.2	
Oromiya	41.9	28.0 - 62.6		29.4	26.3 - 32.9	
Somali	14.7	9.1 - 23.6		17.9	15.3 - 20.9	
Benshangul-Gumuz	30.6	15.8 - 59.2		31.0	23.2 - 41.4	
SNNPR	37.1	31.8 - 43.4		32.0	27.4 - 37.3	
Gambella	24.8	22.6 - 27.1		26.8	22.9 - 31.5	
Harari	32.0	27.7 - 37.0		29.6	24.2 - 36.2	
Addis Ababa	40.8	36.9 - 45.1				
Dire Dawa	33.1	26.8 - 41.1		28.5	20.9 - 38.9	
<b>Ethiopia</b>	<b>40.8</b>	<b>34.3 - 48.5</b>		<b>32.4</b>	<b>30.3 - 34.7</b>	

# Top 5 iron sources in young children

Tigray		Oromiya		Amhara		SNNP	
Nutrient	Iron (%)	Nutrient	Iron (%)	Nutrient	Iron (%)	Nutrient	Iron (%)
Wheat white flour	37.5	Wheat white flour	47.9	Tef mixed flour	33.7	Corn white flour	31.4
Tef red flour	12.5	Corn white flour	24.2	Egg, raw	12.7	Tef mixed flour	14.6
Tef white flour	11.3	Ethiopian kale raw	15.7	Ethiopian kale raw	5.9	Tef white flour	13.3
Wheat black flour	10.7	Tef red flour	4.7	Tef white flour	5.8	Sorghum white flour	12.8
Tef mixed flour	10.5	Milk cow fresh	2.8	Milk cow fresh	4.8	Milk cow fresh	5.7



# Challenges

- Fatigue



- Road blocks





# Challenges...

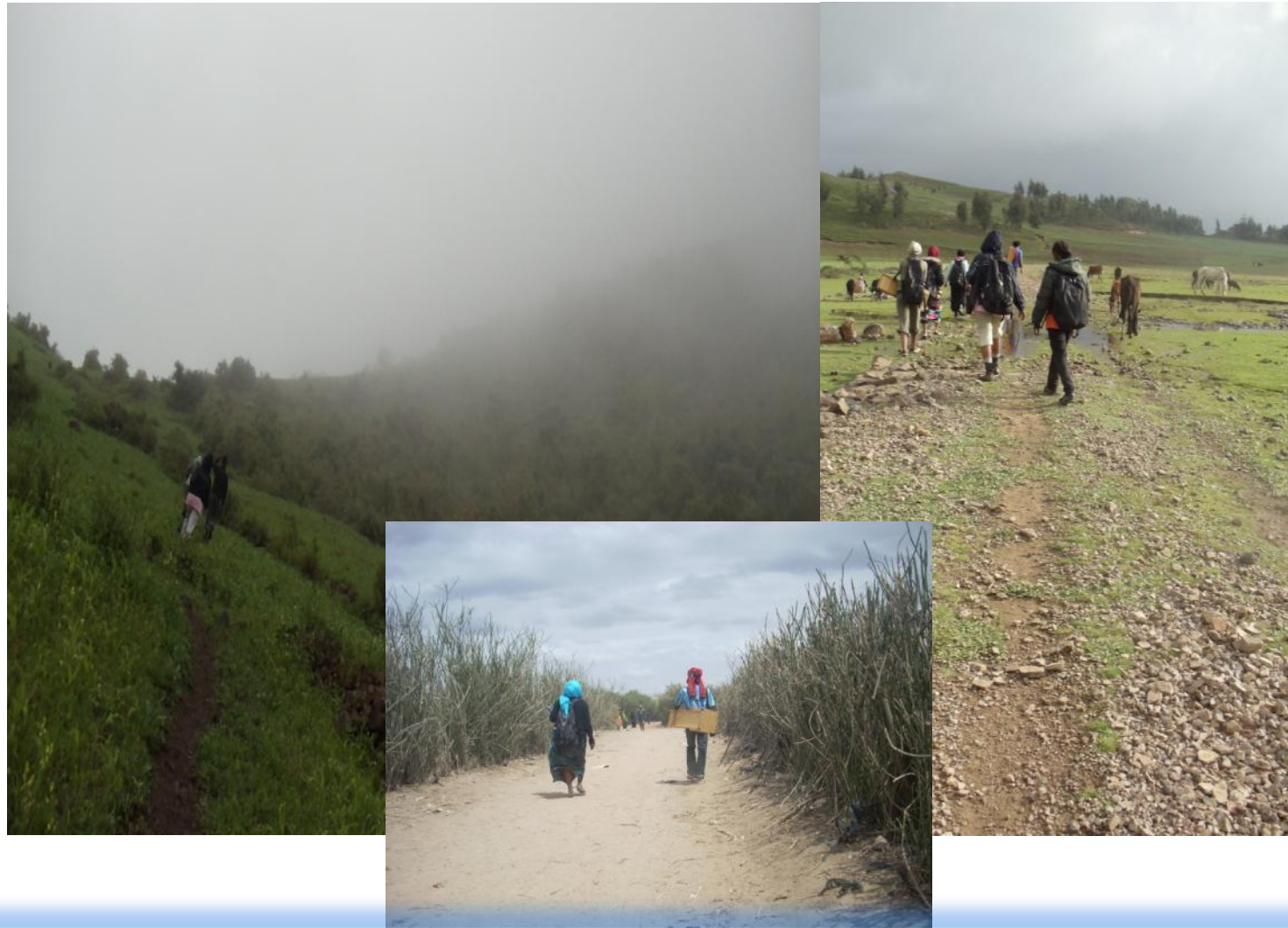


# Challenges – steep hills, difficult trails





# Data collection on foot average 3-4 hours



# Challenges – vehicles, carriers, tires





# Further uses of the NFCS data

- Simulate effectiveness of fortification for wheat and oil for key nutrients
  - programmatic implications for large vs. small scale milling
- Linear programming to identify alternative interventions for young children
- Calculate absorbable zinc in the diet
- Inform programs through assessment of prevalence and intake patterns of key nutrients, ie calcium



# Lessons learned

- A protocol with complete road map of the survey is essential before launch of the survey
- National surveys need high priority commitment and support at every stage
- Experiences from other countries are useful to inform process

Long term value of such study:

- Basis for food fortification and other public health nutrition interventions



# Acknowledgment

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The Ethiopian Public  
Health Institute

