Calculating Wheat Flour Consumption: Sources and Methods

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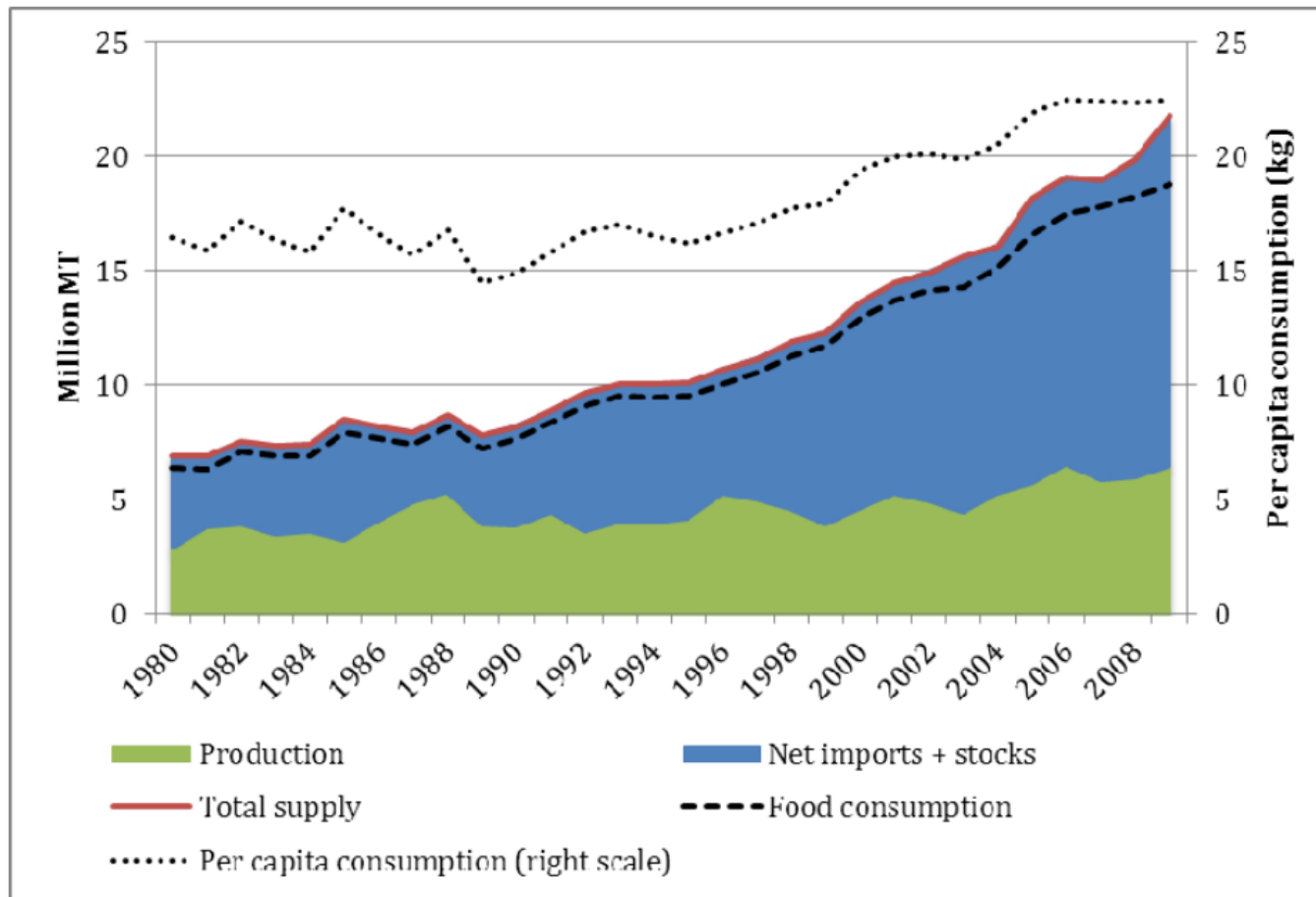
10-14 December 2013

Overview

- Wheat consumption trends in SSA

- Summary of consumption data needs and considerations

- Sources of wheat flour consumption data
  - Benefits and Limitations
  - Data examples
  - Comparisons of wheat flour consumption estimates across countries

- Estimating Consumption using HCES
  - Household Consumption → Individual Intake
  - Food Composition Tables (FCTs), Adult Male Equivalents (AME), Tolerable Upper Intake Levels (UL)
  - ADePT

Wheat Consumption* Trends in SSA

*Based on FAOSTAT data and the disappearance method

- Between 2000 and 2009, per capita wheat consumption in SSA increased at a rate of 0.35 kg/yr

- Consumption is expected to increase at an even faster rate in the future:
  - 670,000 MT to 1.12 million MT per yr between 2010 and 2020
  - 770,000 MT to 1.28 million MT per yr between 2020 and 2030

Source: Mason, Nicole M, Jayne, T. S., and Bekele Shiferaw. (2012). Wheat Consumption in Sub-Saharan Africa: Trends, Dribers, and Policy Implications. East Lansing, MI: Michigan State University International Development Working Paper No. 127.

Wheat Consumption, Production and Net Imports in SSA 1980-2009

Sources: FAOSTAT Commodity Balances and Population databases.

Top Net Importers of Wheat

- The top 5 wheat imports in SSA (between 2000-2009) account for **53%** of wheat net imports, **64%** of total consumption, and **44%** of the population in the region:

  1. Nigeria (23.0%)
  2. Sudan (10.7%)
  3. Ethiopia (8.2%)
  4. South Africa (6.6%)
  5. Kenya (4.9%)

Top Exporters
United States: 34%
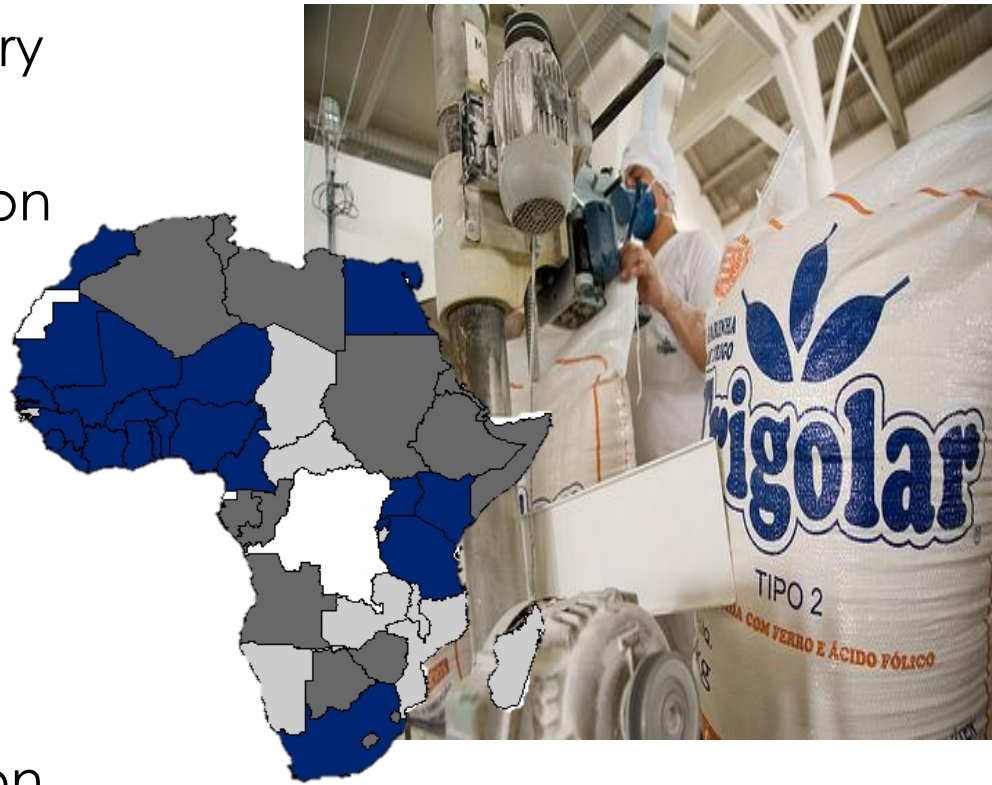**Argentina: 15%**
Australia: 8%

Potential Drivers of Demand

- Rising incomes
- Growing populations
- Urbanization
- Women's participation in the labor force and the opportunity costs of time
- Wheat food aid
- Declining price of wheat relative to other staples (in countries such as Kenya and Nigeria)
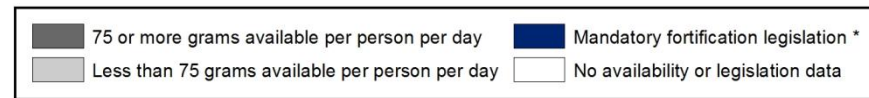
Fortification Process

1. Gather political and industry support

2. Define the target population

3. Collect baseline data

4. Select the food vehicle(s)

5. Estimate costs and secure finances

6. Implement fortification program

7. Food control and inspection

8. Monitor and evaluate progress

9. Impact analysis

Wheat Availability and Fortification Legislation

75 or more grams available per person per day

Less than 75 grams available per person per day

Mandatory fortification legislation *

No availability or legislation data

What can consumption data tell us?

- The current consumption environment

- Baseline information on nutrient intake

- Frequency and quantities of fortification vehicle consumption

- Individual consumption

- Food acquisition

Cost-Benefit Analysis

- Overall objective:

  Make projections of possible reduced economic burden via wheat flour fortification and provide a cost-benefit projection.

- Consumption data needed:
  - % of population consuming commercial flour and flour products
  - Average kg of wheat flour consumed per person per year (**among wheat flour consumers**)
  - Projected change in number of wheat flour consumers over 10 years
  - Projected change in flour consumption (kg/year) over 10 years (**among wheat flour consumers**)

Conditional vs. Unconditional

- Conditional mean quantity consumed
  - Total quantity consumed divided by the number of consumers of wheat flour

- Unconditional mean quantity consumed
 - Total quantity consumed divided by the total number of persons

The numerators are the same, but the denominators differ!

Changes in Demand: Consumers vs. Quantities

- Changes in wheat flour demand may occur because of:

  1. Consumers
     - Changes in the number of consumers and the proportion of households consuming wheat flour (quantity remains constant)

  2. Quantity
     - Changes in the average quantity of wheat flour consumed by those **already consuming** it (number of consumers remains constant)

  3. Consumers and Quantity
     - Changes in both factors

Additional Factors to Consider…
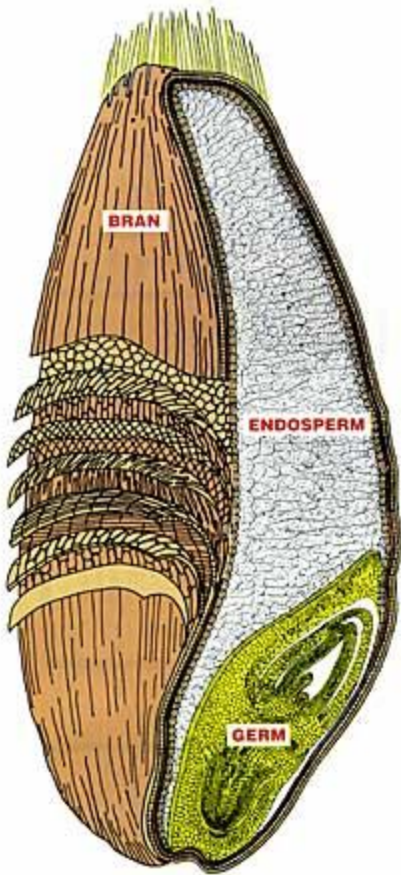
- Wheat extraction rates

- Wheat content estimates for foods containing wheat flour

- How wheat flour is quantified (weight vs. monetary)

- Methods for calculating individual consumption from household level data

Wheat Flour Content Estimates

- Many data sources identify wheat flour and food items which contain wheat flour
- This requires estimating wheat flour content in various wheat flour products.

Food Item	%	Food Item	%	Food Item	%
White bread (European style)	60%	Crackers	90%	Dried Pasta	90%
Flatbread (unleavened)	75%	Biscuits and Cookies	60%	Wet/Cooked Pasta: • Noodles • Spaghetti • Macaroni • Other pasta	28%
Whole wheat bread	75%	Cake	55%		
Sweet breads	65%	Pies and Pastries	35%		

*Estimates provided by Quentin Johnson

Sources of Consumption Data

- Individual Food Consumption Data
  - 24-Hour Survey (diary, directly observed, weighed, or recall)
  - Food Frequency Questionnaire
- Fortification Rapid Assessment Tool (FRAT)
- Household Consumption and Expenditure Surveys (HCES)
- FAO Food Balance Sheets
- Industry Production Data

….but how available is the data? What are the benefits and limitations of each source?

General Availability of Data
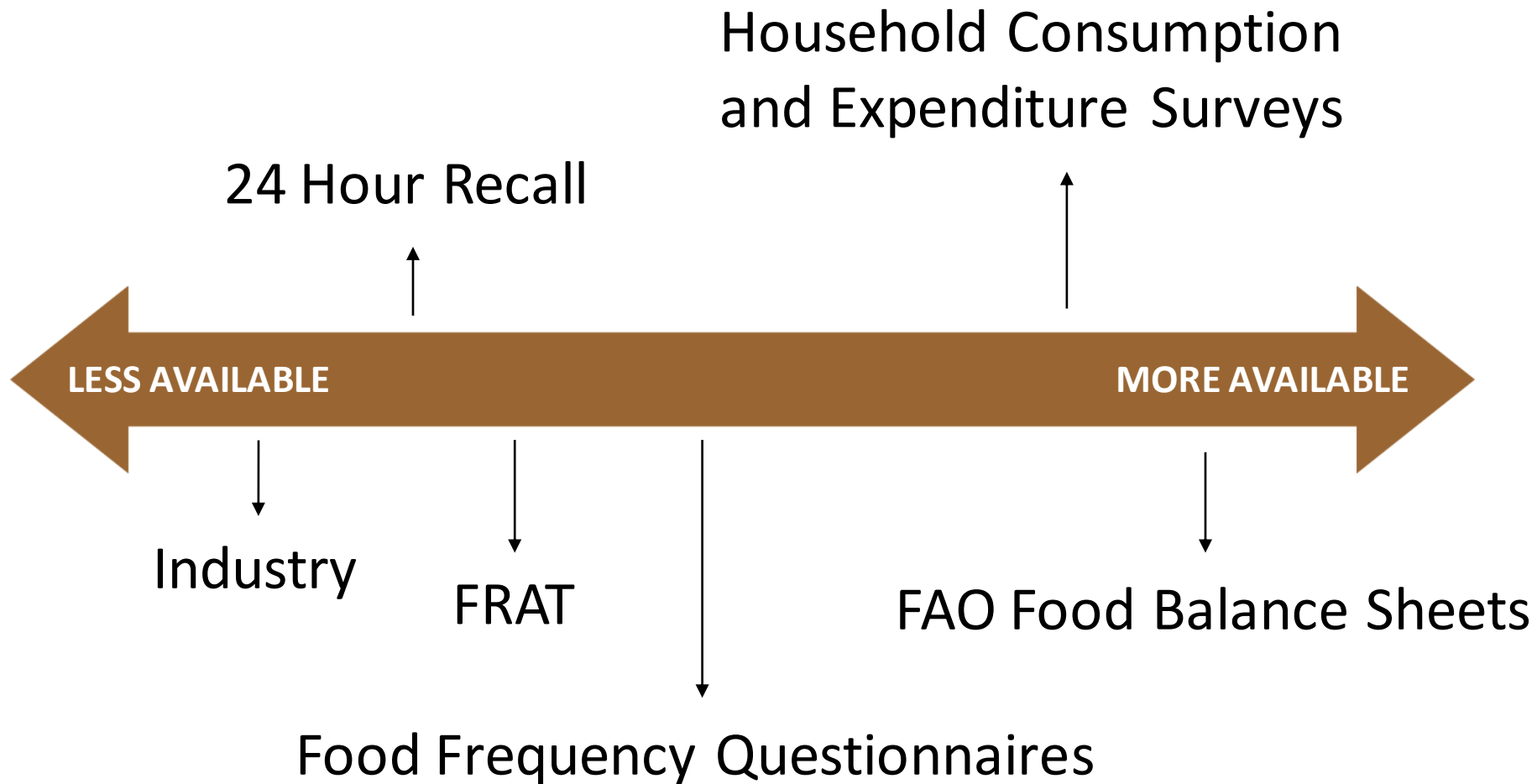
Specificity of Data

Household Consumption and Expenditure Surveys

FAO Food Balance Sheets

LESS SPECIFIC — MORE SPECIFIC

Industry

Food Frequency Questionnaires

FRAT

24-Hour Recall

24-Hour Recall

- Recall and/or food weighing methods are used to account for individual consumption within the previous 24 hours

- Food models, photographs, or weighing or volumetric estimation techniques

- Often considered the "gold standard" source among nutritionists for food consumption data
    - But is it?

- Recently conducted 24-Hour Recall Surveys
    - South African National Food Consumption Survey (1999)
    - Uganda Food Consumption Survey (2008)
    - Cameroon (2010)

24-Hour Recall

TABLE 5.1

FORM FOR RECORDING THE INTERACTIVE 24-HOUR RECALL, WITH A SAMPLE RECALL FOR A 4-YEAR-OLD FEMALE

Interviewer: *Doreen*
Scale no.: *12*
Interview date: *6ᵗʰ June 2005*
Day food eaten: *Thursday*

Location: *Nembya*
Subject ID: *00455*
Subject name: *Sandikonda*

Sex: *F*
Age: *48 months*
Weight: *14kg*

Time	Place eaten	Food or drink	Description, and cooking method	Amount eaten	Weight equivalent (g)	Food Code
7:30	Home	Porridge	Prepared with mgayewa unrefined maize flour	267mL	315	
		Salt	Not iodized	1/2tsp	4	
9:15	Home	Sweet potatoes	Boiled in skins and skins removed	350g	350	
11:20	Home	Ground-nuts	Raw	60g	60	
12:15	Home	Corn-on-cob	Boiled	5cm	100	
14:00	Home	Nsima	Prepared with mgayewa unrefined maize flour	335g		
14:00	Home	Fish relish	Boiled (recipe completed)	37g		
			Ingredients: dry usipa			
			Salt, not iodized			
4:05	Home	Sugar cane	Raw	14cm	76	
6:20	Home	Nsima	Prepared with ufa processed maize flour	305g	305	

Probe for alcohol: Yes ☐ No ☑	Probe for sickness: Yes ☐ No ☑ If yes, did sickness affect appetite? Yes ☐ No ☐ If yes, how? Increase ☐ Decrease ☐
Was food intake unusual? Yes ☐ No ☑ If yes, how was it unusual?	Probe for tablets: Yes ☑ No ☐ Iron ☐ Vitamins ☑ Other supplements ☐ Anti-malaria ☐
Was it a feast day? Yes ☐ No ☑ Was it a market day? Yes ☑ No ☐ Was it a fasting day? Yes ☐ No ☑	

24 Hour Recall: Benefits

- High degree of accuracy (but only if administered correctly)
- Account for intra-household distribution of food
  - Quantitative estimates of individual diets
- Accounts for foods eaten outside of the home
- Open ended food consumption inquiries provide detailed estimates
  - Food items not limited to a predetermined list
  - Can include type of food preparation (raw, boiled, etc.)
  - Four passes approach (Gibson and Ferguson)

24 Hour Recall: Limitations

- Expensive, complex, and difficult to conduct
  - Few are available

- Often conducted regionally or for specific target populations
  - Small sample size
  - May not be statistically representative samples
  - Use for national food and nutrition work is questionable

- Conducted once, may not capture
  - Typical diet
  - Seasonality

Food Frequency Questionnaire

- Provides the frequency of consumption of foods over a given period of time

  – Typically one week to one year

- Most common method of measuring dietary patterns in large studies

- May be semi-quantitative

  – "typical" portion sizes

- Often combined with 24-hour recalls to provide estimates of normal diet patterns

Food Frequency Questionnaire

Food Frequency: Benefits

- Easy to conduct

- Captures individual diet patterns

- Longer recall periods better capture a "typical" diet and may account for seasonality

- Well suited for assessing the reach and coverage of fortification programs

Food Frequency: Limitations

- Does not assist with setting fortification *levels*
  - Cannot account for quantities consumed
- Longer recall periods
  - Less accurate responses
- Predetermined food lists
  - Exclude important food items (nutrient rich or food fortification vehicles)
- Does not distinguish food source (purchased, produced, etc.)

Fortification Rapid Assessment Tool (FRAT)

- Developed by PATH Canada in 1997/98

- Designed to assist public health program managers in designing fortification programs

- Combine a simplified 24-hour recall and Food Frequency Questionnaire

- Collects representative, quantitative data on the consumption of food vehicles among children (6 – 59 months) and women of reproductive age (16-45 years)

Enquête FRAT sur
La Consommation de la Farine de Blé au Congo

FRAT: Benefits

- Designed specifically to assess consumption patterns of fortification vehicles
- Collects additional, qualitative information
  - Processing and storage of food vehicle
  - Availability and ease of obtaining fortification vehicle
- Can be added on to existing surveys, including HCES, or implemented on its own

FRAT: Limitations

- Surveys focus on food intake of potential food vehicles
  - Overall nutrient intake analysis is impossible
- Conducted specifically for the purpose of designing fortification programs
  - Only conducted once, cannot measure trends
- Targets population subgroups
  - Women of reproductive age (16 – 45 years)
  - Children (6 – 59 months)
- Smaller sample sizes than HCES
  - Sample size recommended by FRAT is 210 households
  - Sample size and representativeness may vary dramatically

FRAT: Wheat flour

- FRAT survey countries in which wheat flour was a food vehicle of interest:

  – Burkina Faso, 1999
  – Cameroon, 2011
  – Congo, 2008
  – Guinea, 2001
  – Mali, 1999
  – Mauritania, 2002
  – Mozambique, 2010
  – Senegal, 2006

FRAT Results: Wheat Flour Consumption among WRA

Country, year of publication	Total N (in survey)	% Consumed wheat flour, past week			Median amount of wheat flour consumed on previous day (g/day)		
		All	Urban strata	Nonurban strata	All	Urban strata	Nonurban strata
Burkina Faso, 1999	840	48%	83%	15; 52; 41%	49 g	65 g	21; 47; 55 g
Cameroon, 2011	912	92%	98%	90; 91%	79 g	90 g	66; 71 g
Congo, 2008	1,050	68%	NA	NA	85 g	133 g	76; 76; 68 g
Guinea, 2001	1,050	67%	98%	40; 74; 77; 42%	95 g	95 g	NA; 82; 110; 85 g
Mauritania, 2002	225	88%	99; 100%	67%	108 g	77; 130 g	91 g
Mozambique, 2010	2,506	92%	96; 87; 91%	NA	NA	NA	NA
Senegal, 2006	840	93%	99; 98%	77; 98%	104 g	111 g	98; 115; 98 g

FRAT Results: Wheat Flour Consumption among Children

Country, year of publication	Age range (months)	% Consumed wheat flour, past week			Median amount of wheat flour consumed on previous day (g/day)		
		All	Urban strata	Nonurban strata	All	Urban strata	Nonurban strata
Burkina Faso, 1999	12 – 36	57%	88%	19; 58; 62%	32 g	30 g	15; 38; 40 g
Cameroon, 2011	12 – 59	94%	97%	90; 95%	49 g	71 g	40; 49 g
Congo, 2008	12 – 59	67%	NA	NA	67 g	67 g	59; 56; 59 g
Guinea, 2001	12 – 36	68%	96%	39; 74; 78; 51%	48 g	48 g	NA; 63; 49; NA g
Mauritania, 2002	12 – 36	92%	96; 96%	79%	66 g	66 g	46 g
Mozambique, 2010	6 – 59	81%	84; 78; 81%	NA	NA	NA	NA
Senegal, 2006	12 – 59	91%	96; 94%	76; 98%	65 g	65 g	62; 66; 60 g

Household Consumption and Expenditure Surveys (HCES)

- Large scale, multi-purpose, recurring HH surveys, including:

  - Household Income and Expenditure Surveys (HIES)

  - Household Budget Surveys (HBS)

  - Integrated Household Surveys (IHS)

  - Living Standards Measure Surveys (LSMS)

  - Welfare Monitoring Surveys (WMS)

- Generally representative at a subnational (regional or state) level

- Detailed information on household food acquisition and consumption

HCES: Global Coverage

Region	Population covered by at least one survey in WDR 1990 (%)	Population covered by at least one survey in WDI 2008 (%)
East Asia	85	96
East Europe & Central Asia	21	98
Latin America	55	98
Middle East & North Africa	11	79
South Asia	95	98
Sub-Saharan Africa	6	92
Total	**65**	**95**

WDR: World Development Report. WDI: World Development Indicators.

Source: Ravaillon M. Global poverty measurement: Current practices and future challenges.
http://sites.nationalacademies.org/PGA/sustainability/foodsecurity/PGA_060826

Calculating Quantities from Wheat Consumption Module

MODULE G: FOOD CONSUMPTION OVER PAST ONE WEEK

DATA ENTRY LINE NUMBER	Over the past one week (7 days), did you or others in your household consume any [. . .]? INCLUDE FOOD BOTH EATEN COMMUNALLY IN THE HOUSEHOLD AND THAT EATEN SEPARATELY BY INDIVIDUAL HOUSEHOLD MEMBERS.	G01 YES..1 NO...2>> NEXT ITEM	G02 ITEM CODE	G03 How much in total did your household consume in the past week?		G04 How much came from purchases?		G05 How much did you spend? MK	G06 How much came from own-production?		G07 How much came from gifts and other sources?	
				QUANTITY	UNIT	QUANTITY	UNIT		QUANTITY	UNIT	QUANTITY	UNIT
1	**Cereals, Grains and Cereal Products**											
2	Maize *ufa mgaiwa* (normal flour)											
3	Maize *ufa* refined (fine flour)											
4	Maize *ufa madeya* (bran flour)											
5	Maize grain (not as *ufa*)											
6	Green maize											
7	Rice											
8	Finger millet (*mawere*)		107									
9	Sorghum (*mapira*)		108									
10	Pearl millet (*mchewere*)		109									
11	Wheat flour		110									
12	Bread		111									
13	Buns, scones		112									
14	Biscuits		113									
15	Spaghetti, macaroni, pasta		114									
16	Breakfast cereal		115									
17	Infant feeding cereals		116									
18	Other (specify)		117									
19	**Roots, Tubers, and Plantains**											
20	Cassava tubers		201									
21	Cassava flour		202									
22	White sweet potato		203									
23	Orange sweet potato		204									
24	Irish potato		205									
25	Potato crisps		206									
26	Plantain, cooking banana		207									
27	Cocoyam (*masimbi*)		208									
28	Other (specify)		209									

Annotations:

1. Identify food items containing wheat flour

2. Multiply food items by % wheat flour content before calculating quantity consumed

3. Sum kg of wheat flour consumed per week and multiply by 52 to get kg/yr average.

4. Add all household wheat consumption estimates, and apply Adult Male Equivalents (AME) approach to estimate individual consumption of wheat flour.**

**Some food items will be listed in volumetric units and will need to be converted to kg equivalents.

CODES FOR UNIT:
- KILOGRAMME 1
- 50 KG. BAG 2
- 90 KG. BAG 3
- PAIL (SMALL) . . .4
- PAIL (LARGE) . . .5
- No. 10 PLATE . . .6
- No. 12 PLATE . . .7
- BUNCH. 8
- PIECE. 9
- HEAP 10
- BALE 11
- BASKET (*DENGU*) (SHELLED). . . 12
- BASKET (*DENGU*) (UNSHELLED) . . 13
- OX-CART (UNSHELLED) . . 14
- LITRE. 15
- CUP. 16
- TIN. 17
- GRAM 18
- MILLILITRE . . . 19
- TEASPOON. 20
- BASIN. 21
- SATCHET/TUBE. . .22
- OTHER (SPECIFY). 23

HCES: Variations

- Data capture methods
  - Diary approach (with multiple visits) versus recall (periods vary)

- Method of food acquisition
  - Consumption from own production may not be asked or asked about only a subset of foods

- Quantitative measures
  - Sometimes only expenditure levels are reported, not food quantities

- Food lists
  - Number and types of foods vary

- What is measured:
  - Distinguishing food purchased and food consumed

HCES: Variations

- General statements are challenging to make because HCES are diverse.
- What we judge to be strengths and shortcomings depend on:
  - General survey characteristics: the particular type of survey (i.e., NHBS, LSMS, HIES, etc.)
  - Country-specific characteristics: How the survey was designed and implemented in a country, and how the data was processed
  - Specific issues / applications of interest

HCES: Benefits

- Nationally representative
  - Representative at subnational (regional, provincial/state, or district) level

- Detailed consumption data

- Already being conducted, paid for and processed
  - HCES costs are about 2% the cost of a 24HR survey

- HCES are routinely, periodically updated (generally once every 3-5 years, and largely dependent on funding)

HCES: Limitations

- A mixture of food acquisition and food consumption
  - Acquisition is likely to be greater than consumption
  - Food categories are more likely to report foods as commodities as opposed to food that is ready-to-eat

- Units of measurement may not be standardized
  - May have a common name, but not a common metric (e.g., heap, bunch, etc.)

- Recall period may be too long to be accurate, too short to reflect "usual intake"

HCES: Limitations

- Food consumed away from home is often not asked about and, when it is, is likely to be under-reported

- Predetermined food item lists may not be specific enough
  - Processed foods may be underreported

- Unit of analysis: Household level data, not individual level
  - To analyze nutrition status, it is necessary to make some assumptions about the intra-household distribution of the foods acquired

HCES Data

- International Household Survey Network (IHSN)
    - Central Data Catalog provides searchable metadata from thousands of surveys and censuses conducted in low- and middle-income countries
    - Often include the questionnaires, resource manuals, and survey reports

www.ihsn.org

IHSN Website

IHSN Survey Catalog

HCES Surveys

Country	Year	Survey	# of Households
Burundi	1998	Questionnaire Unifié sur les Indicateurs de Base du Bien-être	6,688
DRC	2005/2006	Employment, Informal Sector and Household Consumption Survey	4,715
Ethiopia	2000	Household Income and Expenditure Survey	16,672
Kenya	2005/2006	Integrated Household Budget Survey	13,390
Malawi	2004	Malawi Second Integrated Household Survey	11,280
Mozambique	2002	Questionário de Indicadores Básicos de Bem-Estar	8,700
Rwanda	2005/2006	Integrated Household Living Conditions Survey	6,378
South Africa	2000	Income and Expenditure Survey 2000	26,263
Tanzania	2000	Tanzania Household Budget Survey	22,718
Uganda	2002/2003	Uganda National Household Survey	9,711
Zambia	2006	Living Conditions Monitoring Survey	19,560
Zimbabwe	2007/2008	Income, Consumption and Expenditure Survey	?

HCES: Recall Methods

Country	Recall Method			Recall Period		
	Interview	Diary	Both	Recall Period (Days)	Diary (Days Recorded)	Diary (Visit to Illiterate HHs every X days)
Burundi	X			15		
DRC	X			15		
Ethiopia	X			7		
Kenya	X			7		
Malawi	X			7		
Mozambique		X		14	7	2
Rwanda	X			NA*		
South Africa	X			30		
Tanzania	X			7		
Uganda	X			7		
Zambia	X			14		
Zimbabwe	X			7		

HCES: Food Items and Acquisition

Country	Number of Food Items	Expenditure (X) or Food Quantity (Q) Reported?	Food Acquired from Purchases	Food Consumed from Purchases	Consumption from Own Production	Gifts, In-Kind, Other
Burundi	32	X		X	X	X
DRC	500	Q				
Ethiopia	224	Q		X	X	X
Kenya	162	Q	X	X	X	X
Malawi	115	Q		X	X	X
Mozambique	332	Q	X		X	
Rwanda	151	Q/X	X			
South Africa	122	X				
Tanzania	135	Q		X	X	X
Uganda	58	Q				
Zambia	36	Q		X	X	X
Zimbabwe	179	Q		X	X	X

Wheat Flour and Products

Wheat flour and food items containing wheat flour reported in HCES:

Country	Wheat Flour	Wheat (Whole Grain)	Bread	Cakes	Biscuits/Scones	Pasta	Wheat Flour Products
Burundi			✓				
DRC	✓		✓	✓	✓	✓	
Ethiopia	✓		✓	✓	✓	✓	
Kenya	✓	✓	✓	✓	✓	✓	
Malawi	✓		✓		✓	✓	
Mozambique	✓	✓	✓		✓		
Rwanda	✓	✓	✓	✓	✓	✓	
South Africa	✓		✓			✓	✓
Tanzania	✓	✓	✓	✓	✓	✓	
Uganda			✓				
Zambia			✓				
Zimbabwe	✓	✓	✓	✓	✓	✓	

Wheat Flour Consumption
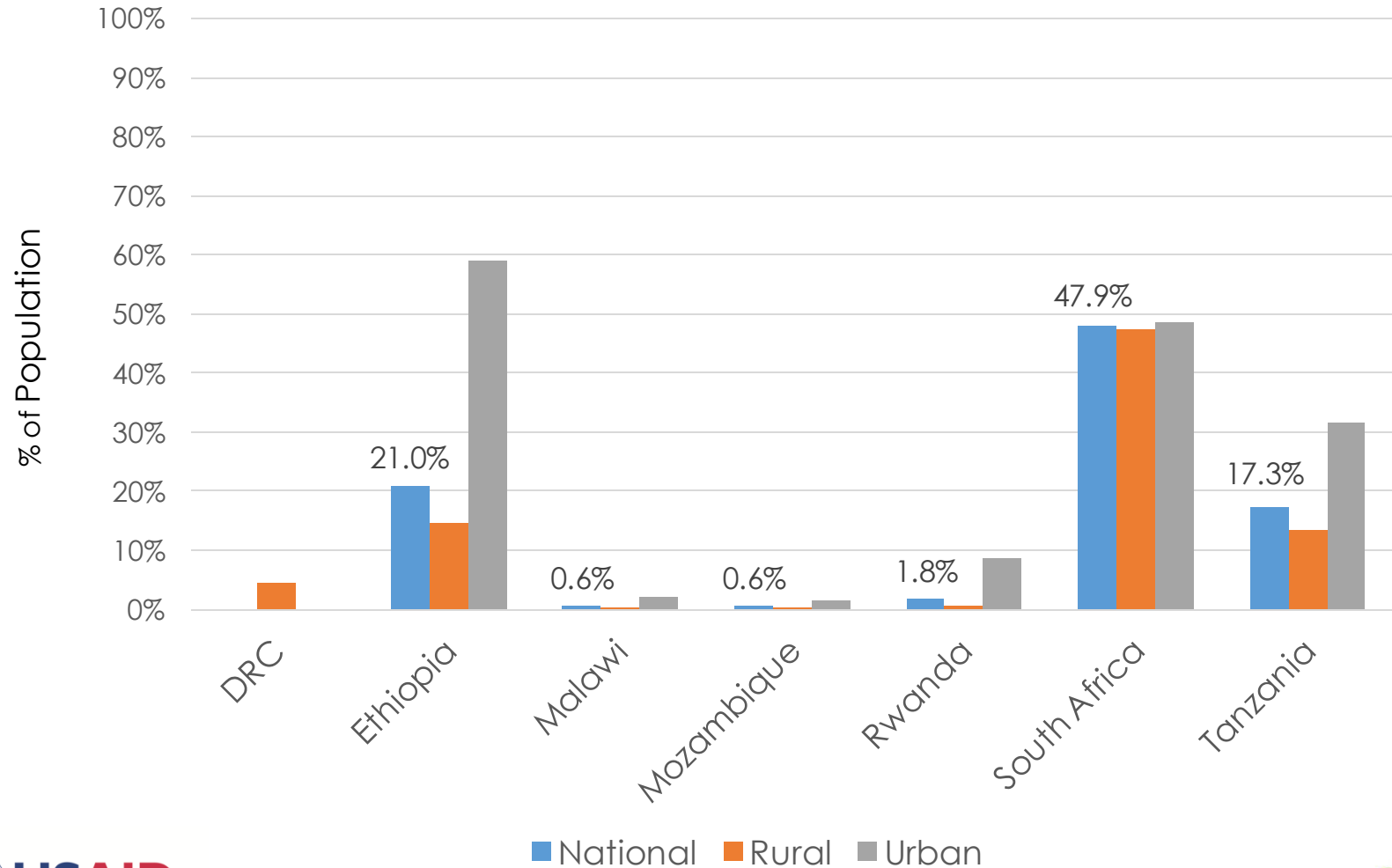
Wheat Flour Consumption (Extended)

Bar chart titled "% of Population" (y-axis, 0% to 100%) showing wheat flour consumption across countries DRC, Ethiopia, Malawi, Mozambique, South Africa, Tanzania, Zimbabwe, with series National (blue), Rural (orange), Urban (gray).

- DRC: Rural ~73%
- Ethiopia: National 28.9%, Rural ~19%, Urban ~87%
- Malawi: National 33.0%, Rural ~27%, Urban ~74%
- Mozambique: National 35.2%, Rural ~20%, Urban ~66%
- South Africa: National 94.4%, Rural ~92%, Urban ~96%
- Tanzania: National 62.5%, Rural ~55%, Urban ~90%
- Zimbabwe: National 79.0%

Legend: National, Rural, Urban

Bread Consumption (HCES)

Food Balance Sheets

- Developed by the Food and Agricultural Organization (FAO) of the United Nations

- National food accounts, supply/utilization accounts, food disappearance data, and food consumption level estimates

  – Provides **supply** data

- Most commonly used data for estimating national diet patterns, levels, and trends

Food Supply (vs. Consumption)

- Supply is determined as:

  Total quantity produced

  + Imports

  - Exports

  - Qty. used for Feed and Seed

  - Storage and Transportation Losses

  = Total food available for human consumption

Total food available/Total population = Per capita consumption

FAOSTAT

http://faostat.fao.org/site/354/default.aspx

Food Balance Sheets

Food Balance Sheets

Uganda - 2009

5. Food supply quantity

4. Identity Fortification Vehicle

6. Multiply by extraction rate

item	Total Population - Both sexes (1000)	Production (1000 tonnes)	Import Quantity (1000 tonnes)	Stock Variation (1000 tonnes)	Export Quantity (1000 tonnes)	Domestic supply quantity (1000 tonnes)	Feed (1000 tonnes)	Seed (1000 tonnes)	Waste (1000 tonnes)	Processing (1000 tonnes)	Other Util (1000 tonnes)	Food (1000 tonnes)	Food supply quantity (kg/capita/yr)	Food supply (kcal/capita/day)	Protein supply quantity (g/capita/day)	Fat supply quantity (g/capita/day)
Population	32368															
Grand Total + (Total)														2260 Fc	49.20 Fc	46.90 Fc
Vegetal Products + (Total)														2087 Fc	37.10 Fc	35.30 Fc
Animal Products + (Total)														173 Fc	12.10 Fc	11.60 Fc
Cereals - Excluding Beer + (Total)		2751 A	556 A	1 A	166 A	3142 A	264 A	59 A	280 A	513 A	1 A	2027 A	62.60 Fc	505 Fc	11.70 Fc	2.40 Fc
Wheat		20 S	426 S	0 S	15 S	431 S		1 S	13 S	0 S	0 S	418 S	12.90 Fc	97 Fc	2.90 Fc	0.30 Fc
Rice (Milled Equivalent)		121 S	80 S	0 S	38 S	163 S		9 S	6 S		0 S	147 S	4.60 Fc	44 Fc	0.90 Fc	0.10 Fc
Barley			30 S	0 S	0 S	29 S	1 S			28 S		0 S	0.00 Fc	0 Fc	0.00 Fc	
Maize		1272 S	13 S	0 S	100 S	1186 S	128 S	27 S	152 S	153 S	1 S	725 S	22.40 Fc	190 Fc	4.50 Fc	1.10 Fc
Rye		0 S			0 S	0 S	0 S									
Oats		0 S	0 S	0 S	0 S	0 S						0 S	0.00 Fc	0 Fc	0.00 Fc	0.00 Fc
Millet		841 S	0 S	0 S	0 S	841 S	84 S	12 S	59 S	103 S		583 S	18.00 Fc	133 Fc	2.20 Fc	0.60 Fc
Sorghum		497 S	8 S	0 S	11 S	494 S	50 S	10 S	50 S	230 S		153 S	4.70 Fc	41 Fc	1.30 Fc	0.40 Fc
Cereals, Other			0 S	1 S	2 S	SD	0 S				0 S	0 S	0.00 Fc	0 Fc	0.00 Fc	0.00 Fc
Starchy Roots + (Total)		8634 A	82 A	0 A	7 A	8708 A	1718 A	82 A	973 A		0 A	5939 A	183.50 Fc	508 Fc	5.60 Fc	0.70 Fc

USAID FROM THE AMERICAN PEOPLE

SPRING — Strengthening Partnerships, Results and Innovations in Nutrition Globally

Food Balance Sheets: Benefits

- Provide data from 1961-2009
  - Able to demonstrate long-term trends in national food supply

- Low cost and highly accessible

- May be used to *suggest* which nutrient inadequacies might be common in the population due to nutrient availability
  - Only at the aggregate level and to a limited extent
  - Focus mainly on staples

Food Balance Sheets: Limitations

- Data limited to primary commodities and minimally processed foods
  - Data for wheat, not wheat *flour*

- Provides supply, not demand, estimates

- Cannot provide coverage estimates
  - Unconditional estimates
  - Who are the consumers? Where are they located?
  - How much of the food item is purchased?

- Lengthy delays in updating annual FBS figures
  - Most recent data available is for 2009

Changes in Wheat Supply, 1989-2009
(kg/person/year)
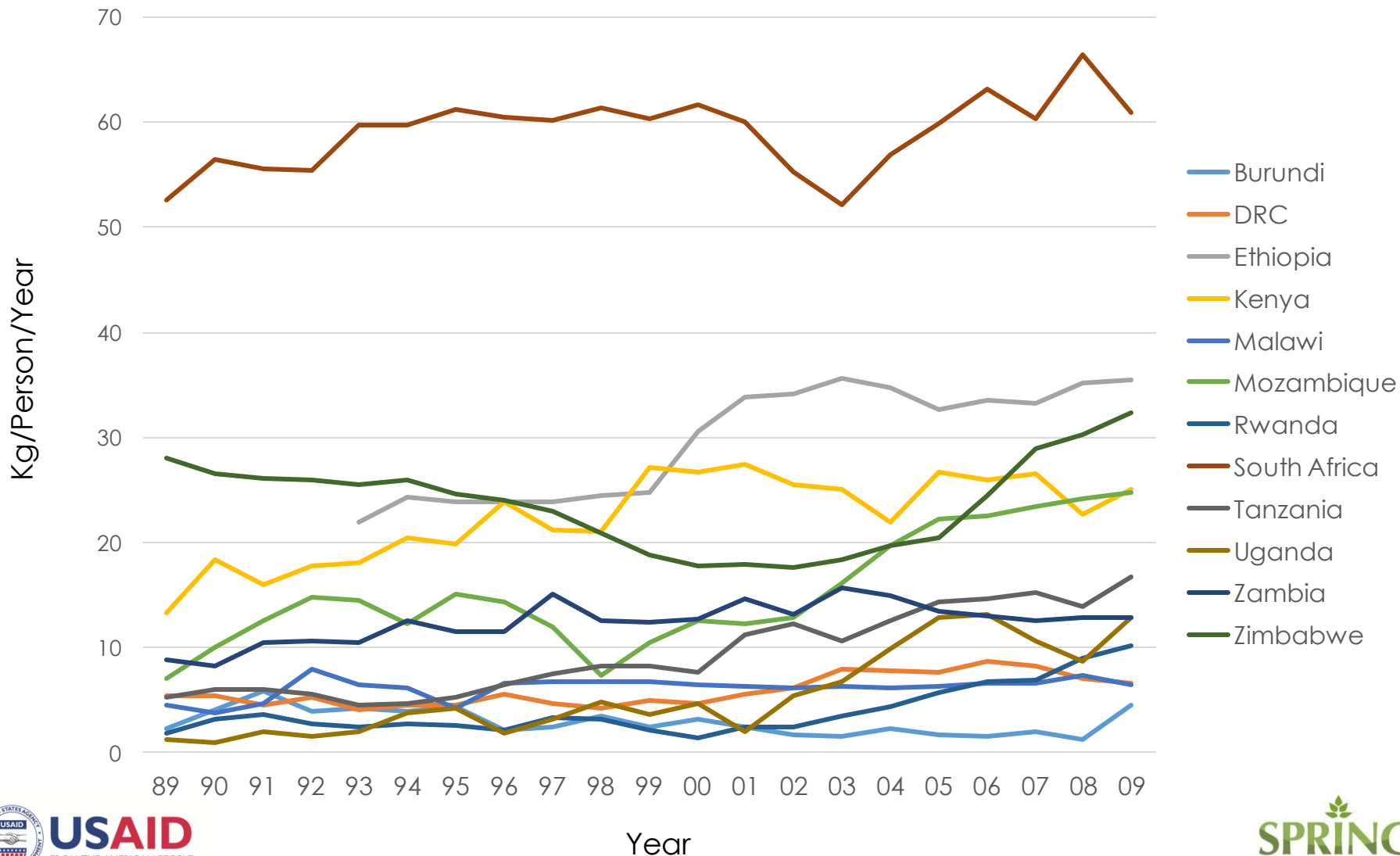
% Change 1989 – 2009

% change in per capita wheat supply (kg/person/year) 1989-2009

Country	% Change
Zimbabwe	15.7%
Zambia	45.5%
Uganda	975.0%
Tanzania	221.2%
South Africa	15.8%
Rwanda	436.8%
Mozambique	252.9%
Malawi	42.2%
Kenya	88.0%
Ethiopia	61.6%
DRC	22.2%
Burundi	95.7%
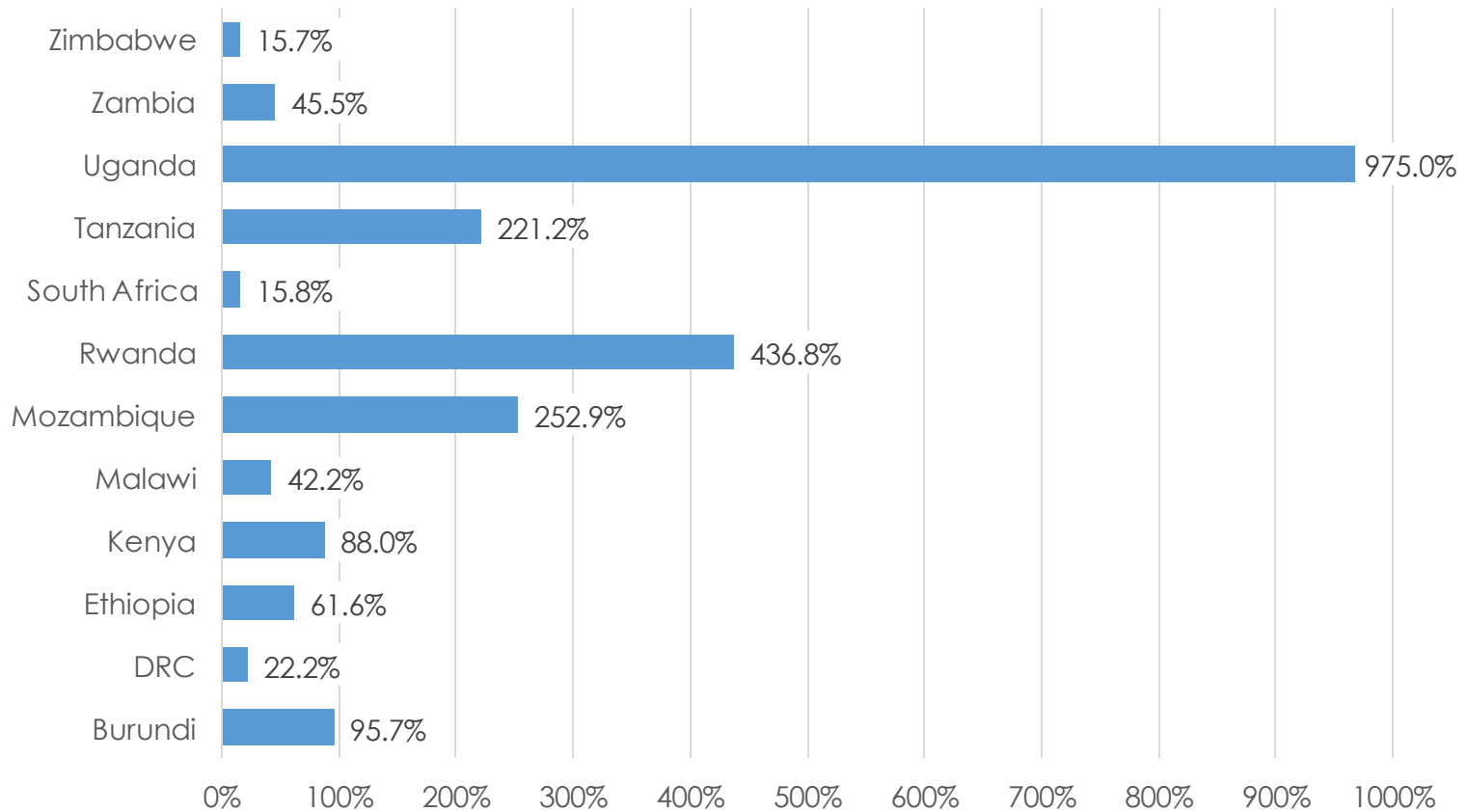
Industry Data

- Industry data from millers can provide important consumer information, such as:
  - market share
  - where (e.g. what regions) products are shipped
  - accurate milling extraction rates
- However, millers may be hesitant to disclose private business information
  - Often report production capacity, rather than actual production
- Supply-side rather than demand-side data

Discussion

- Consumption data is needed throughout the food fortification process:
  - Needs assessment
  - Feasibility Assessment and Program Design
  - Program Baseline
  - Program Monitoring
  - Impact Evaluation

- Is there a right source of consumption data for each application?

Discussion

- Each data source has its strengths and weaknesses, there is no single "gold standard"

- Each source and method may be better suited for particular applications than others

- Tradeoffs will exist between the degree of validity and accuracy, and cost

- Potential bias and error for each method must be taken into consideration when interpreting results

- Some of the weaknesses may be corrected for
  - Household Consumption and Expenditure Surveys, in particular

Thank you

Questions?

Celeste Sununtnasuk
International Food Policy Research Institute (IFPRI)
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Household Consumption and Expenditure Surveys: A Tool for Estimating Food and Nutrient Intake

Celeste Sununtnasuk

International Food Policy Research Institute (IFPRI)

USAID SPRING Project

Dar es Salaam, Tanzania

10-14 December 2013

A Tool for Better Understanding…

1. Diet and dietary patterns
2. Key food sources of essential micronutrients
3. Regional variations in diet
4. Seasonal variations in diet & food security
5. Designing fortification programs & estimating their impacts
6. Food markets
7. Harmonizing portfolios of nutrition programs

Cost, Frequency and Availability

- Already being conducted, paid for and processed

    - Cost of a nutrition analytic file based on typical 24HR survey (8,500 HHs): $2.3 million

    - Cost of a nutrition analytic file from already processed HCES data: $40,000

    - HCES costs are about 2% the cost of a 24HR survey (Source: Fiedler, Martin-Prevel & Moursi, 2011)

- HCES are routinely, periodically updated (generally once every 3-5 years)

Understanding the Diet

Why is this so important?

- We need a good understanding of an individual's
  - Overall nutrient intake
  - Key sources of micronutrients
  - Bioavailability of nutrients

  to establish safe fortificant levels with the appropriate fortification vehicles

Ex: Sources of Energy in Uganda

Average dietary energy consumption (kcal/person/day) by food group

Food group	kcal/person/day
Starches	1078
Cereals & cereal products	391
Meat, meat product, fish	91
Milk and milk products	44
Oil, Fats, Spices	35
Fruits	31
Vegetables	65
Pulses, dry	176
Nuts and seeds	81
Sugar and sweets	85
Beverages	19
Outside food and drink	139
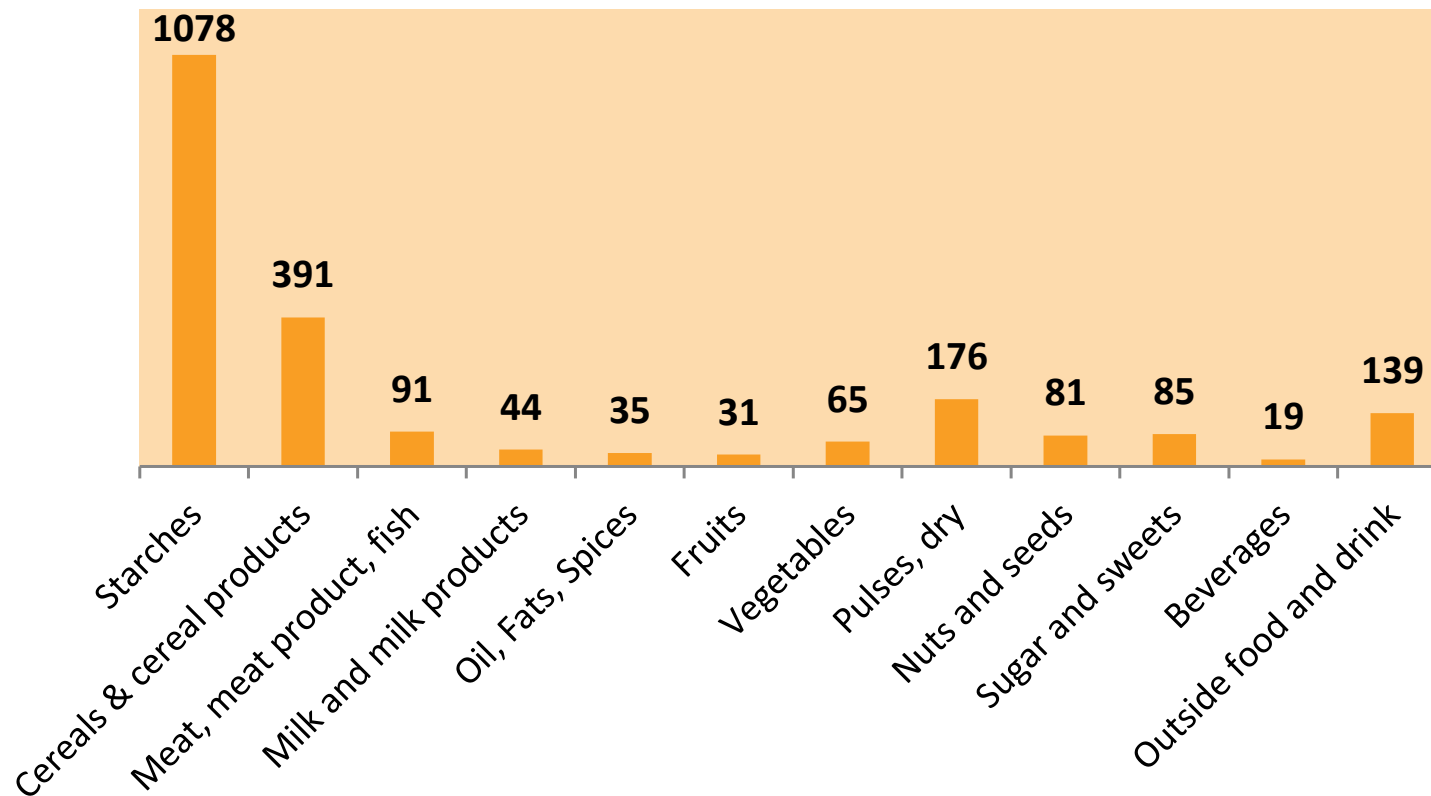
Fortificant Levels

- Where to get them? Bureau of standards and regulations
- What do we assume about their levels?
  - Are they at the plant?
  - At retail?
  - At the household taking into account how foods are prepared and consumed?
- Losses
- Bioavailability
- Current population intake

Calculating Individual Consumption and Nutrient Intake

- HCES provide consumption data at the household level

- How do you calculate individual consumption and nutrient intake?
  - Calculate total household consumption of each food item
  - Match food items with items listed in country-specific Food Composition Tables (FCTs)
  - Apply Adult Male Equivalents (AMEs) concept

Food Composition Tables (FCTs)

- Provide the nutrient content per 100g of edible food

- How precise are they?

- How unambiguously can they be matched to the HCES food item list?

food_code	food_description	food_state	energy_kcal	calcium_mg
1001	MAIZE GRAIN,WHITE VARIETY,FRESH,RAW	Raw	172.00	3
1002	MAIZE GRAIN,WHITE VARIETY,FRESH,BOILED/STEAMED	Boiled	207.00	3
1003	MAIZE GRAIN,WHITE VARIETY,FRESH,ROASTED	Roasted	224.00	4
1004	MAIZE GRAIN,YELLOW VARIETY,FRESH,RAW	Raw	172.00	3
1005	MAIZE,GRAIN,YELLOW VARIETY,FRESH,BOILED/STEAMED	Boiled	172.00	3
1006	MAIZE GRAIN,YELLOW VARIETY,FRESH,ROASTED	Roasted	224.00	4
1007	MAIZE GRAIN,WHITE VARIETY,DRIED,RAW	Raw	365.00	7
1008	MAIZE GRAIN,WHITE VARIETY,DRIED,BOILED	Boiled	188.00	4
1009	MAIZE GRAIN,WHITE VARIETY,DRIED,ROASTED	Roasted	374.00	7
1010	MAIZE GRAIN,YELLOW VARIETY,DRIED,RAW	Raw	365.00	7
1011	MAIZE GRAIN,YELLOW VARIETY,DRIED,BOILED	Boiled	188.00	4
1012	MAIZE GRAIN,YELLOW VARIETY,DRIED,ROASTED	Roasted	374.00	7
1014	MAIZE GRAIN,WHITE VARIETY,DRIED,FRIED	Fried	397.00	8
1015	MAIZE GRAIN,YELLOW VARIETY,DRIED,FRIED	Fried	397.00	8
801007	* MAIZE GRAIN,WHITE VARIETY,DRIED,RAW *BOILED*	Raw	365.00	7
801010	* MAIZE GRAIN,YELLOW VARIETY,DRIED,RAW *BOILED*	Raw	365.00	7
	maize_grains		284.31	5.375
1021	MAIZE ON COB,WHITE VARIETY,FRESH,RAW	Raw	172.00	3
1022	MAIZE ON COB,WHITE VARIETY,FRESH,BOILED	Boiled	207.00	4
1023	MAIZE ON COB,WHITE VARIETY,FRESH,STEAMED	Steamed	207.00	4
1024	MAIZE ON COB,WHITE VARIETY,FRESH,ROASTED	Roasted	224.00	4
1025	MAIZE ON COB,YELLOW VARIETY,FRESH,RAW	Raw	172.00	3
1026	MAIZE ON COB,YELLOW VARIETY,FRESH,BOILED	Boiled	206.00	4
1027	MAIZE ON COB,YELLOW VARIETY,FRESH,STEAMED	Steamed	206.00	4
1028	MAIZE ON COB,YELLOW VARIETY,FRESH,ROASTED	Roasted	224.00	4
	maize_cob		202.25	3.75

UNPS: Consumption Module

Section 15: Household Consumption Expenditure
Part A: Number of household members present
On average, how many people were present in the last 7 days? In this section children are defined as less than 18 years.

Household Members				Visitors			
Male adults	Female adults	Male children	Female children	Male adults	Female adults	Male children	Female children

Part B: Food, Beverage, and Tobacco (During the Last 7 Days)

Item Description	Code	Did you consume [ITEM] 1= Yes 2= No	How many days was [ITEM] consumed out of the last 7 days?	Unit of Qty	Consumption out of Purchases				Consumption out of home produce		Received in-kind/Free		Market Price	Farm gate price
					Household		Away from home							
					Qty	Value	Qty	Value	Qty	Value	Qty	Value		
1	**2**	**3A**	**3B**	**3C**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Matooke (Bunch)	101													
Matooke (Cluster)	102													
Matooke (Heap)	103													
Matooke (Others)	104													
Sweet Potatoes (Fresh)	105													
Sweet Potatoes (Dry)	106													
Cassava (Fresh)	107													
Cassava (Dry/ Flour)	108													
Irish Potatoes	109													
Rice	110													
Maize (grains)	111													
Maize (cobs)	112													
Maize (flour)	113													
Bread	114													
Millet	115													
Sorghum	116													
Beef	117													
Pork	118													
Goat Meat	119													
Other Meat	120													
Chicken	121													
Fresh Fish	122													
Dry/ Smoked fish	123													
Eggs	124													
Fresh Milk	125													
Infant Formula Foods	126													
Cooking oil	127													
Ghee	128													
Margarine, Butter etc	129													

56 Food Items

HarvestPlus FCT

Nutrient Content per 100g of Edible Food

>700 Food Items

food_code	food_description	food_state	energy_kcal	calcium_mg	iron_mg	zinc_mg	vit_a_iu
1001	MAIZE GRAIN,WHITE VARIETY,FRESH,RAW	Raw	172.00	3	1.3	1	0
1002	MAIZE GRAIN,WHITE VARIETY,FRESH,BOILED/STEAMED	Boiled	207.00	3	1.5	1.1	0
1003	MAIZE GRAIN,WHITE VARIETY,FRESH,ROASTED	Roasted	224.00	4	1.7	1.3	0
1004	MAIZE GRAIN,YELLOW VARIETY,FRESH,RAW	Raw	172.00	3	1.3	1	101
1005	MAIZE,GRAIN,YELLOW VARIETY,FRESH,BOILED/STEAMED	Boiled	172.00	3	1.2	1	91
1006	MAIZE GRAIN,YELLOW VARIETY,FRESH,ROASTED	Roasted	224.00	4	1.7	1.3	125
1007	MAIZE GRAIN,WHITE VARIETY,DRIED,RAW	Raw	365.00	7	2.7	2.2	0
1008	MAIZE GRAIN,WHITE VARIETY,DRIED,BOILED	Boiled	188.00	4	1.3	1.1	0
1009	MAIZE GRAIN,WHITE VARIETY,DRIED,ROASTED	Roasted	374.00	7	2.6	2.3	0
1010	MAIZE GRAIN,YELLOW VARIETY,DRIED,RAW	Raw	365.00	7	2.7	2.2	214
1011	MAIZE GRAIN,YELLOW VARIETY,DRIED,BOILED	Boiled	188.00	4	1.3	1.1	99
1012	MAIZE GRAIN,YELLOW VARIETY,DRIED,ROASTED	Roasted	374.00	7	2.6	2.3	198
1014	MAIZE GRAIN,WHITE VARIETY,DRIED,FRIED	Fried	397.00	8	2.8	2.4	0
1015	MAIZE GRAIN,YELLOW VARIETY,DRIED,FRIED	Fried	397.00	8	2.8	2.4	210
801007	* MAIZE GRAIN,WHITE VARIETY,DRIED,RAW *BOILED*	Raw	365.00	7	2.7	2.2	0
801010	* MAIZE GRAIN,YELLOW VARIETY,DRIED,RAW *BOILED*	Raw	365.00	7	2.7	2.2	193
	maize_grains		284.31	5.375	2.05625	1.69375	76.9375
1021	MAIZE ON COB,WHITE VARIETY,FRESH,RAW	Raw	172.00	3	1.3	1	0
1022	MAIZE ON COB,WHITE VARIETY,FRESH,BOILED	Boiled	207.00	4	1.5	1.1	0
1023	MAIZE ON COB,WHITE VARIETY,FRESH,STEAMED	Steamed	207.00	4	1.5	1.1	0
1024	MAIZE ON COB,WHITE VARIETY,FRESH,ROASTED	Roasted	224.00	4	1.7	1.3	0
1025	MAIZE ON COB,YELLOW VARIETY,FRESH,RAW	Raw	172.00	3	1.3	1	101
1026	MAIZE ON COB,YELLOW VARIETY,FRESH,BOILED	Boiled	206.00	4	1.5	1.2	109
1027	MAIZE ON COB,YELLOW VARIETY,FRESH,STEAMED	Steamed	206.00	4	1.5	1.2	109
1028	MAIZE ON COB,YELLOW VARIETY,FRESH,ROASTED	Roasted	224.00	4	1.7	1.3	125
	maize_cob		202.25	3.75	1.5	1.15	55.5

# Calculating Adult Male Equivalents

- The Adult Male Equivalent (AME)
  - An expression of household food intake that accounts for the composition of the household and allows the direct comparison of food or energy intakes of households of different sizes and compositions

- Individual AMEs are divided by total household AMEs, to estimate the intrahousehold distribution of food

Adult Male Equivalents (AMEs)

ADULT MALE EQUIVALENT		
MALE	**AGE (y)**	**FEMALE**
0.216721311	0-1	0.216721311
0.311475410	1-2	0.278688525
0.368852459	2-3	0.344262295
0.409836066	3-4	0.377049180
0.442622951	4-5	0.409836066
0.483606557	5-6	0.434426230
0.516393443	6-7	0.467213115
0.557377049	7-8	0.508196721
0.598360656	8-9	0.557377049
0.647540984	9-10	0.606557377
0.704918033	10-11	0.655737705
0.770491803	11-12	0.704918033
0.836065574	12-13	0.745901639
0.909836066	13-14	0.778688525
0.983606557	14-15	0.803278689
1.040983607	15-16	0.819672131
1.090163934	16-17	0.819672131
1.114754098	17-18	0.819672131
1	18-30	0.786885246
0.967213115	30-60	0.770491803
0.803278689	60-150	0.688524590

Adult males, age 18-30 y, are the benchmark for comparison
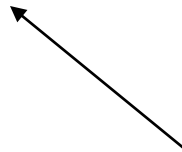
Ex: Rice Consumption, AMEs

SEX	AGE (y)	AME	HH AME	IND AME
Female	60	0.68852	3.61475	0.19048
Female	30	0.77049	3.61475	0.21315
Female	11	0.70492	3.61475	0.19501
Male	40	0.96721	3.61475	0.26757
Male	5	0.48361	3.61475	0.13379

Total Household consumption of rice: 1,571.43 g

Individual consumption (not using AMEs):

1,571.43 g ÷ HH size =   314.26 g per person

Individual consumption (using AMEs):

1,571.43 g x Individual AME =
Female, 60: 299.32 g
Female, 30: 334.95 g
Female, 11: 306.45 g
Male, 40: 420.47 g
Male,   5: 210.24 g

Calculating Nutrient Adequacies

- How do we determine whether or not someone is deficient in a specific nutrient?
  - If nutrient intake is below the corresponding Estimated Average Requirement (EAR)
  - Probability approach for iron

- How do we determine if nutrient intake is excessive?
  - If intake exceeds the Tolerable Upper Level Intake (UL) for the age and sex of the individual

Estimated Average Requirements (EARs)

	AGE	GENDER	STATUS	ESTIMATED AVERAGE REQUIREMENT			
				IRON (mg/d)	VITAMIN A (µg/d)	ZINC (mg/d)	FOLATE (µg/d)
1	0-6 mos.	Both		.27 (AI)	400 (AI)	2 (AI)	65 (AI)
2	6-12 mos.	Both		6.9	500 (AI)	2.5	80 (AI)
3	1-3 y	Both		3	210	2.5	120
4	4-8 y	Both		4.1	275	4	160
5	9-13 y	Male		5.9	445	7	250
6	9-13 y	Female		5.7	420	7	250
7	14-18 y	Male		7.7	630	8.5	330
8	14-18 y	Female	NPNL	7.9	485	7.3	330
9	14-18 y	Female	P	23.0	530	10.5	520
10	19-30 y	Male		6.0	625	9.4	320
11	19-30 y	Female	NPNL	8.1	500	6.8	320
12	19-30 y	Female	P	22.0	550	9.5	520
13	31-50 y	Male		6.0	625	9.4	320
14	31-50 y	Female	NPNL	8.1	500	6.8	320
15	31-50 y	Female	P	22.0	550	9.5	520
16	51-70 y	Male		6.0	625	9.4	320
17	51-70 y	Female		5.0	500	6.8	320
18	>70 y	Male		6.0	625	9.4	320
19	>70 y	Female		7.0	500	6.8	320

NPNL= Non-pregnant, Non-lactating   P = Pregnant   AI = Average Intake

Tolerable Upper Intake Level (UL)

	AGE	GENDER	STATUS	TOLERABLE UPPER INTAKE LEVEL			
				IRON (mg/d)	VITAMIN A (µg/d)	ZINC (mg/d)	FOLIC ACID (µg/d)
1	0-6 mos.	Both		40	600	4	ND
2	6-12 mos.	Both		40	600	5	ND
3	1-3 y	Both		40	600	7	300
4	4-8 y	Both		40	900	12	400
5	9-13 y	Male		40	1,700	23	600
6	9-13 y	Female		40	1,700	23	600
7	14-18 y	Male		45	2,800	34	800
8	14-18 y	Female	NPNL	45	2,800	34	800
9	14-18 y	Female	P	45	2,800	34	800
10	19-30 y	Male		45	3,000	40	1,000
11	19-30 y	Female	NPNL	45	3,000	40	1,000
12	19-30 y	Female	P	45	3,000	40	1,000
13	31-50 y	Male		45	3,000	40	1,000
14	31-50 y	Female	NPNL	45	3,000	40	1,000
15	31-50 y	Female	P	45	3,000	40	1,000
16	51-70 y	Male		45	3,000	40	1,000
17	51-70 y	Female		45	3,000	40	1,000
18	>70 y	Male		45	3,000	40	1,000
19	>70 y	Female		45	3,000	40	1,000

NPNL= Non-pregnant, Non-lactating   P = Pregnant

Dietary Reference Intakes
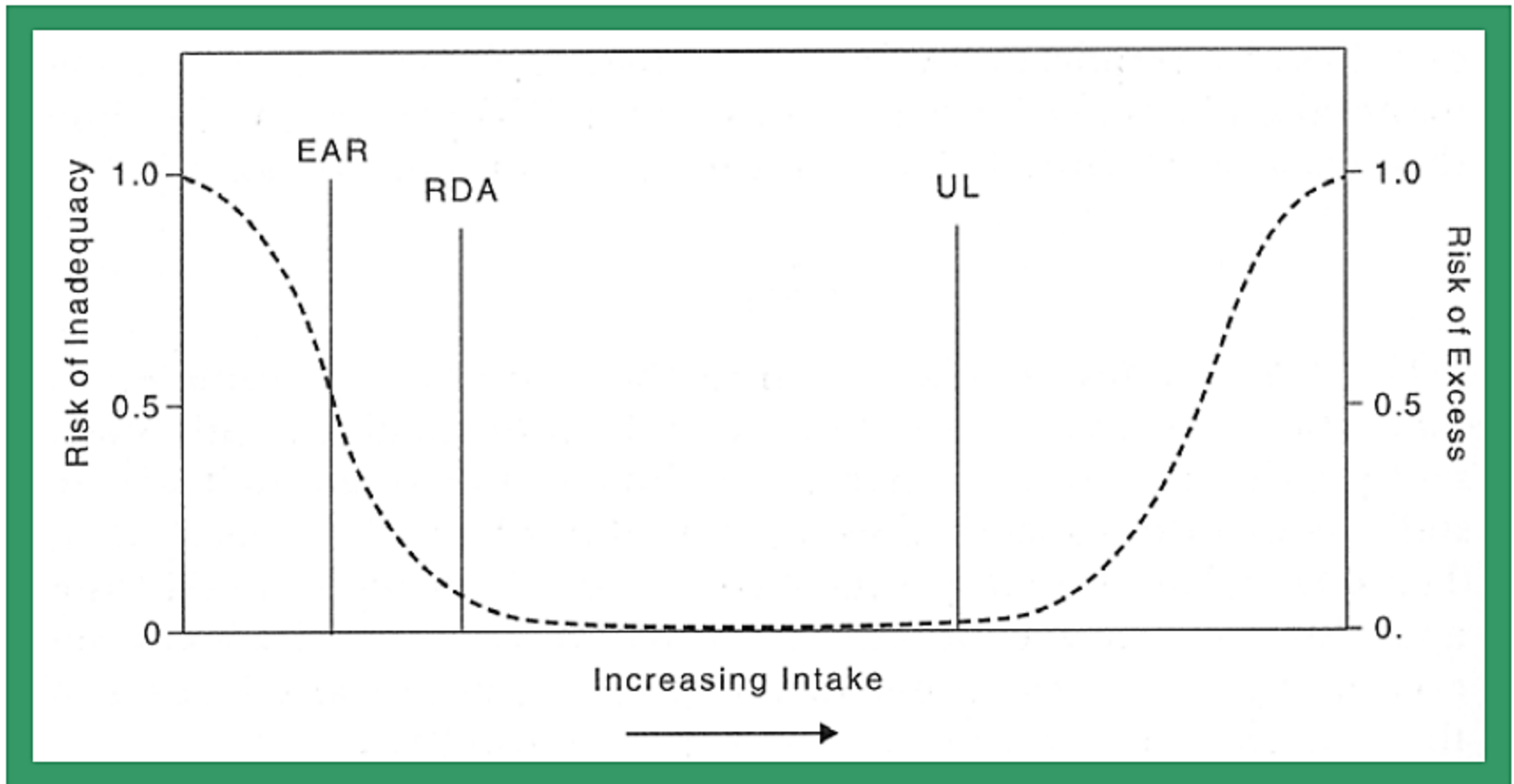
WHO Nutrient Recommendations

Table 1. Average levels of nutrients to consider adding to fortified wheat flour based on extraction, fortificant compound, and estimated *per capita* flour availability

Nutrient	Flour Extraction Rate	Compound	Level of nutrient to be added in parts per million (ppm) by estimated average per capita wheat flour availability (g/day)[1]			
			<75[2] g/day	75-149 g/day	150-300 g/day	>300 g/day
Iron	Low	NaFeEDTA	40	40	20	15
		Ferrous Sulfate	60	60	30	20
		Ferrous Fumarate	60	60	30	20
		Electrolytic Iron	NR[3]	NR[3]	60	40
	High	NaFeEDTA	40	40	20	15
Folic Acid	Low or High	Folic Acid	5.0	2.6	1.3	1.0
Vitamin B_{12}	Low or High	Cyanocobalamin	0.04	0.02	0.01	0.008
Vitamin A	Low or High	Vitamin A Palmitate	5.9	3	1.5	1
Zinc[4]	Low	Zinc Oxide	95	55	40	30
	High	Zinc Oxide	100	100	80	70

Footnotes

1. These estimated levels consider only wheat flour as the main fortification vehicle in a public health program. **If other mass-fortification programs with other food vehicles are implemented effectively, these suggested fortification levels may need to be adjusted downwards as needed.**

2. Estimated per capita consumption of <75 g/day does not allow for addition of sufficient level of fortificant to cover micronutrients needs for women of childbearing age. Fortification of additional food vehicles and other interventions should be considered.

3. NR = Not Recommended because very high levels of electrolytic iron needed could negatively affect sensory properties of fortified flour.

4. These amounts of zinc fortification assume 5 mg zinc intake and no additional phytate intake from other dietary sources.

Ex: 2008 UFCS

- 24-hour recall conducted in three regions of Uganda to determine
  - Food intake and nutrient inadequacies
  - Adequacy of mass fortification

- Sample
  - Children, 24-59 months
  - Women, 15-49 years
  - Central (Kampala), and rural Western and Northern regions

- After calculating dietary intakes and accounting for existing interventions
  - The WHO recommended fortificant levels for folic acid and vitamin A for populations consuming <75 g of flour would be unnecessarily **high** and even **excessive** for WRA and children

Source: Kyamuhangire, William, Lubowa, Abdelrahman, Kaaya, Archileo, Kikafunda, Joyce, Harvey, Philip W. J., Rambeloson, Zo, Dary, Omar, Dror, Daphna K., and Lindsay H. Allen. 2013. "The importance of using food and nutrient intake data to identify appropriate vehicles and estimate potential benefits of food fortification in Uganda." *Food and Nutrition Bulletin, 34*(2): 131-142.

Ex: 2010/2011 Cameroon

- Combined FFQ and 24-hour recall conducted in Cameroon to asses potential fortification vehicles (vegetable oil, wheat flour, sugar, and bouillon cube)

- Sample
  - Children, 12-59 months
  - Women, 15-49 years
  - 3 ecological zones (north, south, large cities)

- Consumption of fortifiable foods varied by ecological zone and socioeconomic status
  - Lower SES groups were less likely to consume fortifiable foods and consumed less amounts

- Micronutrient inadequacy greatest in the north, lower SES groups, and children

Source: Engle-Stone, Reins, Ndjebayi, Alex O., Nankap, Martin, and Kenneth H. Brown. 2012. "Consumption of potentially fortifiable foods by women and young children varies by ecological zone and socio-economic status in Cameroon." *The Journal of Nutrition, 142*(3): 555-565.

Ex: Cameroon

Amount of fortifiable foods consumed in the previous day (g/d)
**bouillon cubes in tenths of g/d
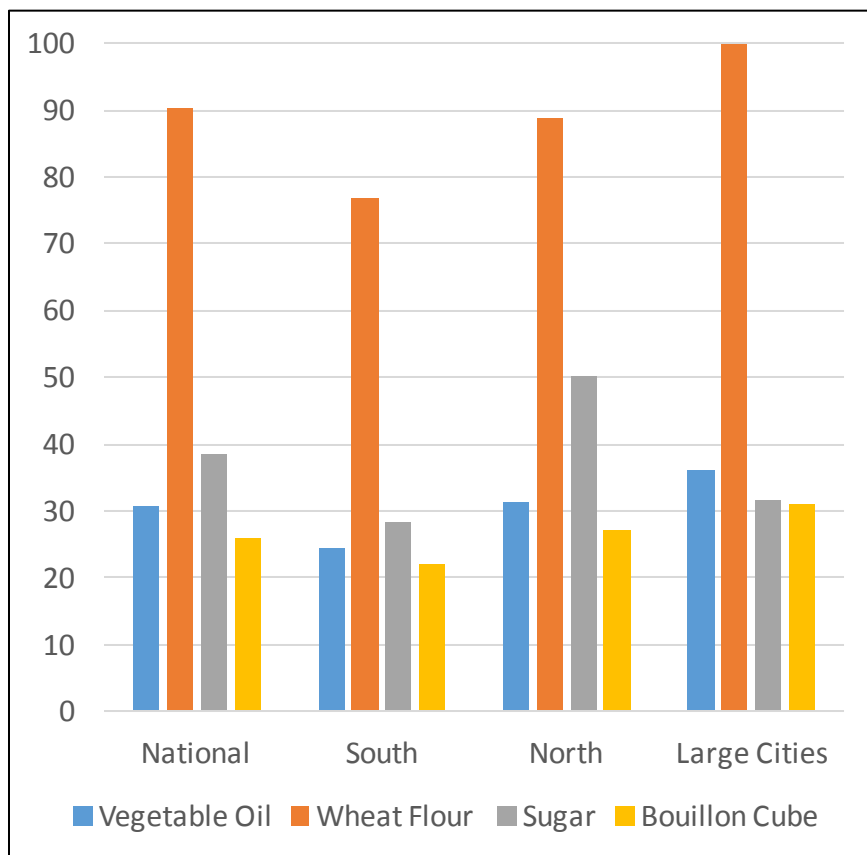
Women
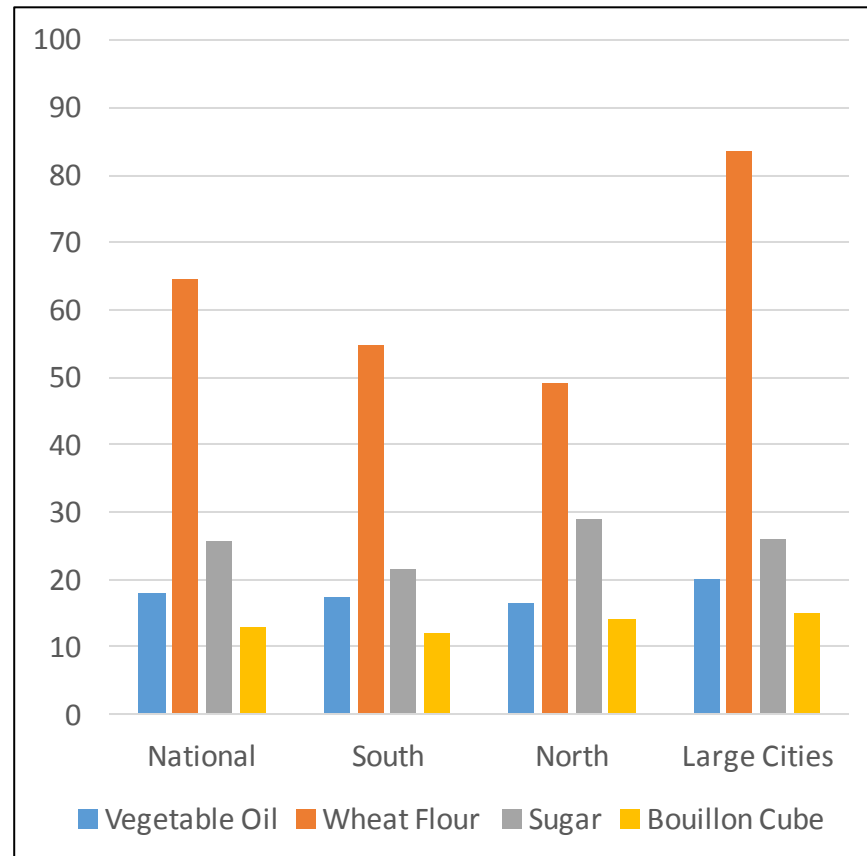
Children

Ex: Cameroon

- Before coverage data was available, a preliminary decision was made to fortify vitamin A

- But coverage turned out to be relatively low....

Proportion of Cameroonian women consuming fortifiable foods at least once in previous week
**Food Frequencies listed above (number of times consumed in previous week)
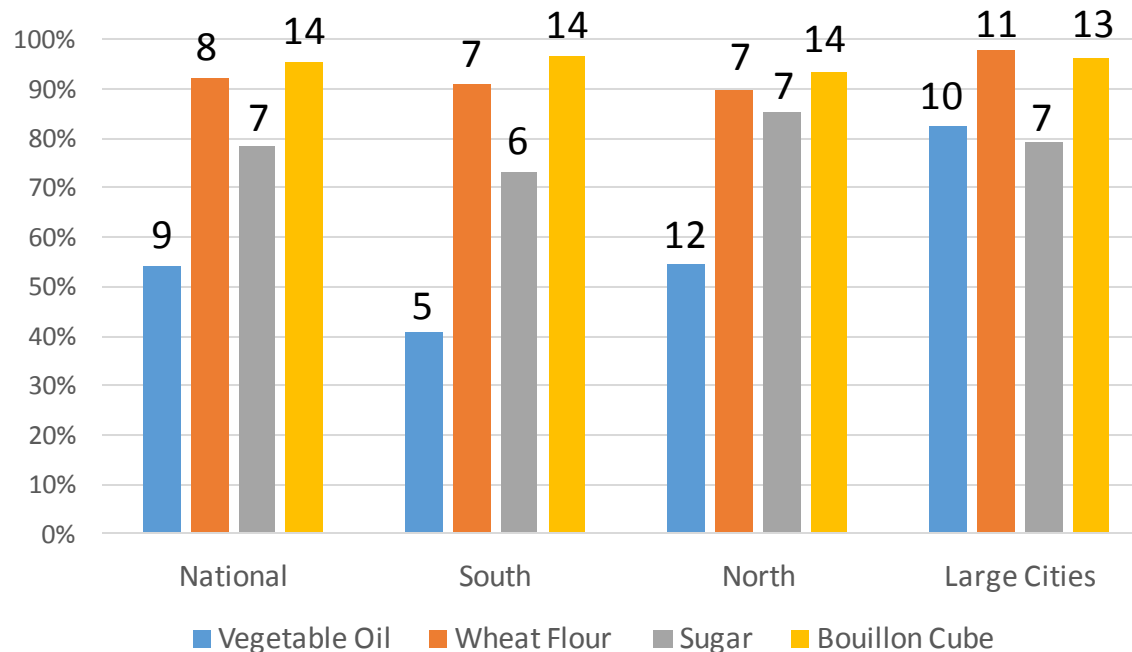
ADePT

- **A**utomated **DE**C's **P**overty **T**ables
- Developed in collaboration between the FAO statistics division and World Bank
- Food Security module can produce indicators from consumption data collected in household surveys
  - Consumption of calories and micronutrients
  - Availability of micronutrients and amino acids
  - Distribution of calories
  - Proportion of people undernourished

ADePT Quick Reference

Follow the numbered steps to perform an analysis.

After launching ADePT, double-click desired module in **Select ADePT Module** window. **Module > Select Module...** to change module from within ADePT.

Use the example project (**Project > Open Example Project**) to familiarize yourself with ADePT analysis steps, options, reports and other features.

1. Click Add... to load dataset(s). Enter dataset year in Label column.

Click **Variables** tab to see basic variable information for selected dataset.

Click **Browse...** to see data, and variable details, for selected dataset.

(Shortcut: double-click file name.)

Select to calculate changes between two years selected at right.

Click **Parameters** tab to adjust factors used in calculations.

Italics: field can accept multiple input variables.

This panel is module-specific.

Project > Open Example Project to see dataset variables properly mapped to input variables.

3. Select tables and/or graphs to be included in report.

Select to include summary of original data in report.

Select name to see details in **Table description and if-condition** tab below.

Select to calculate standard errors and/or frequencies for each table. Report shows results in separate worksheets for each selected table.

Review messages for potential calculation problems. Messages are also in report's **Notifications** worksheet.

2. Map dataset variables to input variables by selecting dataset variables in drop-down lists.

Alternatively, drag variable names from dataset **Variables** tab and drop in fields in input **Variables** tab.

Hover cursor over input variable names and fields to see description in status bar.

4. Click Generate button. Report is automatically displayed in Microsoft® Excel® or Excel Viewer.

Report can also be viewed in an Excel-compatible spreadsheet program.

Food Security Module

Levels of Data

- Household
  - Size
  - Region
  - Area
- Individual
  - Age
  - Gender
  - Height
  - Relationship to HH head
- Food
  - Item code
  - Unit of quantity
  - Monetary value
- Country
  - FCT
  - Vitamins, minerals, etc.

Improving HCES

- To date, HCES have been overwhelmingly used only as a source of data for secondary data

- How much could HCES be strengthened to collect more relevant and precise data for food and nutrition analysis?

Shared Agenda for Improvements

- Standardizing units of measure

- Better capturing food away from home

- Improving the food item list

- Optimizing the recall period

- Distinguishing consumption and acquisition

- Collecting more information about individual consumption

Thank you

Questions?

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