Considerations in calculating flour consumption in a country

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Overview

- Why calculate flour consumption
- Factors to be considered
- Potential sources and quality of data
  - National food consumption data – if available!
  - Household income and expenditure surveys
  - Panel survey
  - FRAT
  - FAO food balance sheets

Why calculate flour consumption

- To determine the levels of fortification
  - to have a public health impact
  - without any adverse effects
- To determine the potential coverage of a food fortification programme
  - Population groups
  - Geographical areas

Factors to be considered

- Information is scarce
  - Not often full information on micronutrient deficiencies - use proxy measures e.g. Vitamin A supplementation coverage
  - Often lack of information on actual food consumption

- But… we cannot let this stop us!
  - We can still base programmes on sound evidence

Potential sources and quality of data

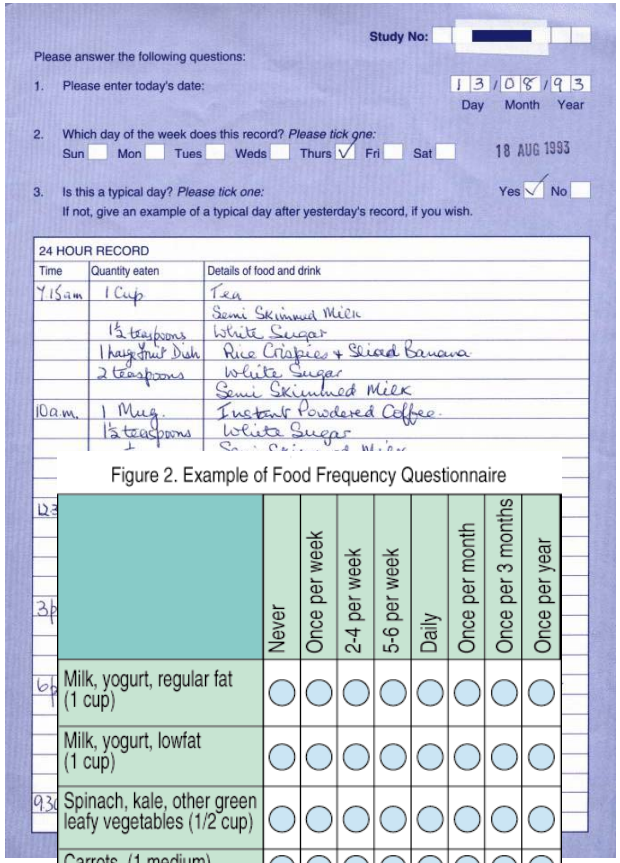
Specificity ↓

- National food consumption data
- Household income and expenditure surveys (HIES)
- Panel survey
- Fortification Rapid Assessment Tool (FRAT)
- FAO food balance sheets

- Others: Demographic Health Surveys, industry information

National food consumption data

- Surveys developed specifically to measure food intake and nutritional status of a population
- Nationally representative samples
- Often uses 24 hr recalls to measure actual food intake as well as food frequency questionnaires
- Best source of food consumption data but often not available



Study No:

Please answer the following questions:

1. Please enter today's date: 13 / 08 / 93 (Day / Month / Year)
2. Which day of the week does this record? *Please tick one:* Sun ☐ Mon ☐ Tues ☐ Weds ☐ Thurs ☑ Fri ☐ Sat ☐ 18 AUG 1993
3. Is this a typical day? *Please tick one:* Yes ☑ No ☐
   If not, give an example of a typical day after yesterday's record, if you wish.

24 HOUR RECORD

Time	Quantity eaten	Details of food and drink
7.15am	1 Cup	Tea
		Semi Skimmed Milk
	1½ teaspoons	White Sugar
	1 Large Fruit Dish	Rice Crispies + Sliced Banana
	2 teaspoons	White Sugar
		Semi Skimmed Milk
10a.m.	1 Mug.	Instant Powdered Coffee.
	1½ teaspoons	White Sugar

Figure 2. Example of Food Frequency Questionnaire

	Never	Once per week	2-4 per week	5-6 per week	Daily	Once per month	Once per 3 months	Once per year
Milk, yogurt, regular fat (1 cup)	○	○	○	○	○	○	○	○
Milk, yogurt, lowfat (1 cup)	○	○	○	○	○	○	○	○
Spinach, kale, other green leafy vegetables (1/2 cup)	○	○	○	○	○	○	○	○
Carrots (1 medium)	○	○	○	○	○	○	○	○
Beef (3 oz)	○	○	○	○	○	○	○	○
Rice, white (1 cup)	○	○	○	○	○	○	○	○
Rice, brown (1 cup)	○	○	○	○	○	○	○	○
Cookies (2 -2" diameter)	○	○	○	○	○	○	○	○
Ice cream, regular fat (1/2 cup)	○	○	○	○	○	○	○	○

The South African National Food Consumption Survey (NFCS)

- Subjects: 3120 Children aged 1–9 years
- Data:
  - socio-demographic status
  - dietary intake (24 hr recall + FFQ)
  - food purchasing practices
  - hunger
  - anthropometric measurements
- Uses are many!
  - Identified the low micronutrient content of die
  - Identified most appropriate food vehicles
    - commonly consumed foods incl. origin (home grown/processed, purchased, "gift")
    - extend of consumption
    - economic distribution
  - Projected impact of fortification programme

Table 8
Proportion of Children Consuming Selected Food Vehicles

Food Vehicle	Number Consuming: 2868 Study Children	% Children Consuming
	# of Children	% Children
1-3 Years n = 1308		
White bread	276	21.10%
7-9 Years n=478		
Whole milk	188	39.33%
Marg & Fat	142	29.71%
White Bread	163	34.10%
Brown Bread	210	43.93%
White sugar	371	77.62%
Maize	338	70.71%

Table 13
Combined Impact of Wheat Flour and Maize Meal Fortification

	% RDA from Maize Fortification	% RDA from Flour Fortification	Total Added Towards RDA from
Thiamin	23%	15%	38%
Riboflavin	21%	15	36%
Niacin	21%	15	36%
Folic Acid*	23%	22	45%
Vitamin B6	22%	15	37%
Vitamin A*	21%	19%	40%
Iron	44%	29%	71%
Zinc	13%	9%	22%

- Link: http://www.sahealthinfo.org/nutrition/foodconsumption.htm
- http://journals.cambridge.org/action/displayFulltext?type=1&fid=631596&jid=PHN&volumeId=8&issueId=05&aid=585180

Household income & expenditure surveys

- Integrated multi purpose instruments that can be adapted according to needs and priorities
- Vary across countries (quality and content) but all report on staple foods
  - Wheat, maize*, sugar, oil etc.

Country	Survey	Recall period (days)	Expenditure only (X) or food quantity (Q) also reported?	Sample size (no. of HHs)	No. of food items reported
Burundi	Enquete prioritaire (1998)	15	X	6,668	32
Congo, Dem. Rep.	Employment, informal sector and household consumption survey (2005–06)	15	Q	4.715	500
Ethiopia	Household income and expenditure survey (2000)*	7	Q	16,672	224
Ghana	Ghana living standards survey 4 (1998)*	35	X	5,998	104
Madagascar	Enquete permanente aupres des menages (2001)	30	Q	5,078	65

Country	Survey	Recall period (days)	Expenditure only (X) or food quantity (Q) also reported?	Sample size (no. of HHs)	No. of food items reported
Malawi	Malawi second integrated household Survey (2004)	7	Q	11,280	115
Mozambique	QUIBB (questionario de indicadores basicos de bem-estar) (2002)	7	Q	8,700	332
Nigeria	Nigeria living standards survey (2003)	30	X	19,158	134
South Africa	Income and expenditure survey (2000)	30	X	26,263	122
Tanzania	Household budget survey (2000)*	30	Q	22,178	135
Uganda	National household survey 2002/2003*	7	Q	9,711	58

Household income & expenditure surveys

- Integrated multi purpose instruments that can be adapted according to needs and priorities
- Vary across countries (quality and content) but all report on staple foods
  - Wheat, maize*, sugar, oil etc.
- But know that…
  - Expenditure data = apparent (not actual) consumption
  - Based on HH's, not individuals
  - Does not include foods eaten outside the home

Household income & expenditure surveys

- However…
  - Differentiates btw home produced, purchased or gifted foods
  - Special uses in respect to flour fortification
    - Assessing coverage of vehicle
      - e.g. wheat flour vs. wheat flour products

Household income & expenditure surveys

- Percentage of HH that purchase some of the potential food fortification vehicles

Country	Maize (flour & products)	Wheat flour	Wheat flour staples	Wheat flour based foods	Sugar	Edible oils
DRC		4%	66%	73%	82%	39%
Ethiopia	22%	21%	29%	29%	22%	29%
Madagascar	3%	5%		45%	73%	90%
Malawi	97%	1%	34%	35%	28%	34%
Mozambique	18%	1%	34%	35%	28%	34%
South Africa		48%			96%	79%
Tanzania	71%	27%			63%	96%

Household income & expenditure surveys

- However…
  - Differentiates btw home produced, purchased or gifted foods
  - Special uses in respect to flour fortification
    - Assessing coverage of vehicle
      - e.g. wheat flour vs. wheat flour products
  - Mapping and targeting fortification efforts
    - E.g. SES or geographical areas including gaps

Household income & expenditure surveys

- Percentage of HHs that purchase potential food fortification vehicles according to residence and income – Example from the Tanzanian HBS (2001)

Food items	On average	Rural HHs	Urban HHs	Poorest quintile	Richest quintile
Wheat flour	17%	13%	31%	8%	29%
Bread	20%	11%	52%	4%	39%
Wheat flour staples	30%	21%	65%	11%	54%
Wheat flour based foods	62%	55%	90%	38%	81%
Maize flour	66%	59%	89%	56%	77%
Sugar	73%	67%	93%	45%	90%
Salt	86%	86%	83%	81%	88%
Edible oils	45%	40%	63%	31%	55%

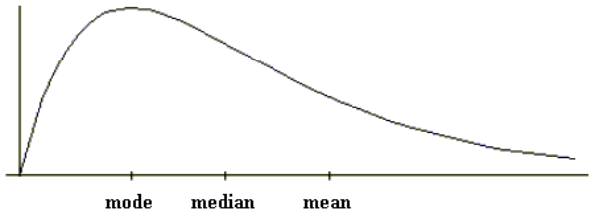
Household income & expenditure surveys

- However…
  - Differentiates btw home produced, purchased or gifted foods
  - Special uses in respect to flour fortification
    - Assessing coverage of vehicle
      - e.g. wheat flour vs. wheat flour products
  - Mapping and targeting fortification efforts
    - E.g. SES or geographical areas including gaps
  - Identifying "new" potential food vehicles
  - Setting the fortification level more precisely
    - Especially if multiple vehicles are considered

Household income & expenditure surveys

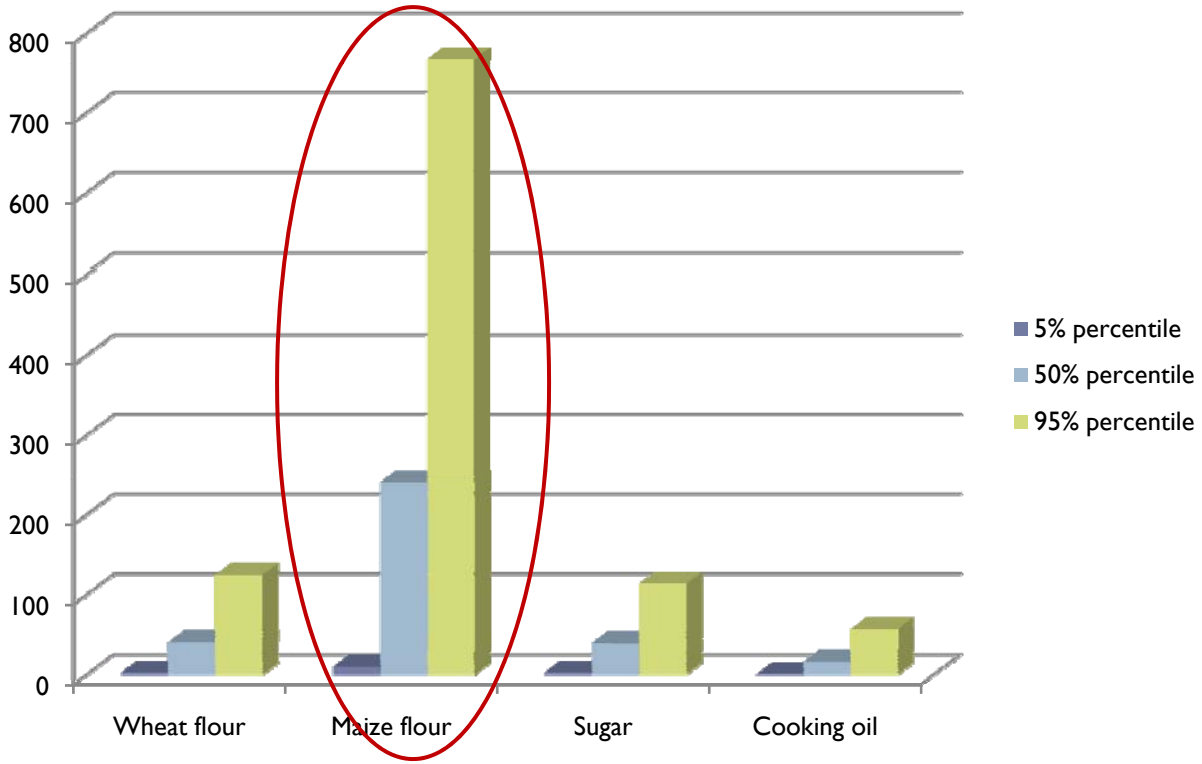
- But keep in mind, consumption levels varies – example from Tz

Food item	5th percentile consumption level (g/day)	Median (most common) consumption level (g/day)	Mean (average) consumption level (g/day)	95th percentile consumption level (g/day)
Wheat flour	3g	18g	40.7g	125g
Maize flour	10g	151.7g	240.7g	768g
Sugar	3g	26.7g	39.7g	113.7g
Edible oils	0.7g	7.7g	16.3g	57g



Keep in mind…

- Large differences in consumption levels of wheat and maize flour within a country – perhaps even greater than between countries…



RECALL from the WHO presentation Day 1

	Ranges of Daily Per Capita Availability of Wheat Flour (g/day)			
Percentile of Wheat Flour Availability	<75	75-149	150-300	>300[1]
5th	7.5	15	30	60
50th	50	100	200	400
95th	150	300	600	800

1Few countries have per capita consumption of >300 grams per day.

Panel Surveys

- Representative samples of households followed with time
  - Surveyed usually on an annual basis
- An integrated survey covering a wide range of socioeconomic factors
  - vs. DHS (only health) and HIES (only income &expenditure)
- HHs are revisited over time
  - Can track transitions in welfare and changes in the determinants
- A variety of questionnaires
  - Household Q
  - Agricultural Q
  - Community Q
- Currently available in: Tanzania, Uganda & Malawi – soon also Nigeria, Niger and Ethiopia and possibly more…

- Link: http://wwww.nbs.go.tz/index.php?option=com_content&view=article&id=92&Itemid=24
- http://www.ifpri.org/dataset/malawi-complementary-panel-survey-cps-2000-2002

Panel Surveys - Uganda

- Is being planned
  - 3,200 HH randomly selected
  - Representative at national, urban/rural and main regional levels
  - Visited for 2 years 2009/2010 & 2010/2011
  - Questionnaires:
    - Multi-topic HH Q
    - Agricultural Q
    - Community Q
    - Price Q
  - HH will be interviewed twice yearly
  - All data will be made publicly available

- Link: http://www.ubos.org/?st=pagerelations2&id=58&p=related%20pages%202:Uganda%20National%20Panel%20Surveys

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													

Panel Surveys

PART B Cont'd: Food Fortification

CHECK WHETHER THE HOUSEHOLD CONSUMED ANY MAIZE FLOUR, SUGAR, SALT OR COOKING OIL DURING THE LAST 7 DAYS

Item Description	Code	Did the household consume [ITEM] 1= Yes 2= No	Is the [ITEM] fortified? 1= Yes 2= No 3= Don't Know CHECK FOR FORTIFICATION LOGO OR SHOW SAMPLE TO RESPONDENT	What Brand of MAIZE FLOUR was consumed? SPECIFY		What brand of COOKING OIL was consumed?		What brand of SUGAR was consumed?		What brand of SALT was consumed?	
1	2	14	15	16A	CODE 16B	17A	CODE 17B	18A	CODE 18B	19A	CODE 19B
Maize flour	113										
Cooking oil	127										
Sugar	147										
Salt	150										

Fortification Rapid Assessment Tool (FRAT)

- Combination of a simplified 24 hr recall and food frequency questionnaire
- Versatile
  - Can be implemented as stand-alone survey
  - Or can be piggybacked onto an existing survey
    e.g. a district health survey
- Collects representative quantitative data from HH level
  - Consumption of potential food vehicles
  - Some qualitative data on the use and availability of food vehicles
  - Children 12-36 months & women aged 16-45
- Note: does NOT measure intake of micronutrients

- Link: http://www.micronutrient.org/English/..%5CCMFiles%5CPubLib/FRATguidelines2003_Nov_20081PKE-1222008-1386.pdf

Key questions answered using the FRAT Survey

CONSUMPTION	USE	AVAILABILITY
Effectiveness: • Do young children and women of child-bearing age consume the fortified food? • What is the range of consumption levels? • Is consumption restricted by low socioeconomic status?	Storage: • Will there be significant losses of the fortificant as a result of storage method in the household?*	Current availability at household level: • What proportion of households have it at the time of the survey?** • Are there socioeconomic barriers to its use?
Regional variations: • Are there major regional variations in consumption patterns?	Food preparation methods: • Is there a possibility of significant losses during processing or food preparation?*	

* Loss of micronutrients due to storage or cooking methods varies between different foods and micronutrients. For example, iodine loss increases with increasing exposure to air, with temperature having a small effect. Loss of vitamin A from rice (Ultra Rice™) increase with temperature, but exposure to air has little effect.

** In some regions where food is purchased one day at a time and consumed as purchased, the availability in the household will not be meaningful, nor will storage practices be important.

Fortification Rapid Assessment Tool (FRAT)

- Experience from Uganda
  - Kamuli district
  - 1104 children aged 12-36 months
  - 1102 mothers/female caretakers aged 16-45
  - ➔
    - Level of sugar consumption, (83-96%) common mode (tea, porridge, orange juice) of sugar consumption, common forms of storage

- Link: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2141566/pdf/AFHS0201-0011.pdf

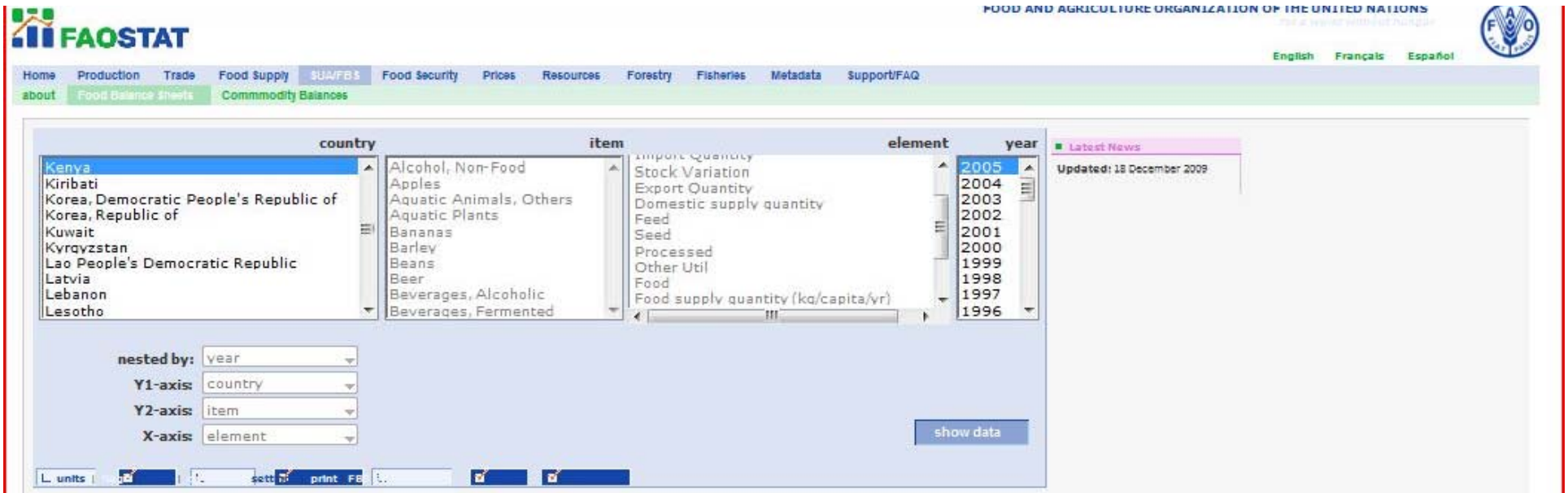
Fortification Rapid Assessment Tool (FRAT)

- Experience from Tanzania
  - Dodoma rural and Arumeru (Arusha) districts, 2007
  - Sample size?
  - Consumption:
    - Maize flour:
      - 301-570 g for women,
      - 216-220g for children
    - Wheat flour:
      - 121-132g for women
      - 111-116g for children
    - Sugar:
      - 13.8-18.3g for women
      - 12-14g for children
    - Edible oil:
      - 41.6-43.5ml for women
      - 24-26ml for children

FAO food balance sheets

- Gives a comprehensive picture of a countries food supply in a given time period
  - Amount of each food item available for human consumption based on supply and utilization
    - Total quantity produced + imported – exported – used for feeding livestock/seeds – losses (storage and transportation) = food available for human consumption
    - Total food available / total population = per capita consumption
- But…
  - Amount actually consumed if often lower due to waste at retails and HHs e.g. during storage, preparation, cooking and "leftovers"
  - Accuracy is also dependent on the reliability of statistics of supply and utilization of food in a population – often a problem in developing countries
    - Non-commercial/ subsistence production, consumption of wild foods, incomplete harvests, unrecorded trade, issues with reliability of export data, quality of crops
- Where basic data is unreliable or incomplete, FBS do not give good estimates of food consumption

Link: http://faostat.fao.org/site/368/default.aspx#ancor

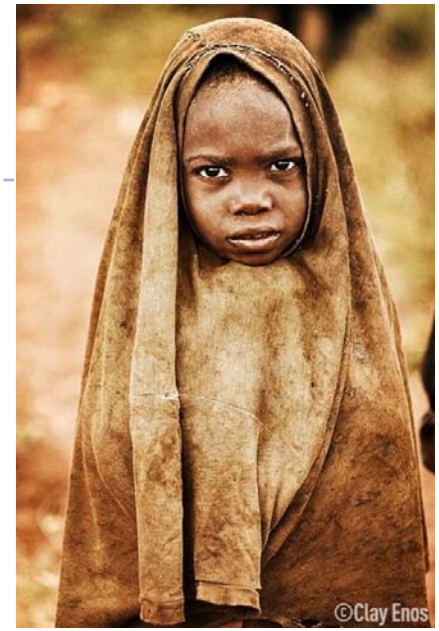


Kenya - 2005

element

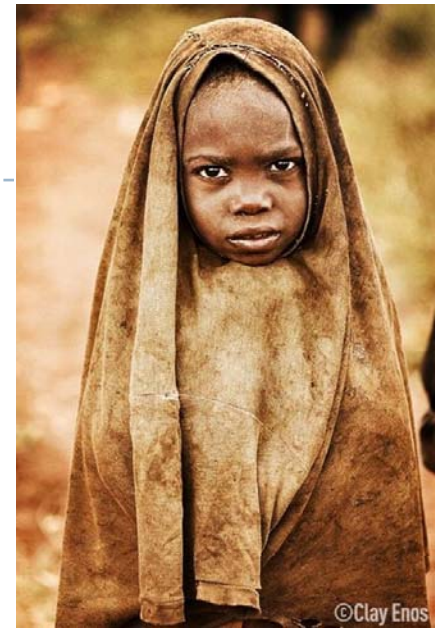
country	Item	Total Population - Both sexes (1000)	Production (1000 tonnes)	Import Quantity (1000 tonnes)	Stock Variation (1000 tonnes)	Export Quantity (1000 tonnes)	Domestic supply quantity (1000 tonnes)	Feed (1000 tonnes)	Seed (1000 tonnes)	Processing (1000 tonnes)	Food (1000 tonnes)	Other Util (1000 tonnes)	Food supply quantity (kg/capita/yr) (Kg)	Food supply (kcal/capita/day) (kcal)	Protein supply quantity (g/capita/day) (g)	Fat supply quantity (g/capita/day) (g)
	Population	35599														
	Grand Total +													2079 Fc	57.8 Fc	44.9 Fc
	Vegetal Products +													1840 Fc	42.5 Fc	30.0 Fc
	Animal Products +													238 Fc	15.3 Fc	14.9 Fc
	Cereals - Excluding Beer +		3564 A	1395 A	20 A	36 A	4943 A	102 A	73 A	107 A	4563 A	98 A	[illegible] Fc	1095 Fc	28.7 Fc	9.2 Fc
	Wheat		369	640	0	9	999	0 M	13	0	954	33	26.8 Fc	201 Fc	6.0 Fc	0.8 Fc
	Rice (Milled Equivalent)		42	456	-5	1	492	0 M	1	0 M	474	17	13.3 Fc	129 Fc	2.4 Fc	0.2 Fc
	Barley		41	11	0	9	43	0 M	1	40	1	1	0.0 Fc	0 Fc	0.0 Fc	0.0 Fc
	Maize		2906	243	25	14	3199	80	53	12	2994	21	84.1 Fc	732 Fc	19.3 Fc	7.9 Fc
	Rye		0 M	0	0 M	0	0	0	0 M	0 M	0 M	0	0.0 Fc	0 Fc	0.0 Fc	0.0 Fc
	Oats		4	1	0	0	5	1	0	0	3	0	0.1 Fc	1 Fc	0.0 Fc	0.0 Fc
	Millet		53	1	0 M	0	54	4	2	11	31	6	0.9 Fc	7 Fc	0.2 Fc	0.1 Fc
	Sorghum		150	39	0 M	2	187	16	3	45	103	21	2.9 Fc	24 Fc	0.8 Fc	0.2 Fc
	Cereals, Other		0 M	4	0	0	3	1	0 M	0 M	3	0	0.1 Fc	1 Fc	0.0 Fc	0.0 Fc
	Starchy Roots +		1582 A	3 A	0 A	0 A	1585 A	0 A	97 A	0 A	1352 A	137 A	38.0 Fc	88 Fc	1.4 Fc	0.1 Fc
	Cassava		348	2	0	0	350	0 M	0 M	0 M	337	13	9.5 Fc	28 Fc	0.2 Fc	0.0 Fc
	Potatoes		980	1	0	0	981	0 M	97	0 M	785	99	22.1 Fc	43 Fc	0.9 Fc	0.1 Fc
	Sweet Potatoes		231	0 M	0 M	0 M	231	0 M	0 M	0 M	208	23	5.8 Fc	16 Fc	0.2 Fc	0.0 Fc
	Yams		7	0 M	0 M	0 M	7	0 M	0 M	0 M	7	0	0.2 Fc	1 Fc	0.0 Fc	0.0 Fc
	Roots, Other		16	0	0	0	16	0 M	0 M	0 M	15	2	0.4 Fc	1 Fc	0.0 Fc	0.0 Fc
	Sugarcrops +		4801 A	0 A	0 A	0 A	4801 A	0 A	0 A	4150 A	651 A	0 A	18.3 Fc	14 Fc	0.2 Fc	0.1 Fc
	Sugar Cane		4801	0	0 M	0	4801	0 M	0 M	4150	651	0	18.3 Fc	14 Fc	0.2 Fc	0.1 Fc

In summary…



- There are various methods available to obtain food consumption levels
- May not seem that straight forward but it is possible to obtain the data
- Get development partners to give technical assistance
  - e.g. analyze household income and expenditure surveys (HIES)

In summary…



- We can NOT let the information gaps stop us from making nutritious foods available to the population
- We need to accelerate the pace of development of evidence-based fortification programs

Thank you!!

Janneke H. Jorgensen, World Bank