GFORSS
Global Food Regulatory Science Society

Global Gateway

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JUMUIYA YA AFRIKA MASHARIKI

International Trade Centre

MARKUP II
EU-EAC Market Access Upgrade Programme Phase II

REGIONAL TRAINING ON SCIENTIFIC BASIS OF CODEX WITH FOCUS ON DATA GENERATION AND SUBMISSION FOR STANDARDS SETTING

23-25 July 2025 • Zanzibar, Tanzania

Dietary Exposure Assessment : General Principles

Day 1: 23 July 2025

Review of a Risk Assessment Approach…

Foundations of Exposure Assessment

Consumption Data

Sources, Limitations

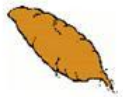
Dietary Intakes/Dietary Exposure Assessment

Occurrence of Food Chemicals

Food consumption

Dietary Intakes/Exposure Assessment

Overall Diet

Amount brought by each food		Amount Consumed (g/day)	X	Occurrence data (µg/g)	Body weight (kg)		Intake / Exposure (µg/kg/day)
	=	141,9	X	0,0093	/ 65	=	0,020
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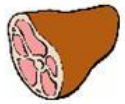
	=	198,4	X	0,0009	/ 65	=	0,003
+							
	=	191,5	X	0,0076	/ 65	=	0,022
+							
	=	541,4	X	0,0025	/ 65	=	0,021
+							
	=	315,0	X	0,0007	/ 65	=	0,003
					Total	=	0,070 (µg/kg/day)

Overview: Types of Food Consumption Data – Pros and Cons

Méthods	Data	Consumption Estimates	Food Chain Level	Drawbacks
Population-based methods	❑ Food Balance Sheets ▪ Total food available for consumption as a physical residual in the market. ▪ Total supply = total demand ❑ Time scale: year	❑ Median, mean	❑ Raw, semiprocessed products	❑ No information on distribution of consumption ❑ No information on individual exposure and subgroups at risk ❑ High level of uncertainty
Household-based methods: **Always available, generated on a regular basis by national institute of statistics**	❑ Purchase or expenditures records ▪ Values and quantities of food purchased, own produced and received at household level ❑ Large sample size ❑ Time scale: weeks	❑ Mean ❑ High Percentile	❑ Raw, semiprocessed and processed products	❑ No intra-household distribution ❑ Not individual food intakes ❑ Food eaten outside home difficult to capture
Individual-based methods	❑ Food record survey ❑ 24-hour recall survey ❑ Food frequency questionnaire ❑ Meal-based diet history survey ❑ Food habit questionnaire ❑ Small sample size ❑ Time scale: days	❑ Mean ❑ High percentile	❑ Raw, semiprocessed and processed products	❑ Expensive, time and resource consuming ❑ Susceptible of under- or over reporting

Stepwise Approach For Dietary Intakes/Dietary Exposure Assessments

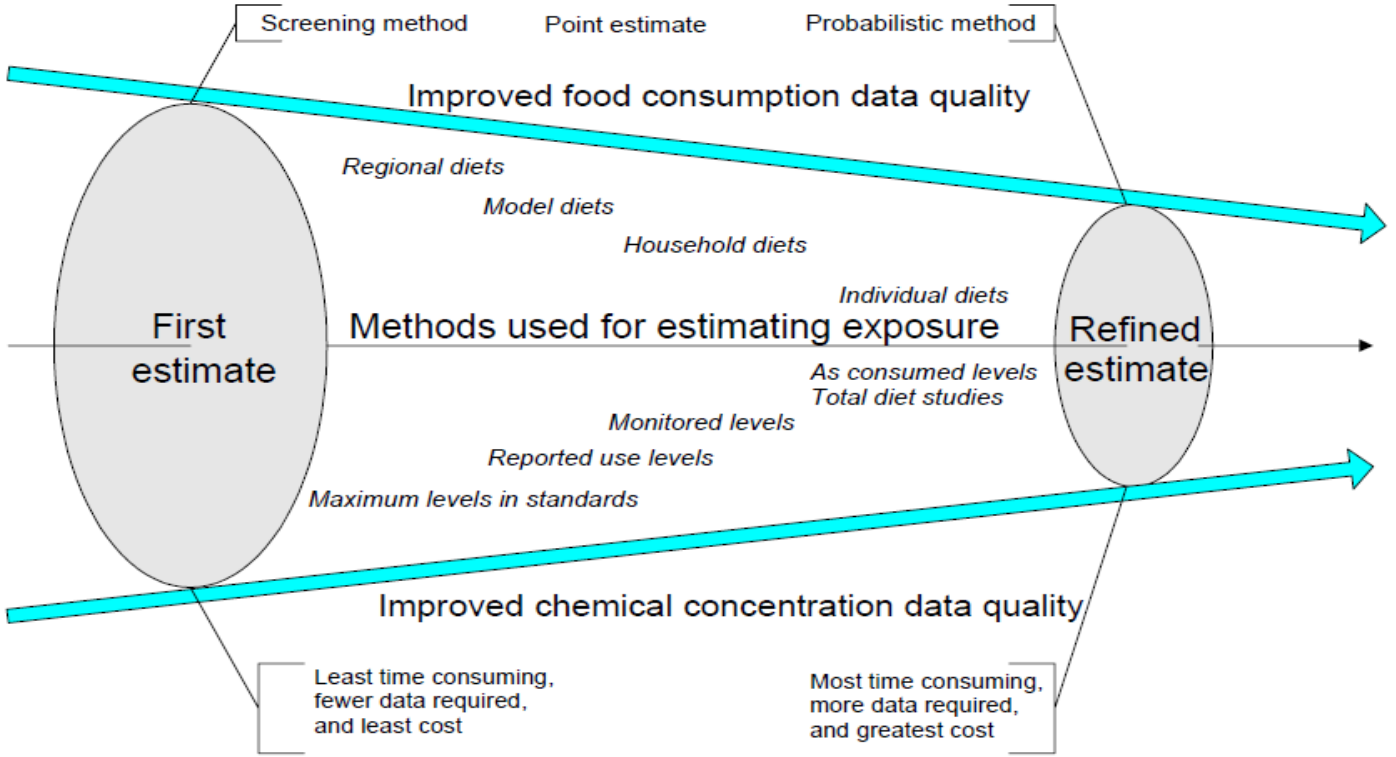
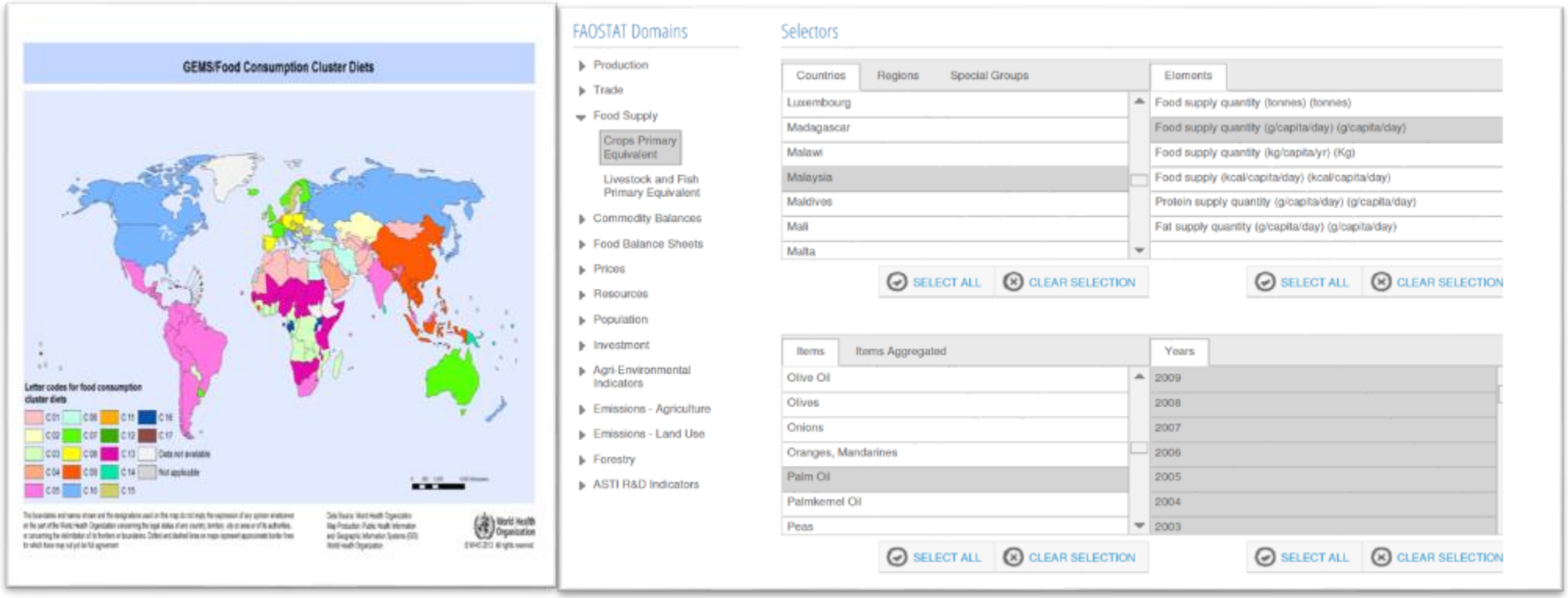


Figure 1 Stepwise approach to obtaining realistic dietary exposure assessments
Note: Data and methods selected from the right-hand side of the diagram are likely to result in a more realistic dietary exposure estimate or "refined estimate"; however, it may not be the "refined estimate" in terms of the "most appropriate" one to suit the purpose of a specific dietary modelling exercise.

Long Term Food Consumption: National Per Capita



Database available : Based on *per capita* data submitted to FAO/Stat (Consumption by year) http://faostat3.fao.org/faostat-gateway/go/to/home/E

Per Capita Consumption: GEMS/Food Cluster Diets

- Based on FAO Food Balance Sheets
- Average per capita consumption:
  - http://www.who.int/foodsafety/chem/gems/en/index1.html
- Used for long term dietary exposure assessment
- 1989: Five regional diets
- 1997: Thirteen cluster diets
- 2012: Review of the cluster diets based on new statistical approach
  - Non-negative Matrix Factorization

Food and Agriculture Organization of the United Nations

Long Term Food Consumption: Clustered Per Capita

- Map - Countries by Cluster - 2012
  jpg, 605kb
- List - Countries by Cluster - 2012
  pdf, 297kb
- Data - Consumption - 2012
  xls, 1.58Mb

- Database available
  - https://www.who.int/nutrition/landscape_analysis/nlis_gem_food/en/

Average vs. High Consumption

- Within a risk assessment process, mean consumption levels are often not sufficient

- It is fundamental to consider also non-average individuals, in particular high consumers
  - Those who consume relatively large quantities of foods

Short Term Exposure

- Based on National individual food consumption data submitted to GEMS/Food
- **Consumption during a day or an eating occasion**
- **Generally 97.5th percentile for consumers only**
- Necessary to check the number of consumers

Target Populations

Adult population

Pregnant women

Small children

Infants

Elderly

Special groups: vegetarians, diabetics, ethnic groups and different socio-economic strata …

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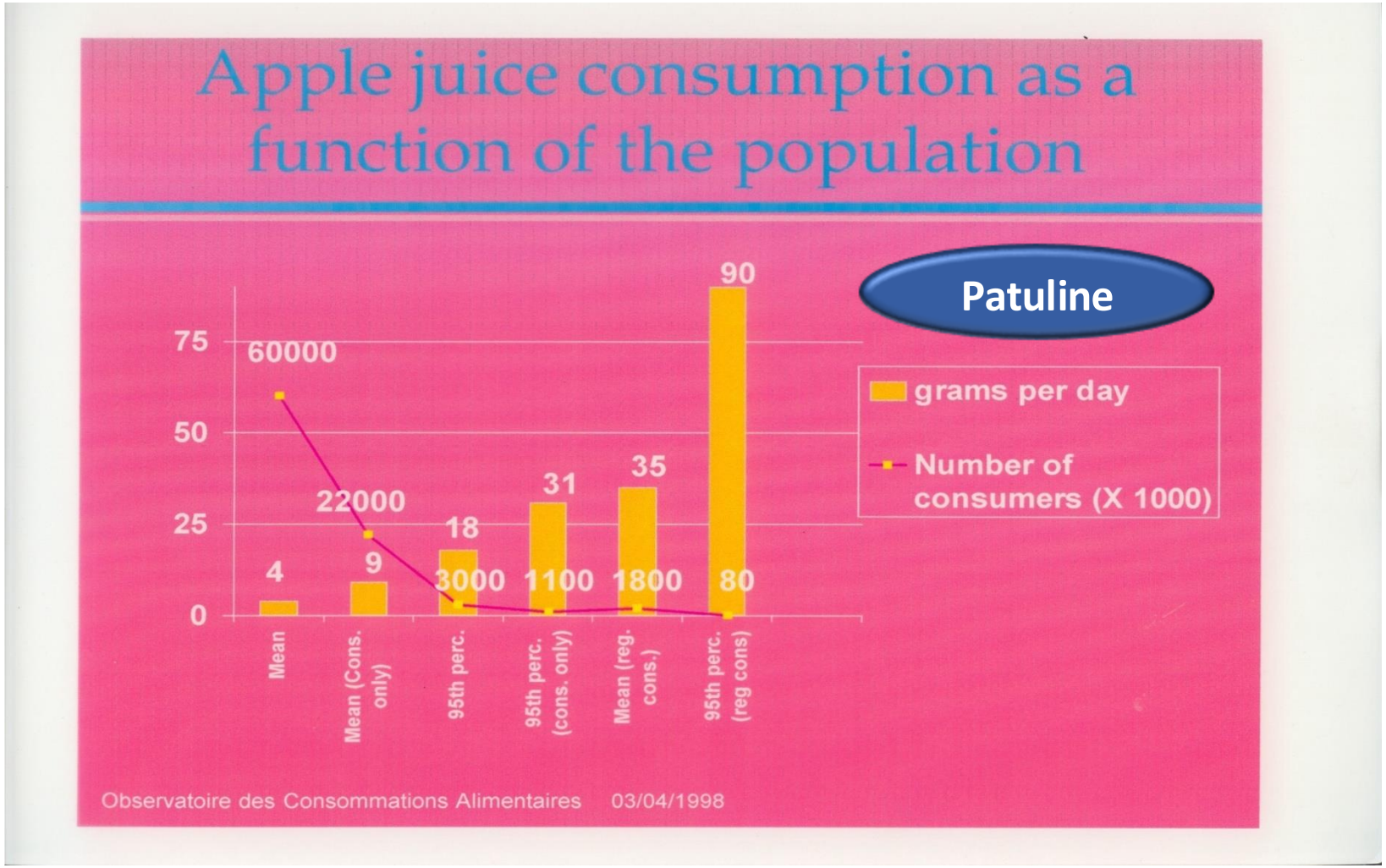
Apple Juice Consumption



Review of Exposure Assessment for Chemicals

Calculation Assumptions to Assess the Exposure

Deterministic and Probabilistic Approaches

Data Available Used In FAO/WHO Risk Assessment

Chemical Substances

Per capita consumption

National *per capita* consumption

Clustered *per capita* consumption

ALWAYS LONG TERM

Individual consumption

Short term individual consumption

Long term individual consumption

ALWAYS NATIONAL

Food Classification is Required

Level 1	Level 2	Level 3	Code
Milk and dairy products (excl. milk fats)	Milks (no other ingredient)	Buffalo milk	ML 0810 #
		Camel milk	ML 0811 #
		Cow milk	ML 0812 #
		Goat milk	ML 0814 #
		Sheep milk	ML 0822 #
		Other and nes milks	ML 0606**
		Milk powder and cream powder (plain)	01.5.1 # #
	Dairy products (excl. milk fats)	Fermented milks (plain)	01.2.1 # #
		Cheese	01.9*
		Ice cream	01.1.2.1*
		Dairy products, nes	AO3 0001**

Codex code for raw agricultural commodities
Codex code for processed food
* Made-up code, no existing reference
* * Existing code but designation adapted

National Per Capita vs. Individual Food Consumption Data

Food Group Commodities	Cluster E (France) Mean Consumption (g/d)	French Individual Food Consumption in g/d (mean/97,5th percentile)
Cereals	222	218/501
Sugar	114	38/116
Fat and oil	35	18/47
Fish	25	32/119
Fruits	190	126/506
Meat	135	119/274

CIFOCOss

FAO/WHO **C**hronic **I**ndividual **FO**od **CO**nsumption database **S**ummary **S**tatistics

World Health Organization

Food and Agriculture Organization of the United Nations

- Individual levels of food consumption for average and high consumers based on national surveys.
- Use to provide chronic dietary intakes/dietary exposure assessments.
  - EFSA (http://www.efsa.europa.eu/en/datexfoodcdb/datexfooddb.htm)
  - USA, Australia, Brazil, China, Japan, South Korea, Thailand, Turkey, Bangladesh, Philippines, Uganda, Burkina Faso
  - Countries data integrated in the database since 2018: Ethiopia, Zambia, Zimbabwe, Kenya, Egypt, Malawi

Chronic Food Consumption Database

- Database gathering all chronic individual food consumption data collated by FAO and WHO

Population	Descriptors (g/pers/day and g/kg bw/day)	Food
❑ Children ❑ General population	❑ Mean with STD ❑ 5th percentile ❑ Median ❑ 90th percentile ❑ 95th percentile ❑ 97.5th percentile	❑ Level 2: 62 food groups ❑ Level 3: 555 food items

- Each row corresponds to the consumption of a food item for an age class in a country

Cluster	Ageclass	country	Level 2 Cod	WHO Code	WHO Name	Total Mean (g/d)
11	Elderly	Belgium	70	11.5	Honey	1.745945946
10	General population	South Korea	70	11.5	Honey	0.289593000

Distribution of Food Consumption : Uganda

Chronic Individual Food Consumption
Summary Statistics

CIFOCOss

Uganda

Country	Food name
Argentina	01.7 - Dairy-based desserts (e.g.,
Australia	02.1.2 - Vegetable fats (excl. oil)
Bangladesh	04.2.2 - Other vegetables, nes, o
Belgium	04.2.2h - Processed nuts, includi
Brazil	06.2.1 - Flours, nes
Bulgaria	07.2.1 - Cakes, cookies and pies
Burkina Faso	09.2.5 - Smoked, dried, fermente
China	11.1 - Sugar, nes
Cyprus	11.3 - Sugar cane juice
Czech Republic (1	12.5.1 - Ready-to-eat soups and
Denmark	12.6a - Sauces and like products
Finland	14.1 - Isotonic drink
France	14.2.1 - Beer and malt beverage
Greece	14.2.6 - Distilled spirituous bever
Hungary	16 - Other processed products (g

Food name	Age class	Number of subjects	Number of consumers	Percentage of consumers
01.7 - Dairy-based desserts (e.g., pudding,	Adult women	176	1	0.57
02.1.2 - Vegetable fats (excl. oil), nes	Adult women	176	3	1.70
04.2.2 - Other vegetables, nes, other proce	Adult women	176	2	1.14
04.2.2h - Processed nuts, including coated	Adult women	176	4	2.27
06.2.1 - Flours, nes	Adult women	176	128	72.73
07.2.1 - Cakes, cookies and pies (e.g., fruit	Adult women	176	10	5.68
09.2.5 - Smoked, dried, fermented, and/or s	Adult women	176	41	23.30
11.1 - Sugar, nes	Adult women	176	129	73.30
11.3 - Sugar cane juice	Adult women	176	2	1.14
12.5.1 - Ready-to-eat soups and broths, in	Adult women	176	20	11.36
12.6a - Sauces and like products, nes	Adult women	176	2	1.14
14.1 - Isotonic drink	Adult women	176	4	2.27
14.2.1 - Beer and malt beverages, nes	Adult women	176	11	6.25
14.2.6 - Distilled spirituous beverages cont	Adult women	176	3	1.70

Chart | Table

Distribution of food consumption in Uganda (g/kg bw/day)

Distribution of Food Consumption : Uganda (2)

Chart | Table

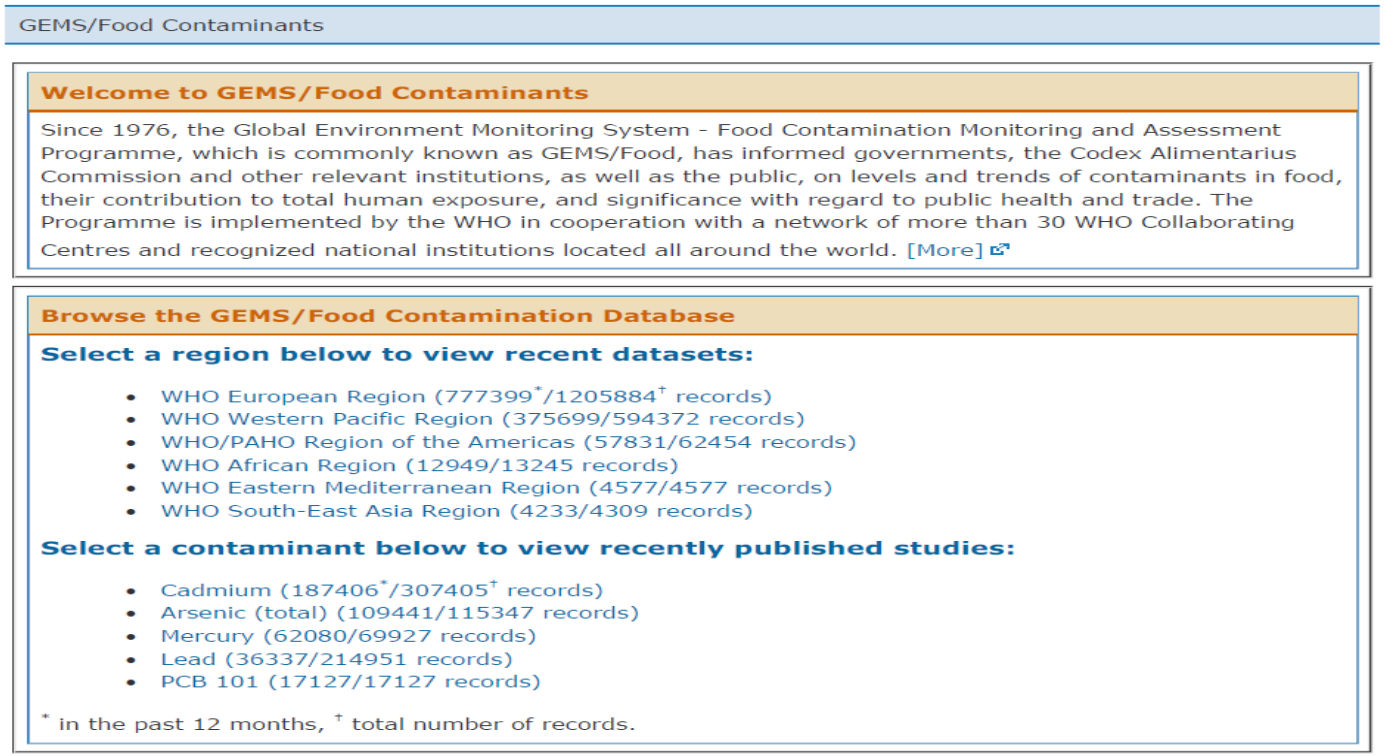
Distribution of food consumption in Uganda (g/kg bw/day)

Food	Age class	Total Mean	Total STD	Total P5	Total P50	Total P90	Total P95	Total P975	Consumers mean	Consumers STD	Consumers P5	Consumers P50	Consumers P90	Consumers P95	Consum
01.7 - Dairy-based desserts (e.g., p	Adult women	0.0210	0.2786	0.0000	0.0000	0.0000	0.0000	0.0000	3.6964		3.6964	3.6964	3.6964	3.6964	3.69
02.1.2 - Vegetable fats (excl. oil), n	Adult women	0.0014	0.0118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0800	0.0525	0.0283	0.1083	0.1114	0.1118	0.11
04.2.2 - Other vegetables, nes, othe	Adult women	0.0266	0.2527	0.0000	0.0000	0.0000	0.0000	0.0000	2.3393	0.5962	1.9600	2.3393	2.6766	2.7187	2.73
04.2.2h - Processed nuts, including	Adult women	0.0064	0.0575	0.0000	0.0000	0.0000	0.0000	0.0000	0.2803	0.3007	0.0579	0.1794	0.5721	0.6440	0.67
06.2.1 - Flours, nes	Adult women	3.4819	3.1884	0.0000	3.3635	7.8283	9.4920	10.7579	4.7876	2.7763	0.4317	4.3507	8.4863	10.4221	11.0
07.2.1 - Cakes, cookies and pies (e.	Adult women	0.0205	0.0930	0.0000	0.0000	0.0000	0.0593	0.4577	0.3614	0.1769	0.0784	0.4522	0.5010	0.5056	0.50
09.2.5 - Smoked, dried, fermented, a	Adult women	0.0333	0.0984	0.0000	0.0000	0.1077	0.1989	0.2521	0.1428	0.1623	0.0233	0.0765	0.2523	0.4850	0.57
11.1 - Sugar, nes	Adult women	0.4611	0.4387	0.0000	0.3765	1.0894	1.2853	1.4916	0.6292	0.3957	0.0993	0.5446	1.1768	1.3696	1.53
11.3 - Sugar cane juice	Adult women	0.0404	0.4329	0.0000	0.0000	0.0000	0.0000	0.0000	3.5552	2.7928	1.7778	3.5552	5.1350	5.3325	5.43
12.5.1 - Ready-to-eat soups and br	Adult women	0.1399	0.5324	0.0000	0.0000	0.3835	0.7927	1.8578	1.2309	1.0941	0.3293	0.7797	2.5206	2.7480	3.67
12.6a - Sauces and like products, n	Adult women	0.0015	0.0141	0.0000	0.0000	0.0000	0.0000	0.0000	0.1330	0.0077	0.1281	0.1330	0.1373	0.1379	0.13
14.1 - Isotonic drink	Adult women	0.0601	0.4033	0.0000	0.0000	0.0000	0.0000	0.0000	2.6462	0.6028	2.0028	2.6555	3.1934	3.2765	3.31
14.2.1 - Beer and malt beverages, n	Adult women	0.4162	2.4047	0.0000	0.0000	0.0000	1.6805	4.1381	6.6586	7.4482	1.5176	4.1252	13.9201	20.1674	23.2
14.2.6 - Distilled spirituous beverage	Adult women	0.0191	0.1510	0.0000	0.0000	0.0000	0.0000	0.0000	1.1194	0.3849	0.7397	1.3093	1.3598	1.3661	1.36
16 - Other processed products (exc	Adult women	0.0080	0.0835	0.0000	0.0000	0.0000	0.0000	0.0000	0.7029	0.4936	0.3888	0.7029	0.9822	1.0171	1.03
16.2 - Plant based composite food,	Adult women	0.0024	0.0222	0.0000	0.0000	0.0000	0.0000	0.0000	0.2077	0.0355	0.1851	0.2077	0.2278	0.2303	0.23
16.7 - Egg-based composite food	Adult women	0.0369	0.1904	0.0000	0.0000	0.0000	0.0000	0.6493	0.8126	0.4306	0.2814	0.8645	1.3054	1.3540	1.37
16.9 - Animal-based composite fooc	Adult women	0.0186	0.1172	0.0000	0.0000	0.0000	0.0000	0.2760	0.5460	0.3674	0.2238	0.4658	0.9136	1.0706	1.14
17 - Other foods (foods which cant	Adult women	0.0309	0.1925	0.0000	0.0000	0.0000	0.0306	0.3839	0.6041	0.6488	0.1380	0.4020	1.2824	1.7280	1.95
CF 1211 - Wheat flour	Adult women	0.0480	0.1837	0.0000	0.0000	0.0360	0.3137	0.6645	0.4698	0.3710	0.1731	0.3201	0.7390	0.9619	1.32
CF 1255 - Maize flour	Adult women	1.1352	1.4877	0.0000	0.4458	3.3308	4.2623	4.8108	2.0181	1.4670	0.3193	1.6304	4.1077	4.7033	5.77
CF 3200 - Millet flour	Adult women	0.2442	0.5209	0.0000	0.0000	1.0165	1.3371	1.4713	0.8597	0.6551	0.2054	0.6431	1.4330	1.8533	2.05
CP 0179a - Wheat white bread	Adult women	0.0614	0.1825	0.0000	0.0000	0.3131	0.4464	0.6433	0.4909	0.2377	0.2786	0.3749	0.7888	0.8146	1.00
FA 0818 - Lard (of pigs)	Adult women	0.0014	0.0173	0.0000	0.0000	0.0000	0.0000	0.0006	0.0348	0.0859	0.0004	0.0007	0.0982	0.1638	0.19
FC 0004 - Orange, sweet, sour + or	Adult women	0.0616	0.3242	0.0000	0.0000	0.0000	0.1064	0.8395	1.2046	0.8665	0.4473	0.9804	2.2019	2.5815	2.77
FI 0326 - Avocado	Adult women	0.2383	0.6525	0.0000	0.0000	0.9603	1.6515	2.2910	1.3979	0.9446	0.4091	1.1749	2.7257	3.2084	3.64
FI 0327 - Banana	Adult women	1.6136	2.7711	0.0000	0.0000	4.6166	6.2785	8.5706	3.3411	3.1870	0.4624	2.3594	6.3685	8.8521	12.1

GEMS/Food Contaminants Database

❑Estimation of Chemical Concentration

- https://extranet.who.int/gemsfood/Default.aspx#



GEMS/Food Contaminants

Welcome to GEMS/Food Contaminants

Since 1976, the Global Environment Monitoring System - Food Contamination Monitoring and Assessment Programme, which is commonly known as GEMS/Food, has informed governments, the Codex Alimentarius Commission and other relevant institutions, as well as the public, on levels and trends of contaminants in food, their contribution to total human exposure, and significance with regard to public health and trade. The Programme is implemented by the WHO in cooperation with a network of more than 30 WHO Collaborating Centres and recognized national institutions located all around the world. [More]

Browse the GEMS/Food Contamination Database

Select a region below to view recent datasets:

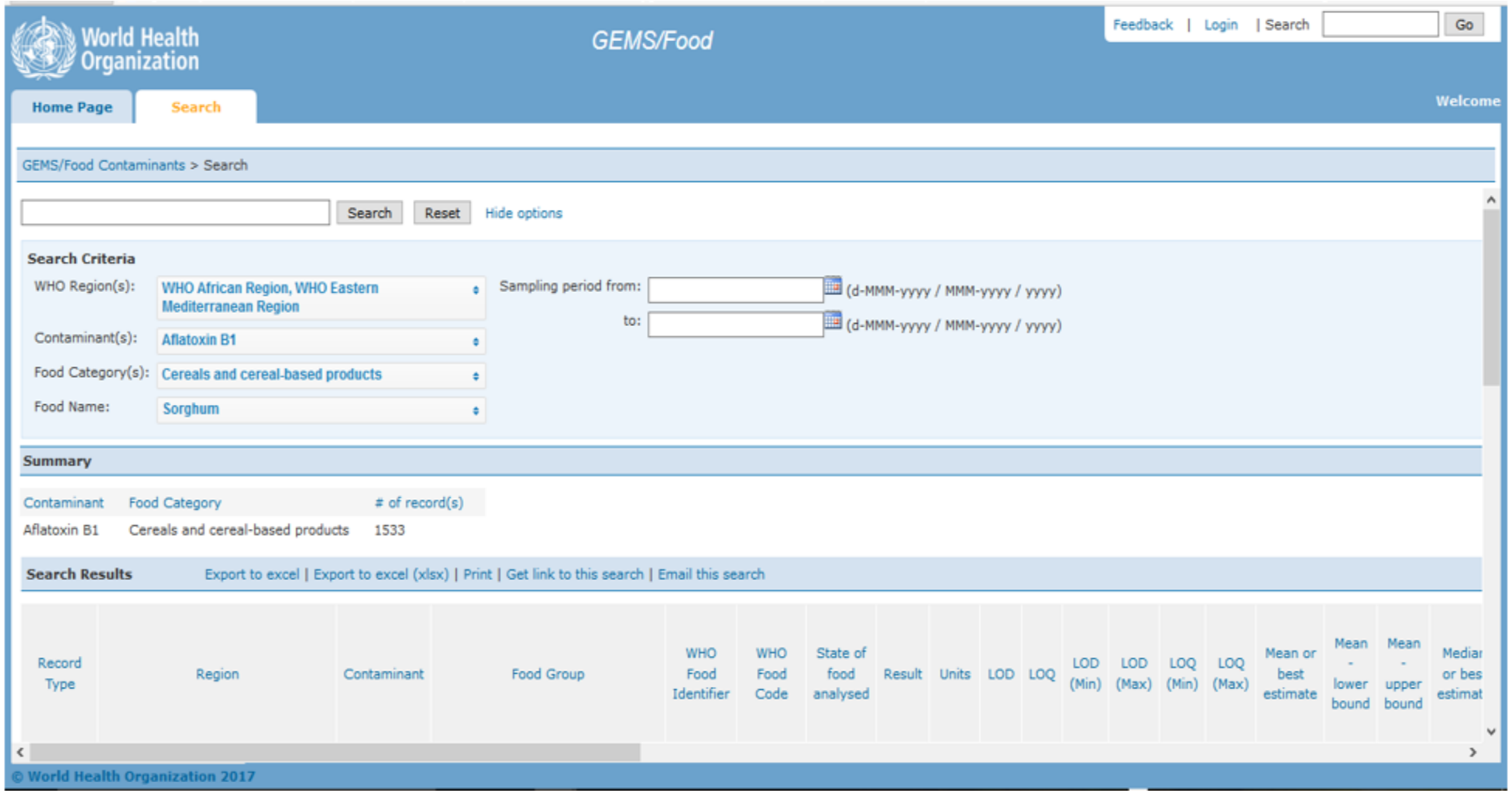
- WHO European Region (777399*/1205884† records)
- WHO Western Pacific Region (375699/594372 records)
- WHO/PAHO Region of the Americas (57831/62454 records)
- WHO African Region (12949/13245 records)
- WHO Eastern Mediterranean Region (4577/4577 records)
- WHO South-East Asia Region (4233/4309 records)

Select a contaminant below to view recently published studies:

- Cadmium (187406*/307405† records)
- Arsenic (total) (109441/115347 records)
- Mercury (62080/69927 records)
- Lead (36337/214951 records)
- PCB 101 (17127/17127 records)

* in the past 12 months, † total number of records.

GEMS/Food Contaminants Database (2)



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GEMS/Food Contaminants Database (3)

World Health Organization

GEMS/Food

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Aflatoxin B1 Cereals and cereal-based products 1533

Search Results Export to excel | Export to excel (xlsx) | Print | Get link to this search | Email this search

Record Type	Region	Contaminant	Food Group	WHO Food Identifier	WHO Food Code	State of food analysed	Result	Units	LOD	LOQ	LOD (Min)	LOD (Max)	LOQ (Min)	LOQ (Max)	Mean or best estimate	Mean - lower bound	Mean - upper bound	Mediar or bes estimat
Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								
Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								
Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								
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Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								
Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								
Individual	WHO Eastern Mediterranean Region	Aflatoxin B1	Cereals and cereal-based products	Sorghum	GC 0651	Raw	ND	ug/kg	3.75	7.5								

Calculation Models to Assess Dietary Exposure & Statistical Assumptions

"Deterministic" approach (i.e: screening method, point estimates, TDS)

- ❑ Occurrence:
  - Maximum observed value , MRL, usages authorization or fortification, ML…
  - Consumers and occurrence surveys are independent
- ❑ Average, median, P95, P97.5 **for both consumption and occurrence / contamination**
  - Statistics consumption observed on population, households or individuals
  - Statistics occurrence data observed on raw commodities or processed foods
- ❑ **Over a lifetime**, we may calculate how the individual is to be exposed at
  - maximum, mean or median of occurrence data and / or consumption.
- ❑ Approach mainly used in risk assessment to chemicals in food at national/European and international level

Deterministic Modelling: Long Term Estimates

	Meat	Wine	Cereal	Bread	Coffee	Fruit and Veg.	Dry	Rice	Alcohol
IDENTI	viande	vin	cereal	pain	cafe	fruitleg	sec	riz	alcool
1000101	400	770	1000	1030	67	0	200	400	0
1000102	1020	0	200	700	67	0	100	600	0
1000103	150	0	585	120	0	0	320	200	0
1000201	609	4360	260	2386	357	0	990	0	0
1000301	740	0	515	1095	0	0	0	0	0
1000302	30	0	90	410	22	0	0	0	0
1000401	195	0	450	980	70	0	80	1200	0
1000402	195	0	375	1145	70	0	80	1200	0
1000403	185	0	75	1140	15	0	0	1550	0
1000404	270	0	586	790	70	0	0	910	0
1000501	320	200	120	1150	148	525	200	0	0
1000502	175	800	260	1040	126	500	0	0	0
1000601	275	0	100	840	51	0	0	100	0
1000701	280	0	335	1494	121	0	320	0	0
1000702	193	0	400	1114	175	0	320	0	0
1000703	460	0	365	2838	26	0	320	0	0
1000801	200	0	610	880	94	615	0	150	0
1000802	188	0	705	600	0	175	0	100	0
1000901	430	5520	0	1680	82	0	0	150	0
1000902	360	0	250	670	0	0	200	150	0
1002501	363	0	0	1048	44	0	0	0	0

Mean

Contamination in X

0.313	Meat
0.135	wine
0.611	Cereal
0.728	Bread
0.984	Coffee
0.193	Fruit and Veg.
0.446	Dry
0.533	Rice
0.075	Alcohol

IDENTI	POIDS	Exposition
1000101	69	28.4
1000102	70	19.7
1000103	46	16.1
1000201	100	34.7
1000301	56	24.0
1000302	54	7.1
1000401	58	30.9
1000402	60	31.1
1000403	44	40.3
1000404	24	65.5
1000501	71	19.4
1000502	42	30.9
1000601	58	14.9
1000701	89	18.4
1000702	52	27.5
1000703	60	43.4
1000801	58	23.6
1000802	26	39.0
1000901	69	32.8
1000902	75	12.3
1002501	85	10.8

Each consumption is multipled by **the mean contamination (of the Commodity)**, then summed together and divided by the body weight

Calculation Models to Assess Dietary Exposure & Statistical Assumptions

"Probabilistic" approach

❑ Parametric

- **Direct combination of consumption** and **occurrence distributions** by random selection according **to the <u>parameters of the estimated distribution law</u>** or adjusted

❑ Non-parametric

- Direct combination distributions of consumption and contamination/occurrence by random selection according to the **observed empirical distribution**

❑ Hypothesis :

- Over a lifetime, the individual **will be exposed to the same level of chemical composition and / or consumption**. Consumers and occurrence surveys **<u>are independent</u>**
- It is importance to characterize and record data sources, the approach used to generate dietary intakes/exposure figures along with uncertainties in the database and assumption taken

Probabilistic Modeling

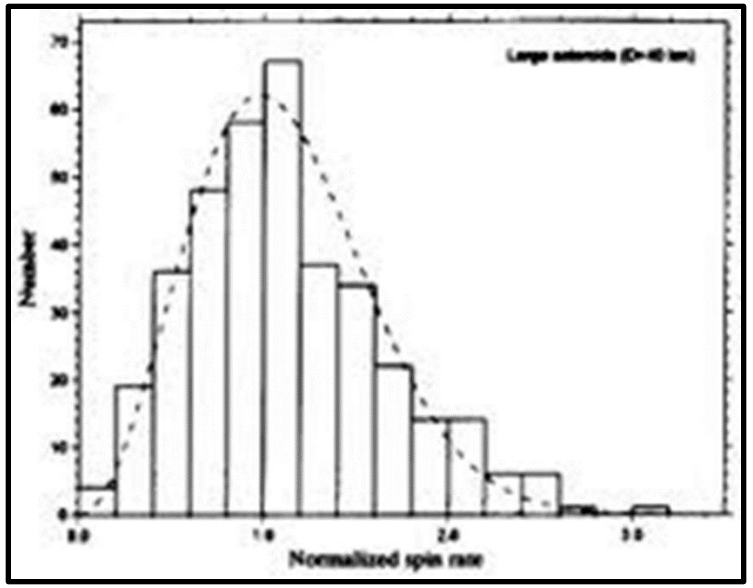
Random Runs

IDENTI	viande	vin	cereal	pain	cafe	fruitleg	sec	riz	alcool
1000103	150	0	585	120	0	0	320	200	0
1000302	30	0	90	410	22	0	0	0	0
1000802	188	0	705	600	0	175	0	100	0
1000902	360	0	250	670	0	0	200	150	0
1000102	1020	0	200	700	67	0	100	600	0
1000404	270	0	586	790	70	0	0	910	0
1000601	275	0	100	840	51	0	0	100	0
1000801	200	0	610	880	94	615	0	150	0
1000401	195	0	450	980	70	0	80	1200	0
1000101	400	770	1000	1030	67	0	200	400	0
1000502	175	800	260	1040	126	500	0	0	0
1000601	275	0	100	840	51	0	0	100	0
1000301	740	0	515	1095	0	0	0	0	0
1000702	193	0	400	1114	175	0	320	0	0
1000403	185	0	75	1140	15	0	0	1550	0
1000402	195	0	375	1145	70	0	80	1200	0
1000601	275	0	100	840	51	0	0	100	0
1000701	280	0	335	1494	121	0	320	0	0
1000901	430	5520	0	1680	82	0	0	150	0
1000201	609	4360	260	2386	357	0	990	0	0
1000703	460	0	365	2838	26	0	320	0	0

X

viande	vin	cereal	pain	cafe	fruitleg	sec	riz	alcool
0.75	0.55	0.5	0.2	1	0.2	0.5	0.5	0.05
0.2	0.01	0.5	2.7	1	0.05	0.5	0.5	0.05
0.5	0.01	0.5	0.5	1	0.19	0.1	0.5	0.05
0.2	0.89	0.5	0.5	1	0.06	0.5	1.4	0.05
0.5	0.01	0.5	0.2	0.04	0.5	1.6	0.5	0.05
0.2	0.01	0.5	0.5	0.04	0.05	0.04	0.5	0.05
0.34	0.01	0.5	0.5	1	0.02	0.1	0.5	0.05
0.2	0.01	0.5	0.2	0.04	0.5	0.5	0.5	0.05
0.2	0.01	0.5	0.2	0.04	0.07	0.5	0.5	0.05
0.1	0.01	0.5	0.9	1	0.44	0.5	0.5	0.05
0.2	0.04	0.05	0.3	0.2	0.13	0.04	0.5	0.05
0.5	0.01	0.5	0.5	0.1	0.46	0.2	0.5	0.05
0.2	0.01	0.5	0.5	1.6	0.24	0.5	0.5	0.05
0.2	0.01	1	0.2	0.2	0.1	0.5	0.5	0.05
0.2	0.01	0.5	0.5	0.08	0.06	0.5	0.5	0.05
0.2	2.89	1	0.2	0.05	0.05	0.5	0.5	0.05
0.2	1.48	0.5	0.5	0.88	0.08	0.2	0.5	0.05
0.2	0.01	0.5	0.5	0.066	0.5	0.5	0.5	0.05
0.2	0.21	0.5	1.2	1	0.2	0.1	0.5	0.05
0.5	0.01	0.8	0.5	0.05	0.05	0.5	0.5	0.05
0.2	0.01	0.5	0.5	3.2	0.11	0.5	0.5	0.05

Product term by term and dividing by the body weight

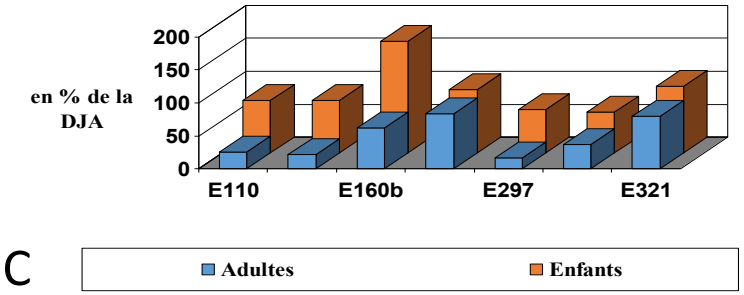


Screening Tools (Budget Method) – Food Additive Ex

❑**Q** = **3 kg solid food + 6.0 liters beverages**

- Based on maximum physiological limits with 0,50g/kgbw/d for solid food and 0,100ml/kg bw/d for beverages **for an 60kg adult** (equivalent to 3kg foods and 6 liters beverages) (EHC 240, 2010)
- With **arbitrarily default proportion** factor for solid foods and beverages that may contain the substance

❑**C** = Maximum permitted level for a food additive



Based on theoretical maximum levels both for **Q** and for C

❑E = Q * **C**

- If E < ADI Acceptable additive (exposure is favorable)

Budget Method vs Food Consumption

Table 1: Summary of anticipated exposure to Brilliant Blue FCF using the tiered approach (EC, 2001) in children and the adult population.

	Adult UK population (>18 years old)	**Children UK & Expochi population** (1-10 years old, 15.8-29 kg body weight
	mg/kg bw/day	mg/kg bw/day
Tier 1. Budget method	8.1	13.1
Tier 2. Maximum Permitted Level		
• Mean exposure	0.9	0.5 – 3.4
• Exposure 95th*or 97.5th percentile**	3.3	1.2 – 7.2
Tier 3. Maximum reported use levels		
• Mean exposure	0.6	0.2 – 2.1
• Exposure 95th*or 97.5th percentile**	3.0	0.6 – 4.8

Margin of Exposure (MOE)

- Ratio between selected point of departure (on dose-response curve from animal or epidemiological study) and the estimated human intake
- Takes potency and exposure into account
- Can be used to prioritize different contaminants if consistent approach is applied
- A MOE below 10 000* may indicate a human health concern and a MOE over 10 000 indicate a low concern

$$\text{MOE} = \frac{\text{Low dose producing tumors in animals}}{\text{human exposure dose}}$$


thank you
danke
謝謝
ngiyabonga
teşekkür ederim
gracias
merci
obrigado
obrigado
bedankt
dziękuję
go raibh maith agat
mochchakkeram
tapadh leat
спасибо
рахмат
Баярлалаа
faafetai lava
vinaka
спасибі
blagodaram
dank je
misaotra
matondo
paldies
grazzi
mahalo
kiitos
dankie
dhanyavad
nanni
nandri
bayarlaa
gràçie
köszönöm
hvala
mauruuru
enkosi
akun
dankon
ačiū
djiere dieuf
tau
хвала
asante
manana
obrigada
murakoze
tenki
chokrane
дякую
mamnun
chnorakaloutioun
gratias ago
gràcies
sulpáy
sukriya
kop khun krap
taiku
sagolun
sobodi
děkuji
mèsi
didi madloba
najis tuke
kam sah hamnida
rahmat
terima kasih
ありがとう
tanemirt
rahmet
grazie
arigatô
takk
dakujem
trugarez
shukriya
mercé
мерси
diolch
dhanyavadagalu
ευχαριστώ
xièxie
감사합니다
তোমাকে ধন্যবাদ
شكرًا لك