tds exposure

TOTAL DIET STUDIES - METHODOLOGY

Choosing substances of interest and populations of importance

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Véronique Sirot (Anses)

SEVENTH FRAMEWORK PROGRAMME

WP2: populations and substances

- 7 Partners: ANSES (WP leader), U-Gent, ISS and TUBITAK-MAM (sub-task leaders), CRA NUT, HAH, and MSPSI/AESAN.

- 3 parts:
  - Identification of the populations of interest
  - Relevance of the TDS approach
  - Prioritization of the substances

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Populations of interest and related specific foods

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Objectives

- A TDS provides background contamination or composition levels in the general food supply, suitable for estimating population dietary exposure (EFSA/FAO/WHO, 2011)
- Usually: general population, adults and children
- Other populations (e.g. UK, France…)
- Objectives:
  - Identify populations more sensitive / more exposed
  - Identify specific foods related to the targeted populations

Populations of interest

- **Age – gender groups:** different diet and sensitive populations (ex: infants)
- **Diet type groups:** different diet because of ethical or religious reasons (ex: vegetarians or vegans: higher consumption of vegetables, pulses, legumes, grains…)
- **Geographical, professional or socio economic status groups:** different diet or living in a polluted environment (ex: students: higher consumption of junk food)
- **Disease or health related groups:** different diet for medical reasons (ex: people suffering from osteoporosis: higher consumption of dairy products)

EXAMPLES

Age-gender groups	Specific foods to be included in the food baskets
Infants (0-3y)	Baby foods, Growing-up milk, Honey, Supplements
Children (4-18y)	Food specially designed for children
Pregnant women / lactating women	Supplements, Herbal tea
Post menopausal women	Fortified foods
Elderly (institutional or free living)	Functional foods, Supplements, Salt free diet

Diet-type groups	Specific foods to be included in the food baskets
Vegetarians	Soy products, vegetable beverages (soy “milk”…), grains, nuts, legumes, pulses, Supplements
People having specific dietary habits (ethnical origin)	Rice, hot pepper, spices, condiments, soya sauce and other sauces, tropical fruits and vegetables, roots
Athletes	Supplements (proteins...), Sport beverages

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Substances of interest:

Relevance of the TDS approach

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Summary of the relevance of the TDS approach by substance

Substance groups	Substances	Relevance?	Key elements
Nutrients	Nutrients	**Yes**	-
Environmental contaminants	Trace elements	**Yes**	Impact of preparation
	Dioxins, furans, PCBs, brominated and perfluorinated compounds	**Yes**	Impact of preparation (brominated compounds)
Chemical substances intentionally added to foods	Foods additives	**Yes**	Some additives only
	Flavourings	**No**	Volatility
Chemical residues of substances being deliberately applied at other points in the food production chain	Pesticide residues	**Yes**	Impact of pooling
	Veterinary drug residues	**Yes**	Impact of preparation
		No	For prohibited substances and substances for which MRL are fixed to zero

Substance groups	Substances	Relevance?	Key elements
Contaminants formed during food processing	PAHs	**Yes**	Impact of preparation
	Furan	**No**	Volatility + Food preparation "as consumed"
	Acrylamide	**Yes**	Impact of preparation / pooling
	3-MCPD and related compounds	**Yes**	Impact of pooling
Naturally occurring contaminants	Mycotoxins	**Yes**	Impact of pooling
	Phytoestrogens	**Yes**	Avoid pooling of soy-based products with other products
	Alkaloids	**No**	Pooling effect
Contaminants transferred from food packaging or food contact materials	Melamine, MOSH, bisphenol A, phtalates	**Yes**	Effect of packaging (BPA) Impact of preparation (phthalates)
Others	Radionuclides	**Yes**	Radioactive decay (for short-lived radionuclides)
	Nanoparticles	**No**	No validated analytical method
	Nitrosamines	**Yes**	Impact of cooking

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Substances of interest:

Prioritization of the substances

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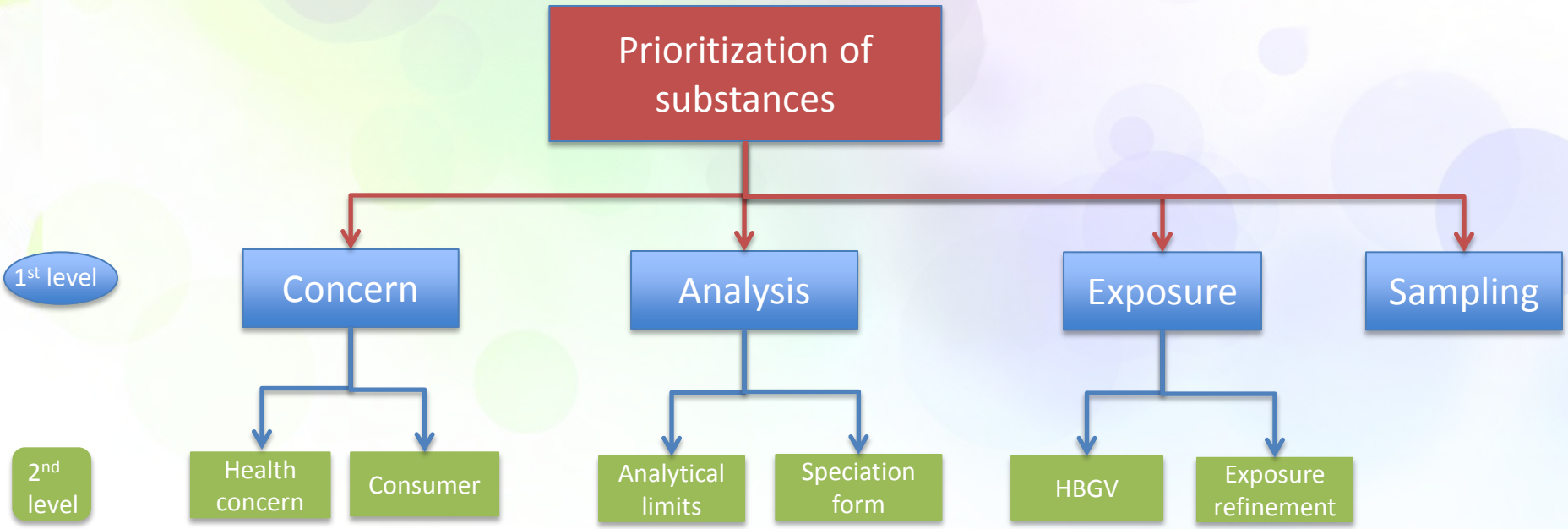
The decision process in AHP (Analytic Hierarchy Process)

1. Identifying priority problems and targets
2. Identifying the criteria to be used to compare the various actions
3. Defining the relative weights for criteria
4. Making list of alternatives among which we want to make a prioritization
5. Evaluating the importance of each alternative for each criterion
6. Aggregation of all judgments

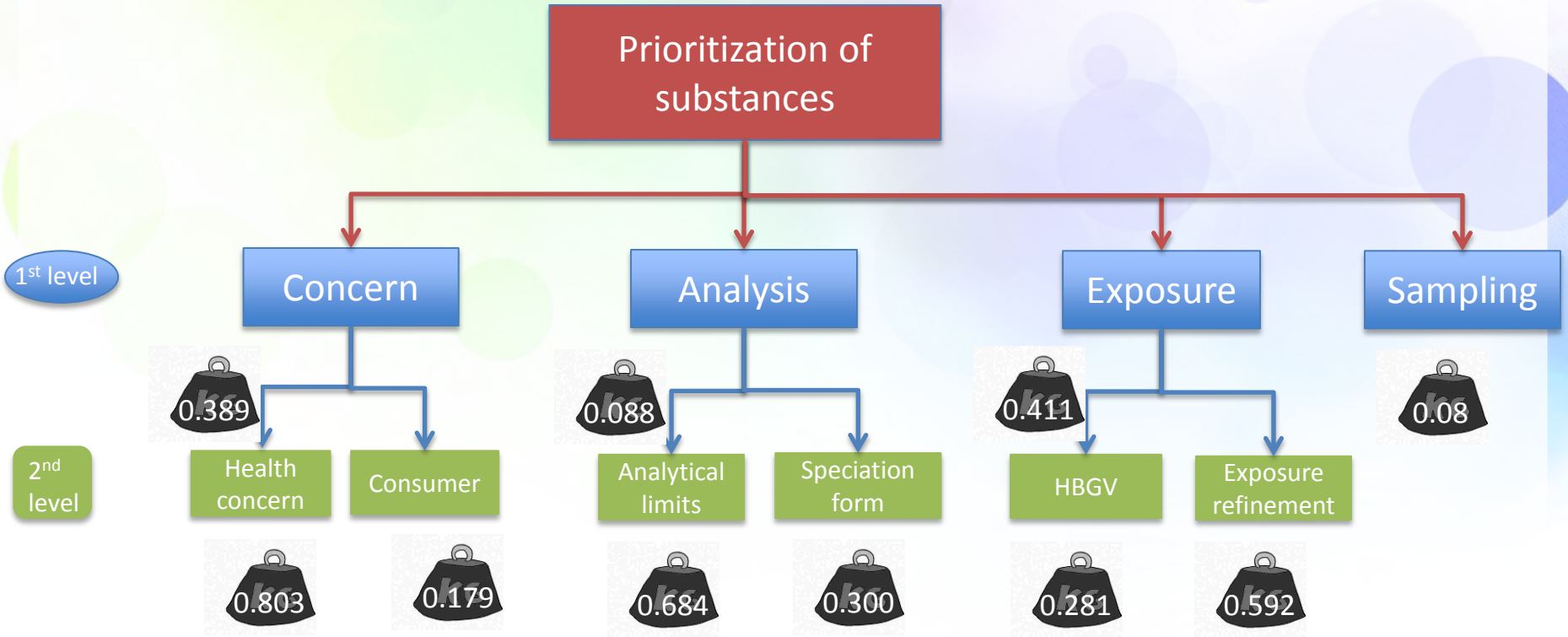
Identifying the criteria to be used to compare the substances



Summary of the prioritization criteria

Criteria	Sub-Criteria	Conclusion
Concern	Health concern	↗Evidence of harmful effect, ↗Priority
	Consumer concern	↗Concern, ↗Priority
Analysis	Analytical limits	↗Detection, ↗Priority
	Speciation forms/metabolites	↗Specificity of the method, ↗Priority ↗Ability to approximate, ↗Priority
Exposure	HBGV	↗Robustness of HBGV, ↗Priority
	Exposure refinement	↗Risk, ↗Priority
Sampling	Contamination origin	↘Geographical and/or temporal variations, ↗ Priority

Defining the relative weights for the criteria



Evaluating the importance of each substance for each criterion: 6-level scale

Criteria/sub-criteria	Scale
Health concern	**Health concern (linked with chronic exposure) according to bibliographic data (literature) and/or previous evaluations (JECFA, EFSA, etc.)**
6	Sufficient evidence of harmful effects on humans: CMR activity, neurotoxic effects, hepatotoxicity, etc. (e.g. IARC class 1 for carcinogenicity)
5	Sufficient evidence of harmful effects on animals but limited evidence of effects on humans (e.g. IARC class 2A for carcinogenicity)
4	Sufficient evidence of harmful effects on animals but inadequate evidence of effects on humans (e.g. IARC class 2B)
3	Limited evidence of harmful effects on animals but inadequate evidence/evidence suggesting lack of effects on humans (e.g. IARC class 3 for carcinogenicity)
2	Inadequate evidence of harmful effects on animals and inadequate evidence of effects on humans
1	Evidence suggesting lack of harmful effects on humans and inadequate evidence/evidence suggesting lack of effects on animals (e.g. IARC class 4 for carcinogenicity)

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Example: nitrites in France

Consumer concern	Consumer/population/media concern, whatever the source of information
6	Very afraid of the substance/does not want to be exposed under any circumstances
5	Afraid of the substance/prefers to limit its exposure
4	Has heard about the substance (occurrence, effects, etc.) but is not yet afraid
3	Has heard about the substance (occurrence, effects, etc.) but is completely indifferent
2	Knows the substance (name) but does not know anything on the potential effects
1	Does not know the substance

Substance	Sub-criteria (Level 2)						Intermediate calculations						Criteria (Level 1)				Score	Rank
	Health concern	Consumer concern	Analytical limits	Speciation form/metabolites	HBGV	Sampling	Health concern	Consumer concern	Analytical limits	Speciation form/metabolites	Exposure	Sampling	Concern	Analysis	Exposure	Sampling		
Nitrites (E249-250)	5	2	1	6	4	6	0.669	0.060	0.114	0.300	0.274	0.080	0.142	0.018	0.274	0.080	0.128	1
Sorbates (E200-203)	1	1	4	5	4	6	0.134	0.030	0.456	0.250	0.274	0.080	0.032	0.031	0.274	0.080	0.104	4
Benzoates (E210-213)	3	1	3	5	4	6	0.402	0.030	0.342	0.250	0.274	0.080	0.084	0.026	0.274	0.080	0.116	3
Sulfites (E220-228)	4	2	3	5	4	6	0.535	0.060	0.342	0.250	0.274	0.080	0.116	0.026	0.274	0.080	0.124	2
Lecithin (E322)	1	2	3	6	1	6	0.134	0.060	0.342	0.300	0.069	0.080	0.038	0.028	0.069	0.080	0.054	5

Example of list of substances (in the TDS-Exposure WP2)

Ranking	Substances
1	Methylmercury
2	Cadmium
3	Inorganic arsenic
4	Lead
5	Dioxins, furans, dioxin-like PCBs
6	Sulfites (E220-228)
7	Aluminium
8	Acrylamide
9	Bisphenol A
10	Mineral oil saturated hydrocarbons (MOSHs)
11	Inorganic mercury
12	3-MCPD and related compounds
13	Non dioxin-like PCBs
14	Nitrites (E249-250)
15	Aflatoxins (B1, B2, G1, G2)

Conclusion

- Population: depend on context and available data
- The methodology rather than the list
- The ranking is dependent on the experts' judgment and is susceptible to change:
  - Consumer concern (country, period, culture…)
  - Analytical limits (method, laboratory…)
  - Geographical and seasonal variations of the concentration (country)
  - Update of scientific data: HBGV, toxicological data, exposure…
  - Emerging substances

Thank you for your attention

Coordination team: tds-exposure@anses.fr

Website: http://www.tds-exposure.eu

Email: Veronique.Sirot@anses.fr