General principles

- ✓ Pesticide residues
- ✓ Contaminants
- ✓ Natural toxins
- ✓ Additives
- ✓ Food contact materials
- ✓ Nutrients
- ✓ Enzymes
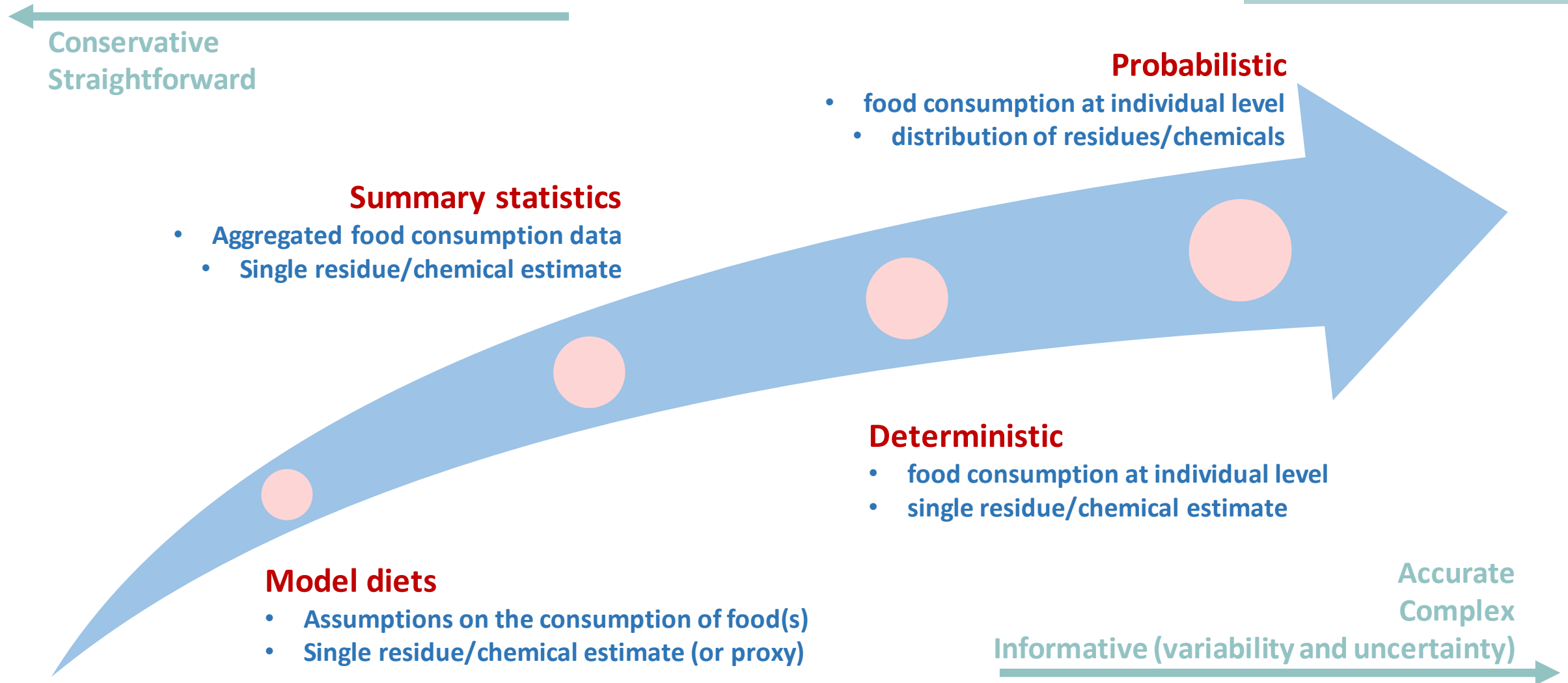- ✓ Flavourings
- ✓ Feed additives
- ✓ …

Occurrence

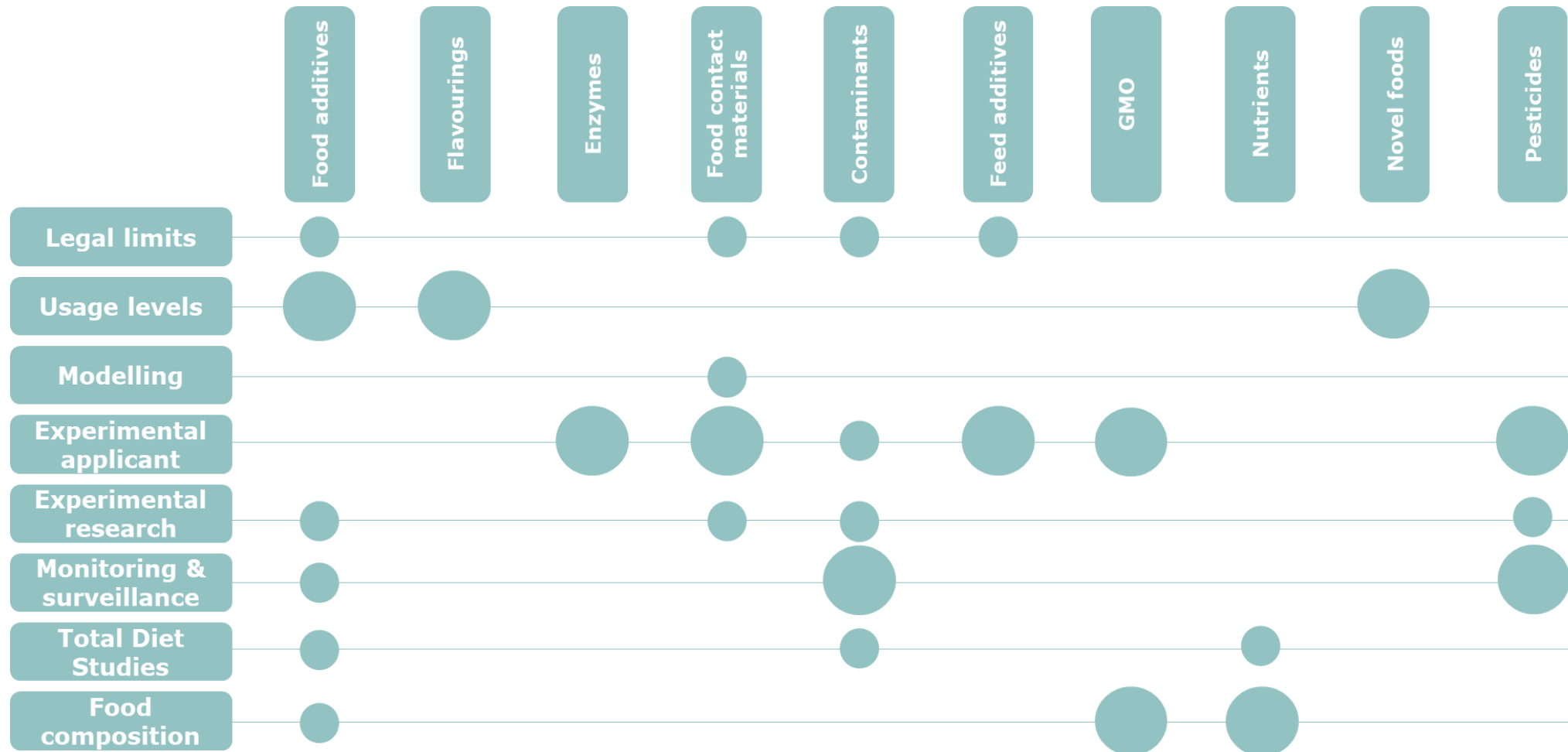**Consumption**
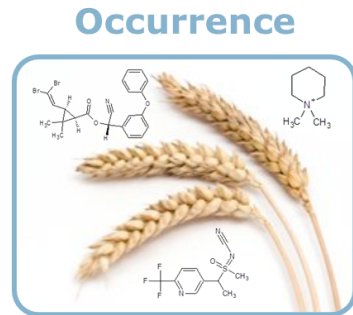
Exposure

Acute or chronic ?

Prospective or retrospective ?

Conservative or accurate ?

Exposure modelling

Conservative
Straightforward

Probabilistic
- food consumption at individual level
  - distribution of residues/chemicals

Summary statistics
- Aggregated food consumption data
  - Single residue/chemical estimate

Deterministic
- food consumption at individual level
- single residue/chemical estimate

Model diets
- Assumptions on the consumption of food(s)
- Single residue/chemical estimate (or proxy)

Accurate
Complex

Informative (variability and uncertainty)
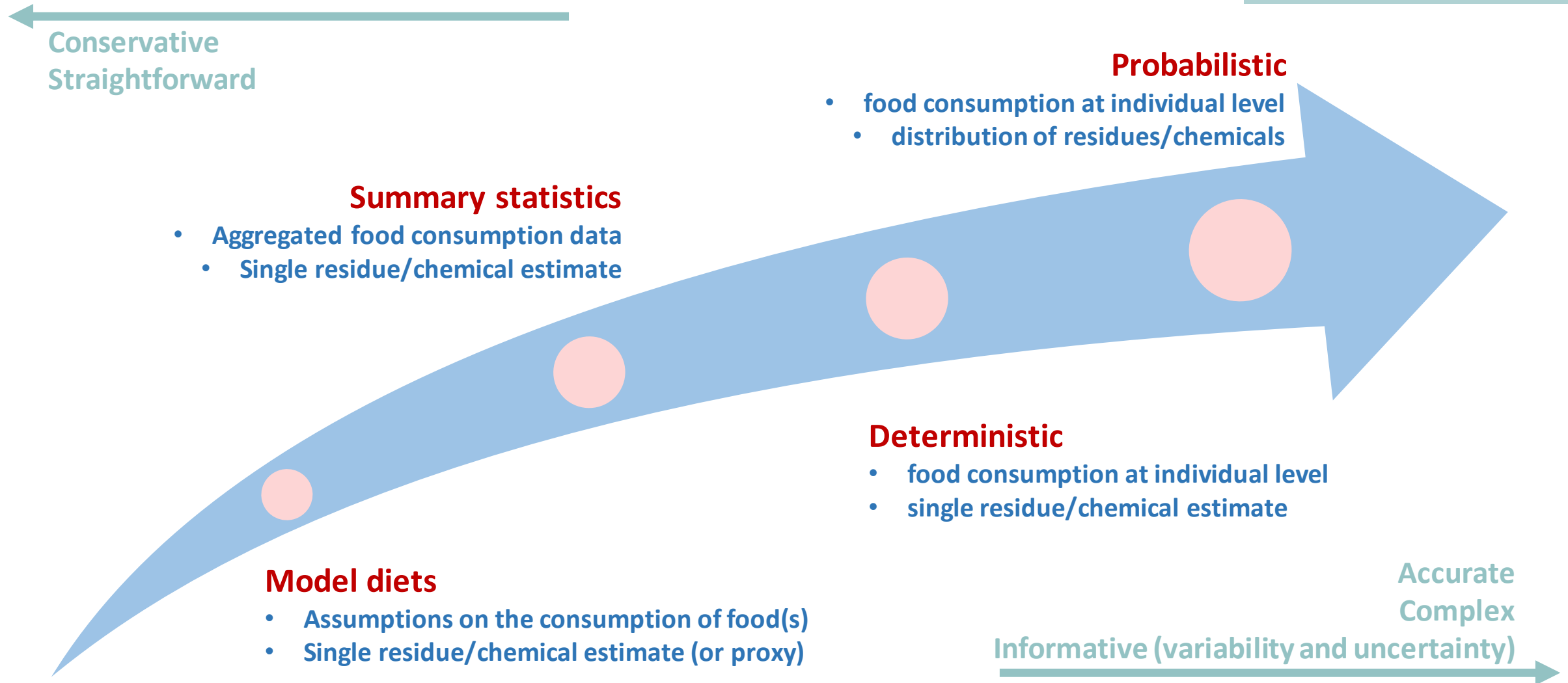
Chemical occurrence data

Food Consumption data

The **EFSA Comprehensive Database** contains:

- *24-hour recall* or *dietary record* surveys

- data collected at individual level (>140k individuals)

- most recent data within each country (75 surveys, 25 countries)

- random sample at national level
  - different age classes, from infants to elderly
  - special population groups

Exposure modelling

PARMA
SUMMER SCHOOL
Food Safety Aspects of Integrated Food Systems

Conservative
Straightforward

Probabilistic
- food consumption at individual level
- distribution of residues/chemicals

Summary statistics
- Aggregated food consumption data
- Single residue/chemical estimate

Deterministic
- food consumption at individual level
- single residue/chemical estimate

Model diets
- Assumptions on the consumption of food(s)
- Single residue/chemical estimate (or proxy)

Accurate
Complex

Informative (variability and uncertainty)

EFSA Exposure Tools

Summary statistics

- Food Enzyme Intake Model (FEIM)
- Pesticide Residue Intake Model (PRIMo)

Gradual transition

Deterministic distributions

- Feed Additive Consumer Exposure (FACE) calculator
- Food Additives Intake Model 2.0 (FAIM)
- Rapid Assessment of Contaminant Exposure (RACE)
- Dietary Exposure (DietEx) Tool

Use for combined exposure to multiple chemicals?

- Initially designed for exposure to individual chemicals in specific domains
- Be careful if used for combined exposure to multiple chemicals

Chronic deterministic model

Peter

18 kg

Food categories

	Average consumption (g/day)	Average concentration (mg/kg)	Average exposure (mg/day)
fish	200	1.8	**0.36**
eggs	32.5	30	**0.98**
milk	150	0.75	**0.11**
honey	7.5	2	**0.02**

Total chronic exposure in <u>mg per day</u>:	**1.47**
Total chronic exposure in <u>mg/kg bw per day</u>:	**0.08**

Chronic exposure distribution

What about us ?!

Mean exposure

High exposure (95th percentile)

O   μ

Co-occurrence data

Sample	Analytical result		Relative potency	Adjusted concentration
1		X	1	
		X	0.5	
		X	0.75	
2		X	1	
		X	0.25	
…	…		…	…

Cumulative Risk Assessment

Basic principles

- Establishment of Cumulative Assessment Groups (CAGs) for thyroid and nervous system
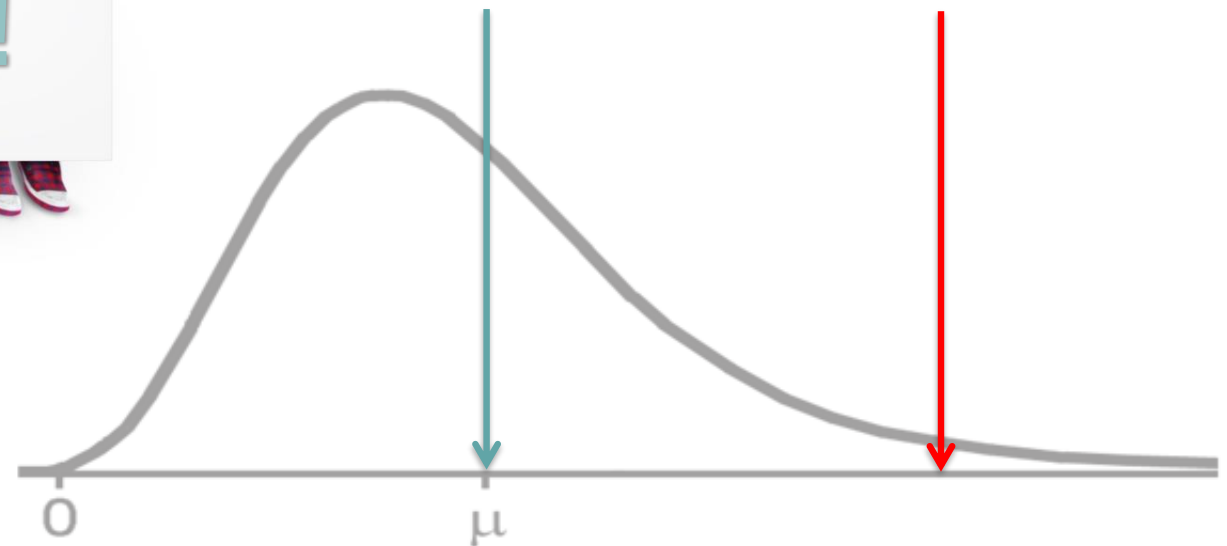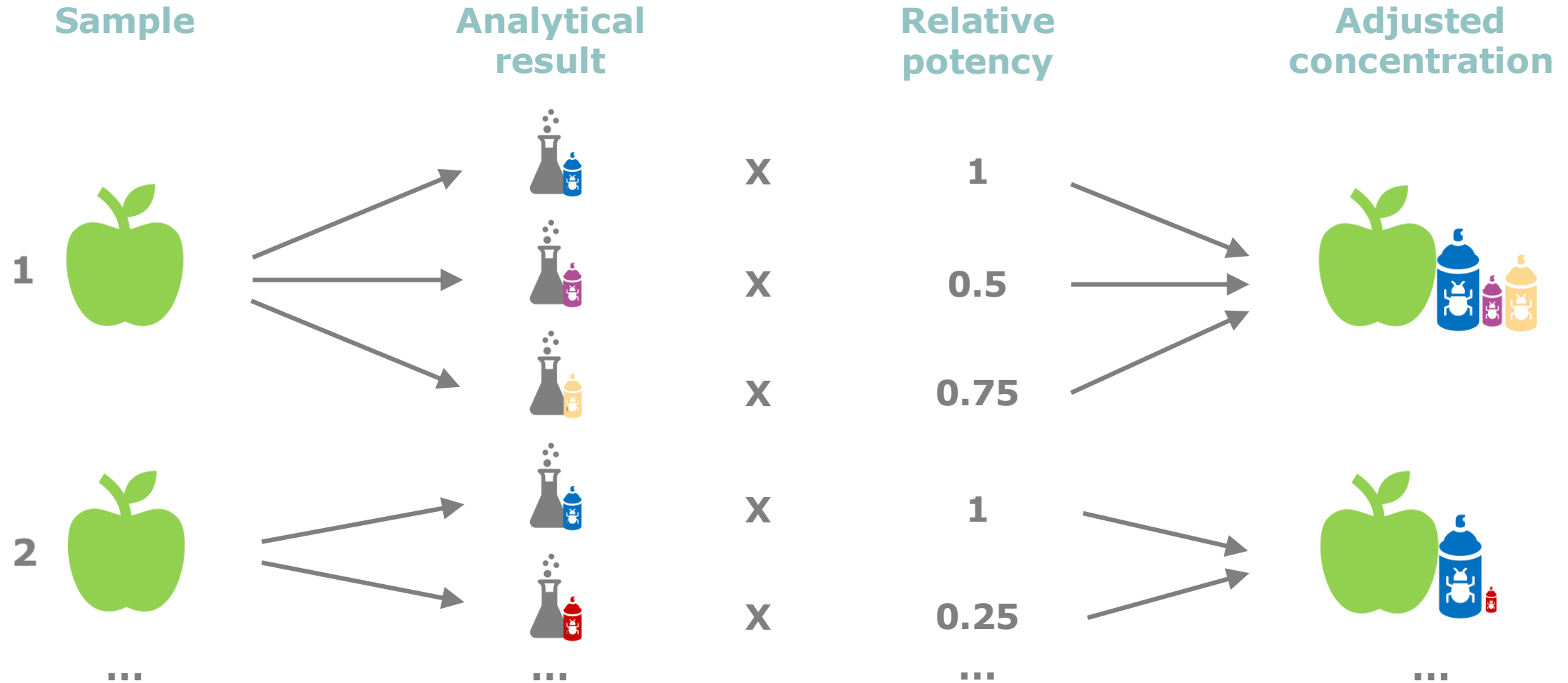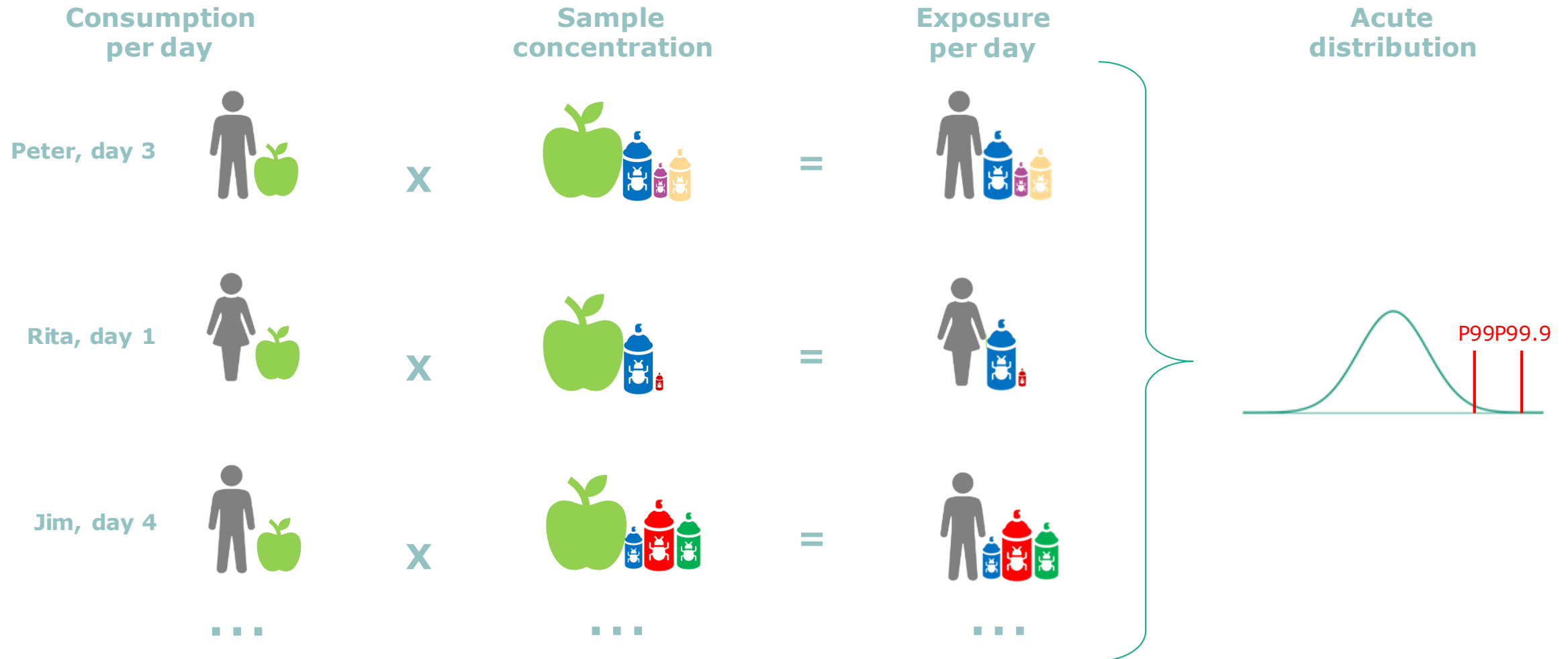
- Retrospective assessment of combined dietary exposure using probabilistic modelling

- Risk characterization through expert knowledge elicitation

2019

Pilot assessment

Target organs

Thyroid — *Chronic*

Nervous system — *Acute*

Monitoring data
3-year cycle / 30 commodities

2014 2015 2016

Population groups
10 groups in total

Adults   Children   Toddler

https://doi.org/10.2903/j.efsa.2020.6087
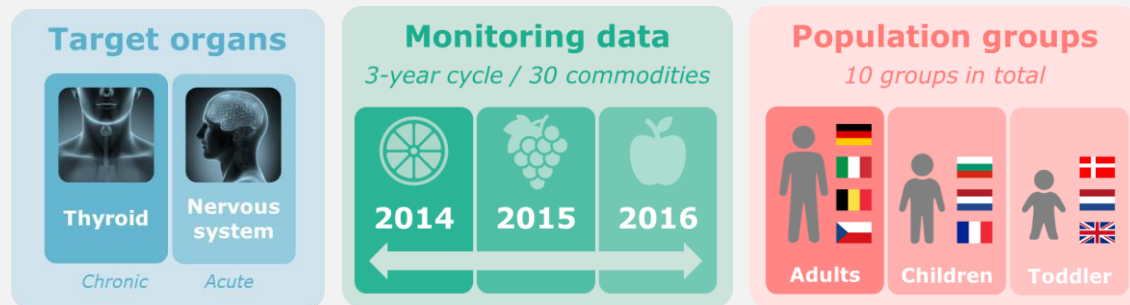https://doi.org/10.2903/j.efsa.2020.6088

2020

Follow-up assessment

Target organ

Nervous system — *Chronic*

Monitoring data
3-year cycle / 35 commodities

2016 2017 2018

Population groups
10 groups in total

Adults   Children   Toddler

https://doi.org/10.2903/j.efsa.2021.6392
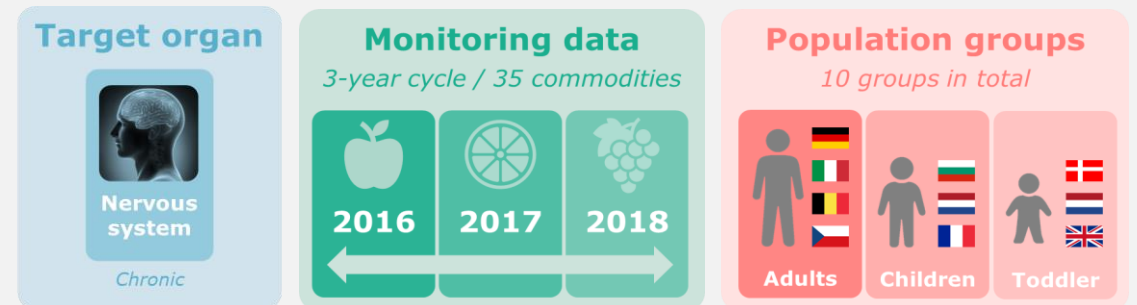
Cumulative Risk Assessment

Main findings

- Outcome of the risk assessment is predominantly driven by a limited number of substances (i.e. bromide ion, chlorpyrifos, deltamethrin, dimethoate, omethoate, pirimiphos-methyl, thiram, triazophos).

- Highest exposure estimates, withing a single day, are often attributed to the (illegal) finding of a one pesticide in a specific sample.

- Model estimates are very conservative and subject to high level of uncertainty. Further data are needed (in processed foods) to obtain better estimates.
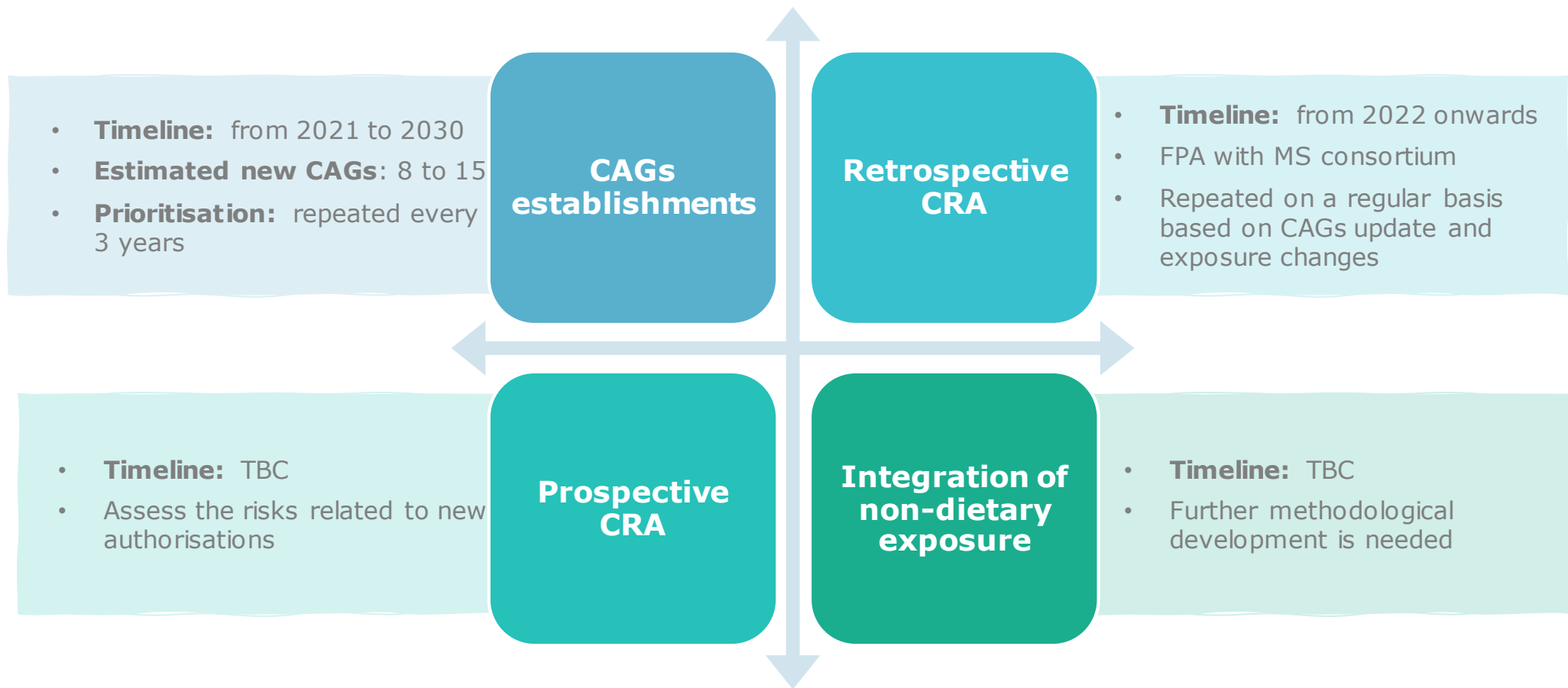
Conclusion

- It is concluded **with varying degrees of certainty** that cumulative exposure to pesticides that have the chronic/acute effects on the thyroid/nervous system does not exceed the threshold for regulatory consideration established by risk managers.

Future perspectives

EFSA-SANTE Action Plan on Cumulative Risk Assessment for Pesticides Residues

- **Timeline:** from 2021 to 2030
- **Estimated new CAGs**: 8 to 15
- **Prioritisation:** repeated every 3 years

CAGs establishments

Retrospective CRA

- **Timeline:** from 2022 onwards
- FPA with MS consortium
- Repeated on a regular basis based on CAGs update and exposure changes

- **Timeline:** TBC
- Assess the risks related to new authorisations

Prospective CRA

Integration of non-dietary exposure

- **Timeline:** TBC
- Further methodological development is needed

https://ec.europa.eu/food/system/files/2021-03/pesticides_mrl_cum-risk-ass_action-plan.pdf

Future perspectives

Vision on risk assessment of combined exposure to multiple chemicals

By 2030, EFSA and partners will be equipped for the routine implementation of human health risk assessment to multiple chemicals, across EFSA´s domains of activity. Harmonised tools and consolidated data are available for a structured and efficient assessment of both dietary and non-dietary exposure to multiple chemicals. Available methods are fit-for-purpose and address requirements from the sectorial legislations.

What will we focus on?

- Combined exposure to multiple chemicals
- Human health risk assessment
- Dietary and non-dietary exposure

Step-wise implementation

I. Dietary exposure to multiple pesticides

II. Aggregated exposure to multiple pesticides

III. Aggregated exposure to multiple chemicals