

## Stakeholder conference Total Diet Studies Exposure Assessment Jacob van Klaveren RIVM

# GENERAL PRESENTATION OF THE WP

- ▶ List of partners: RIVM, URV, BfR, Fera, IFR, ANSES, Ugent, NIPH
- ▶ General schedule:
  - food grouping
  - Link to sources of uncertainty
  - harmonised perspective
  - tests, risk prioritisation
  - validation or biomarkers
- ▶ Links with other WPs:
  - WP6 database structure – exposure
  - WP7 uncertainties (inclusion of uncertainties in MCRA)
  - WP9 new TDS data

# Health risk assessment

## Exposure assessment

- Exposure sources: **food**
- Exposure route: **diet**
- Exposure level
- Highly exposed groups

## Effect assessment

### Hazard identification

Identification of negative health effects  
– target organ and critical effect

### Hazard characterization

- Selection of critical data
- Mechanism of toxicity
- Dose-response for critical effect
- "Point of departure"
- Kinetic and dynamic variability
- Sensitive groups

## Risk characterization

Compare estimated exposure and "safe  
exposure level"

## EFSA guidance



### Essential principles

- representative of the whole diet
- pooling of foods
- food analysed as consumed

## Overall objectives exposure assessment

- create a risk management tool based on TDS exposure assessment and risk mitigation measures
- to improve exposure assessment methodology regarding TDS
- to harmonise exposure assessment approach regarding TDS over Europe

# WORK IN PROGRESS AND ACHIEVEMENTS

- ▶ Overview of TDS performed in the past
- ▶ Training to harmonise the methodology using MCRA
- ▶ Level of detail in food grouping
  - Variation and homogeneous within food group
  - Small and broad food category
- ▶ Link between foodex1 and national code

# Composite food groups

119 categories of foods were combined into 20 groups for analysis



Separated into groups likely to contain substances,  
and those consumed in large quantities

# Example : milk samples

## Food item grouping

Code	Food item
18041	coconut milk
19021	full cream dry milk
19023	full cream UHT milk
19024	full cream pasteurized milk
19026	condensed full cream milk
19027	sweetened condensed full cream milk
19041	semi skim UHT milk
19042	semi skim pasteurized milk
	semi skim UHT milk restored with vitamins
19045	semi skim UHT milk restored with proteins, vitamins, and minerals
19044	semi skim dry milk
19054	skim dry milk
19050	skim milk
19055	skim UHT milk restored with vitamins
19110	flavoured semi skim milk
19122	chocolate milk
19127	strawberry flavoured semi skim milk
19200	goat milk

1242 food items  
(INCA2 classification,  
INCA2 coding)

## 2 criteria

TDS Code	TDS Food item
18041	coconut milk
100028	full cream milk
19026	condensed full cream milk
	sweetened condensed full cream milk
19027	semi skim milk
100026	semi skim dry milk
19044	skim dry milk
19054	skim milk
100027	flavoured semi skim milk
19110	chocolate milk
	strawberry flavoured semi skim milk
19127	goat milk
19200	

754 item groups

88% adult consumption  
89% child consumption

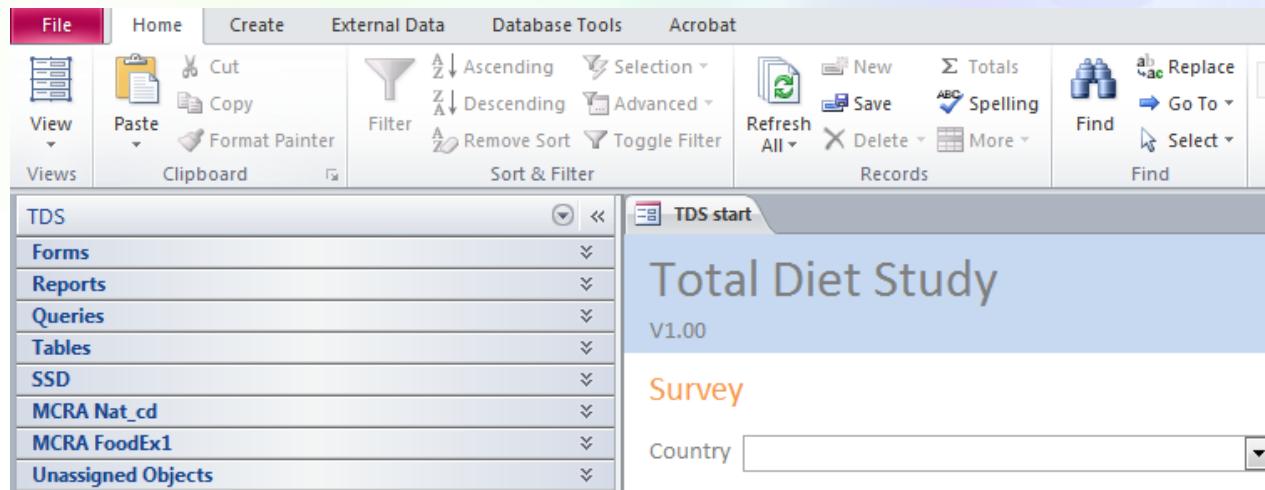
TDS Code	TDS Food item
100028	full cream milk
100026	semi skim milk
100027	skim milk
19122	chocolate milk

8 regional lists  
+ 1 national list

= 212 food items  
(1319 samples)

# HISTORICAL DATA AND HARMONISED APPROACH

- ▶ MS Access database for:
  - Transferring historical data into FoodEx1
  - Decision tree when think were national codes and FoodEx1 did not match
    - More national codes link to one FoodEx1 code
    - Pooled samples



# NATIONAL CODING NOT ALWAYS SAME DETAIL AS FOODEX1

- Decision tree University of Ghent for:

## Mapped National code - FoodEx1

National product	FoodEx1
1 ARROWROOT POWDER	A.01.000319 Arrowroot ( <i>Maranta arundinacea</i> )
1000 LAMB LEG; HALF LEG ROAST LEAN ONLY	A.01.000732 Mutton / lamb meat ( <i>Ovis aries</i> )
1001 LAMB LEG RAW LEAN AND FAT	A.01.000732 Mutton / lamb meat ( <i>Ovis aries</i> )
1002 LAMB SCRAG AND NECK STEWED LEAN AND FAT	A.01.000732 Mutton / lamb meat ( <i>Ovis aries</i> )
1003 LAMB SCRAG AND NECK STEWED LEAN ONLY	A.01.000732 Mutton / lamb meat ( <i>Ovis aries</i> )
1004 LAMB SCRAG AND NECK STEWED LEAN ONLY WEIGHED WITH FAT AND BO	A.01.000732 Mutton / lamb meat ( <i>Ovis aries</i> )

Source Deliverable 8.1

# COMPARING NATIONAL CODES AND FOODEX1

**Table 4: Percentiles of long-term exposure to dioxin-like compounds in adults living in Belgium, Netherlands, France, UK and Spain obtained via two classification systems**

	Total dioxin-like compounds							
	Exposure (pg TEQ/kg bw/day)							
	Using national codes				Using FoodEx1 codes			
	P50	P90	P95	P99	P50	P90	P95	P99
Belgium	0.69	1.46	1.82	2.60	0.65	1.40	1.75	2.61
France	0.39	0.78	0.95	1.38	0.40	0.76	0.91	1.21
The Netherlands	0.78	1.65	2.53	4.87	0.77	1.64	2.48	4.86
Spain	0.48	1.17	1.53	2.40	0.49	1.19	1.53	2.42
UK	0.99	1.55	1.76	2.23	0.99	1.55	1.75	2.16

# MCRA 8 release (mcra8.rivm.nl)

**WAGENINGEN UR**  
For quality of life

National Institute for Public Health and the Environment  
Ministry of Health, Welfare and Sport

**fera**  
The Food and Environment Research Agency

## MCRA 8

MCRA stands for Monte Carlo Risk Assessment.

MCRA is a web-based system for probabilistic exposure and risk assessment of chemicals in the diet.

The MCRA system brings together statistical models, shared data and data uploaded by the user.

MCRA 8 also provides Cumulative Exposure Assessment for chemicals grouped in a Cumulative Assessment Group for which a single health effect is considered relevant.

Optionally exposure from other routes can be added in an Aggregate Exposure Assessment.

MCRA 8.0 was developed in [EU project ACROPOLIS](#)

### Login

Username

Password

[Go to registration](#)

# MCRA 8 overview

- ▶ Organise TDS data in MCRA8
- ▶ integration TDS issues e.g. uncertainties and TDS database (Food Case Risk) (MCRA9)

The screenshot shows the MCRA8 software interface. At the top, there is a dark header bar with the text "Logged in as: vandervoet | Logout | Support". The main content area has a light gray background. On the left, there is a vertical sidebar with the word "project" in green. In the center, there is a "summary" section with the word "summary" in green. To the right, there is a "Summary" section with the word "Summary" in blue. Below these are four colored bars: blue (data), purple (select), red (model), and orange (output). At the bottom right of the main area, there is a small logo for the "SEVENTH FRAMEWORK PROGRAMME" with a stylized "7" icon.

Logged in as: vandervoet | Logout | Support

project

summary

Summary

Overview

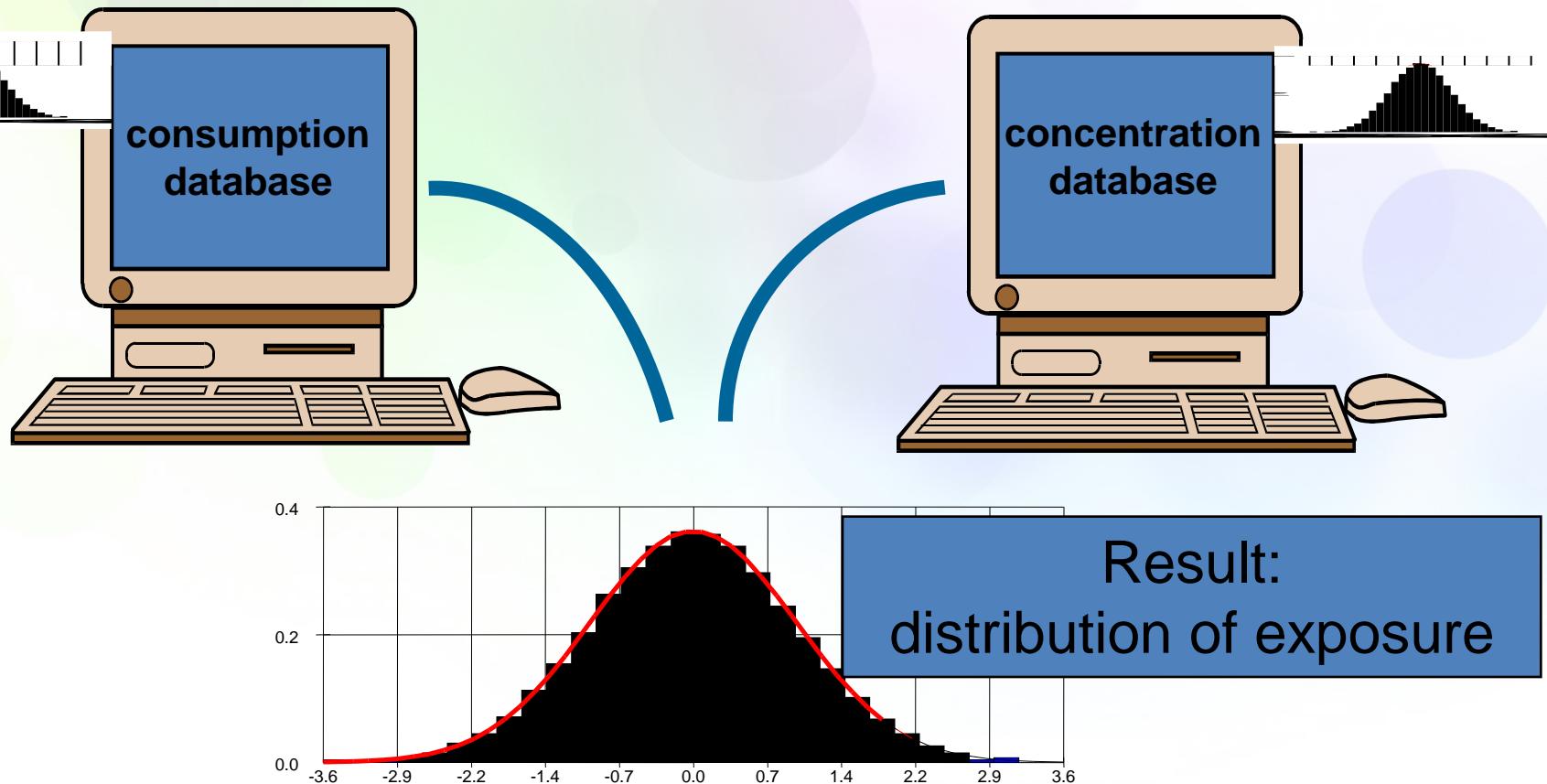
data

select

model

output

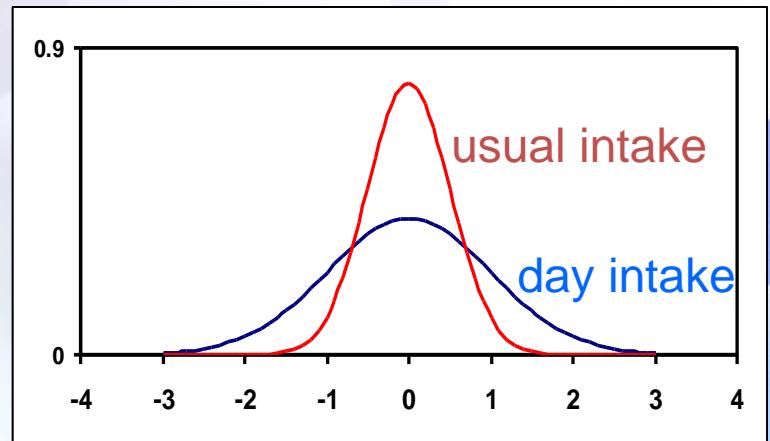
# MCRA: How it works acute



Random sampling from a concentration and a consumption database

# How it works chronic (ETUI project)

- ▶ Observed individual Mean  
EFSA Guidance
- ▶ variance components model
  - between individuals
  - days within individuals
  - transformation to a log or power (Box-Cox) scale
  - remove within persons variation



# MCRA: Data

summary

data

Data ?

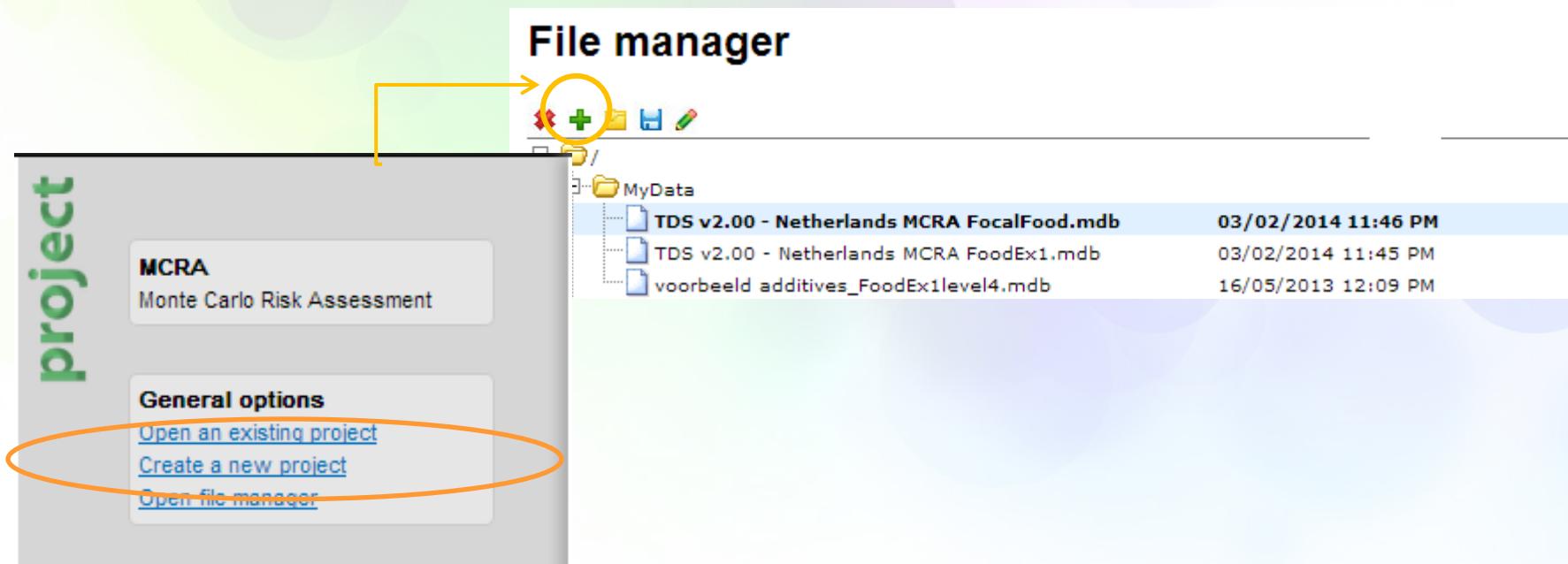
select

model

output

**✓ Foods\*** [clear](#)Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)**✓ Consumptions\*** [clear](#)Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)**✓ Compounds\*** [clear](#)Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)**✓ Concentrations\*** [clear](#)Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)[Show advanced settings](#)[Clear All](#)[Compile & Continue](#)

# MCRA: upload data



# Selection of compounds

summary data select model output

Compounds Conversion Population Subsets Food Subsets

Select a compound from the list.

Compound

- Dioxins LB
- Mono-ortho substituted PCBs
- Non-ortho substituted PCBs
- TEQ dioxins and dioxin-like PCBs

Next step >>

# MCRA: Model

summary data select model

## Model ?

Concentrations Exposures Monte-Carlo Uncertainty Output

*Concentration data can be sampled directly from the data (empirical model) or from parametric models. Concentrations < LOR (Limit Of Reporting) (non-detects) can be co-modelled (censored models) or one can specify a non-detects handling method for imputation. Agricultural use data can be used to impose true zeroes for all or part of the non-detects. Effects of processing on concentrations can be specified using processing factors*

Concentration model

Default concentration model

Non-detects replacement

• Factor f (f x LOR)

[Show advanced settings](#)

[Show concentration models](#) [Next step >>](#)

# MCRA: Model (2)

**model**

**Model** 

Concentrations Unit-variability Intakes Monte-Carlo **Uncertainty** Output

*Repeated analyses are made using resampled data. Results are displayed in the form of approximate confidence intervals. Warning: computation times may be substantially longer.*

**Perform uncertainty analysis**

**Number of iterations per resampled set**

**Number of resample cycles**

**Resample concentrations**

**• Parametric uncertainty**

**Resample individuals**

[Show advanced settings](#)

**Next step >>**

# MCRA: output requirements

model

Model ?

Concentrations Unit-variability Intakes Monte-Carlo Uncertainty Output

Specify details of output that will be generated

Show percentiles for 50 75 90 95 99 99.9

Percentage for drilldown 99.9

Percentage for upper tail 97.5

Show % of population below level(s) Manual

• Exposure levels 1 10 50 100 200 500

• Exposure levels are Percentage

← % of TDI

Show advanced settings

Next step >>

# Run the model

summary

## Summary

### Data

Single data-source: TDS v2.00 - Netherlands MCRA FoodEx1.mdb

### Select

Food consumption survey: DNFCFS-3  
Compound: TEQ dioxins and dioxin-like PCBs LB

### Model

Concentration model: empirical, nondetects set to zero.  
Number of Monte Carlo simulations: 100000  
Uncertainty analysis: No

### Run



17% [\(cancel\)](#)

Input data loading complete

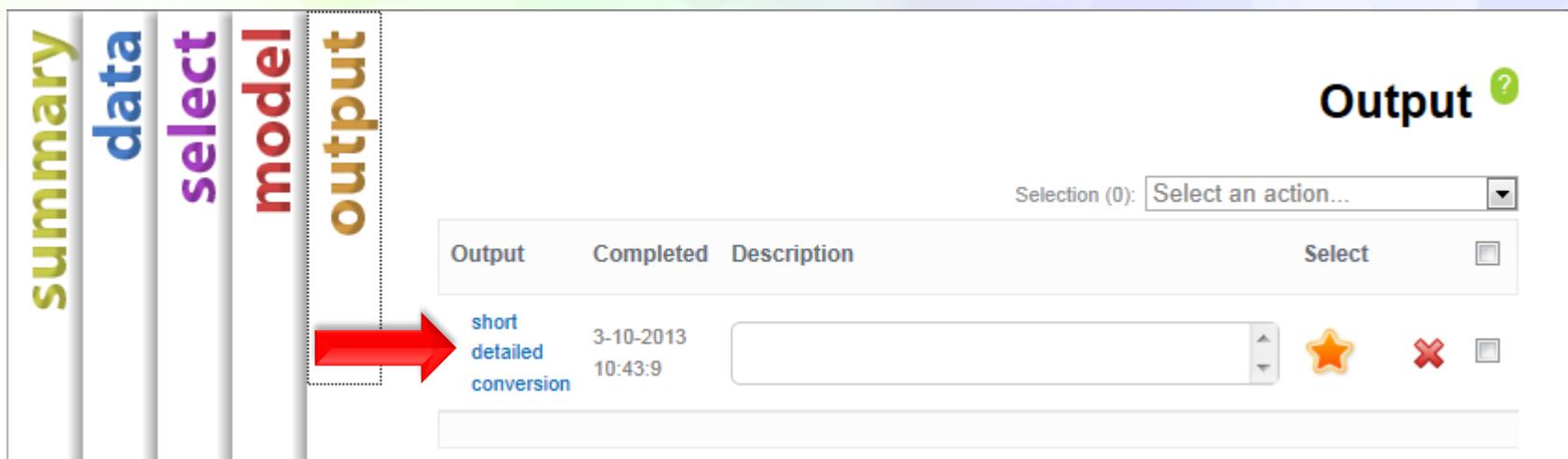
### Output

Outputs:

No output available

data  
select  
model

# MCRA: Output (1)

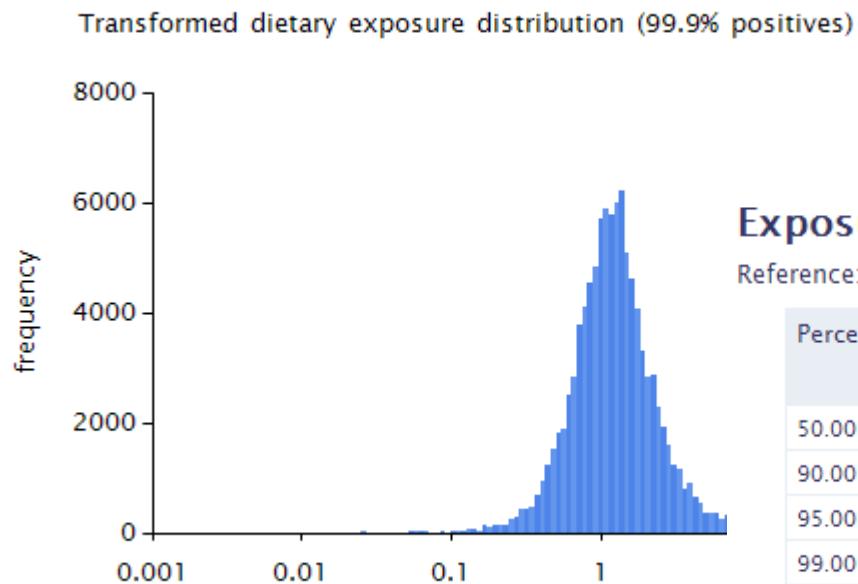


The screenshot shows the MCRA software interface with the following elements:

- Left sidebar:** A vertical sidebar with tabs: **summary** (green), **data** (blue), **select** (purple), **model** (red), and **output** (orange). The **output** tab is selected, indicated by a red arrow pointing to it.
- Header:** The word **Output** is displayed in a large, bold, black font with a green question mark icon.
- Toolbar:** A dropdown menu labeled **Selection (0): Select an action...** with a dropdown arrow.
- Table:** A table with columns: **Output**, **Completed**, **Description**, and **Select**. The table contains one row:
  - Output:** short detailed conversion
  - Completed:** 3-10-2013 10:43:9
  - Description:** (empty text input field)
  - Select:** (checkbox)
- Icons:** A row of icons: a yellow star, a red X, and a grey square.

# MCRA: Output (2)

## Transformed dietary exposure distribution



Example, no real data

## Exposure percentiles

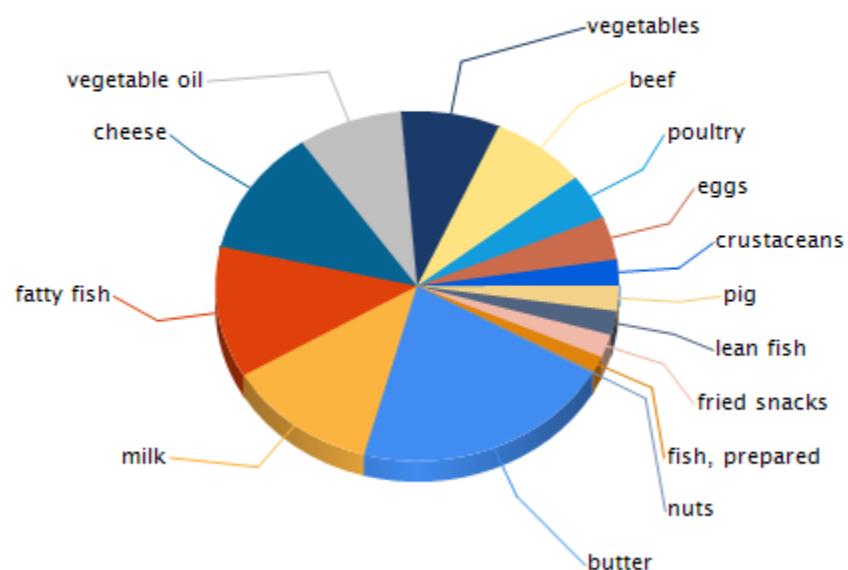
Reference: TEQ dioxins and dioxin-like PCBs LB, ARfD = NaN ( $\mu\text{g}/\text{kg bw/day}$ ),

Percentage	
50.00 %	1.227
90.00 %	2.784
95.00 %	3.898
99.00 %	8.508
99.90 %	17.66
99.99 %	31.96

# MCRA: Output (3): Contribution foods

## Contribution to total exposure distribution for food as measured

Contribution to total exposure distribution for foods as measured



# Add own residue finding

## New Project

Enter Name, Tag(s) and Description for your new project. Choose a scenario (default is exposure and type of exposure (Acute or Chronic). A single compound analysis is default or check the for other options.

Name: TDS polluted egg

Tags: (empty)

Description: Click to edit..

Exposure type: Acute

Cumulative exposure:

Aggregate exposure:

Use focal commodity:

Hide advanced settings

Submit

## summary

### data

✓ Foods\* [clear](#)  
Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)

✓ Consumptions\* [clear](#)  
Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)

✓ Compounds\* [clear](#)  
Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)

✓ Concentrations\* [clear](#)  
Selected file: TDS v2.00 - Netherlands MCRA FoodEx1.mdb [change](#)

✓ Focal food samples\* [clear](#)  
Selected file: TDS v2.00 - Netherlands MCRA FocalFood.mdb [change](#)

## Data

# Define food item that has to be replaced

summary data select model

**Select** ?

Compounds Focal Foods Conversion Population Subsets Food Subsets

Sample Subsets

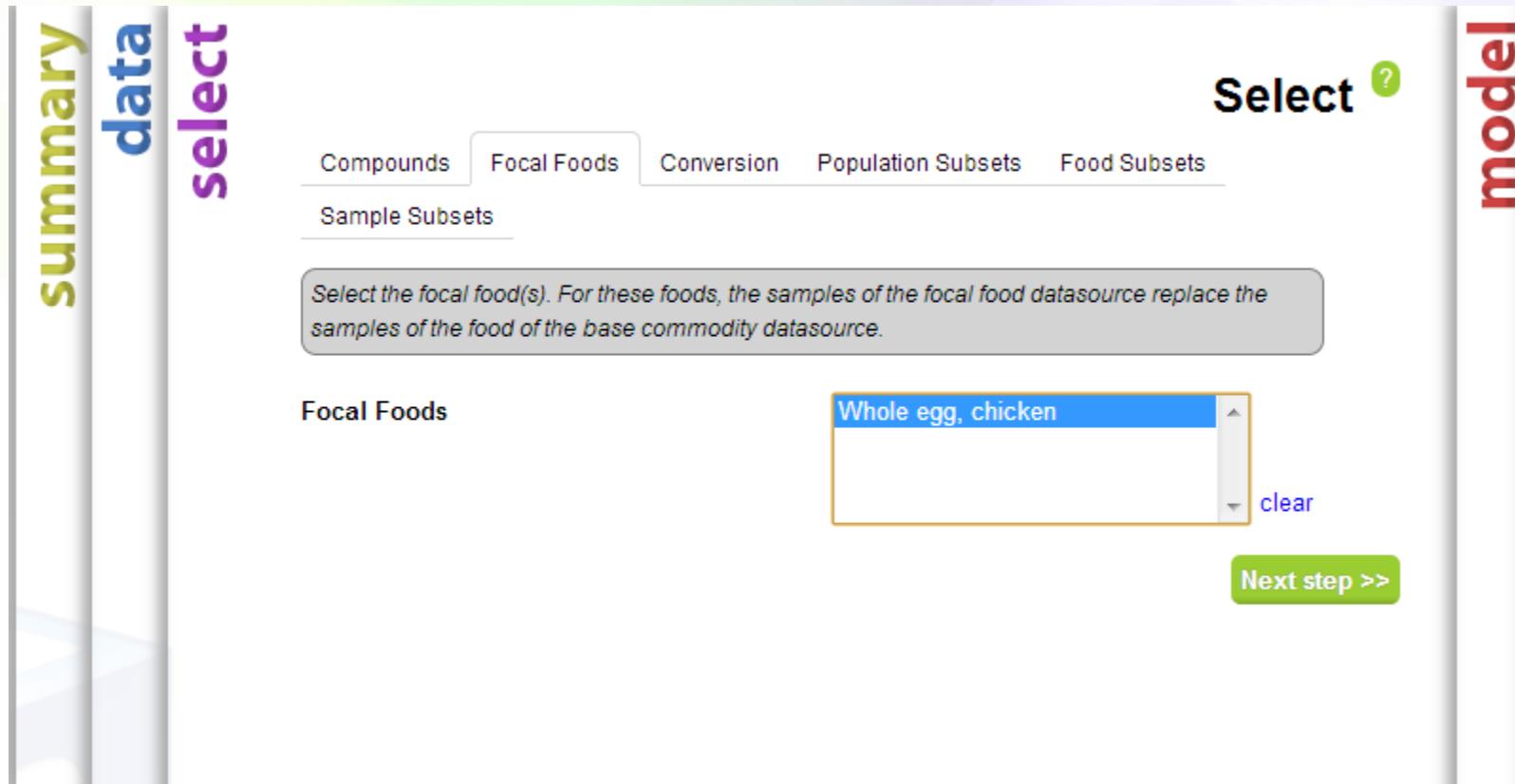
Select the focal food(s). For these foods, the samples of the focal food datasource replace the samples of the food of the base commodity datasource.

Focal Foods

Whole egg, chicken

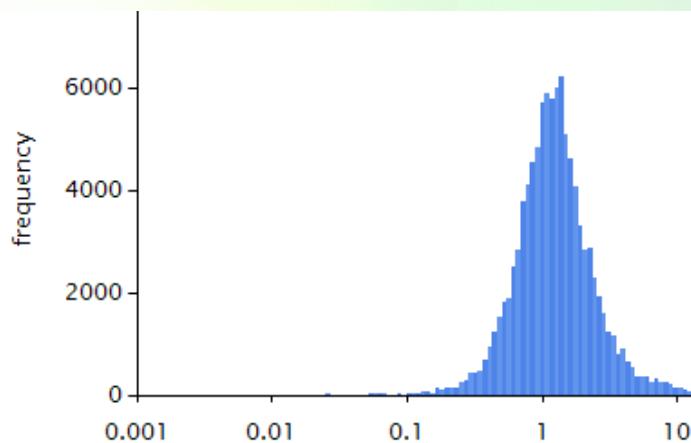
clear

Next step >>



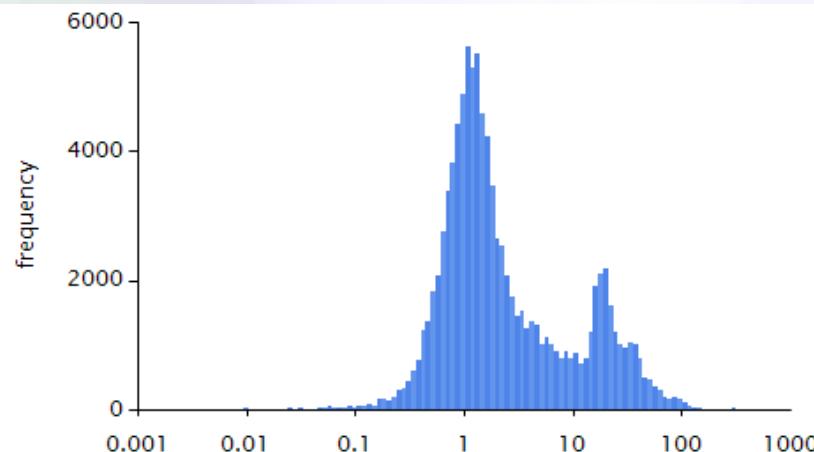
# With and without contaminated egg

Without contamination



Example, no real data

With contaminated egg



Example, no real data

# Future harmonised perspective

MyData	
acropolis/Shared	
BelgiumTriazoles2011.mdb	21/06/2013 02:29 PM
CyprusTriazoles2007-10.mdb	12/04/2013 09:48 AM
CyprusTriazoles2007-10Pessimistic.mdb	26/08/2013 09:53 AM
CzechRepTriazoles2007-10.mdb	12/04/2013 09:49 AM
CzechRepTriazoles2007-10Pessimistic.mdb	12/04/2013 09:49 AM
DenmarkTriazoles2007-10.mdb	19/04/2013 04:20 PM
DenmarkTriazoles2007-10Pessimistic.mdb	26/08/2013 09:55 AM
FranceTriazoles2007-10.mdb	12/04/2013 09:52 AM
FranceTriazoles2007-10Pessimistic.mdb	04/06/2013 09:54 AM
ItalyTriazoles2007-10.mdb	12/04/2013 09:53 AM
ItalyTriazoles2007-10Pessimistic.mdb	12/04/2013 09:53 AM
LetviaConsumptionData.mdb	20/06/2013 06:52 PM
MaximumResidueLimit.mdb	12/04/2013 10:08 AM
NetherlandsTriazoles2007-10.mdb	12/04/2013 09:53 AM
NetherlandsTriazoles2007-10Pessimistic.mdb	12/04/2013 09:54 AM
SloveniaTriazoles2007-2009.mdb	20/06/2013 06:48 PM
SwedenTriazoles2007-10.mdb	12/04/2013 09:54 AM
SwedenTriazoles2007-10Pessimistic.mdb	12/04/2013 09:55 AM
TriazolesProcessing-Optimistic.mdb	12/04/2013 09:55 AM
TriazolesProcessing-Pessimistic.mdb	12/04/2013 10:02 AM
UnitedKingdomTriazoles2007-2010.mdb	12/04/2013 10:03 AM
UnitedKingdomTriazoles2007-2010Pessimistic.mdb	12/04/2013 10:08 AM
UnitVariability.mdb	12/04/2013 10:08 AM

# CONCLUSIONS

- ▶ We were able to convert the results using national codes toward a harmonised EU platform
- ▶ Next step is to look at methodological aspects
  - Overestimating or underestimating
  - Completeness e.g. 10 % of food items is not sampled, how does it affect the TDS exposure
  - Effect of variation and uncertainty
- ▶ First ideas about integration FoodCaseRisk and MCRA
- ▶ Possible to connect stakeholder's own residue finding to TDS data