



# **FNS - Cloud**

Food Nutrition Security

# **Total Diet Study risk assessment**

challenges and communication

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Research and Premotec

# Total Diet Study risk assessment

## Challenges and communication

- What is a Total Diet Study?
- Challenges to harmonize TDS exposure assessment
- FNS-Cloud project solutions
  - Cloud computing
  - Demonstration and communication materials



# EFSA – FAO – WHO guidance TDS



EFSA Journal 2011; 9(11):2450

## JOINT GUIDANCE OF EFSA, FAO AND WHO

### **Towards a harmonised Total Diet Study approach: a guidance document<sup>1</sup>**

**European Food Safety Authority (EFSA), Parma, Italy<sup>2,3</sup>**

**Food and Agriculture Organization of the United Nations (FAO), Rome, Italy**

**World Health Organization (WHO), Geneva, Switzerland**

<https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2011.2450>

# Which countries performed a TDS

- TDS conducted in United Kingdom, Spain, France, The Netherlands, Belgium, Czech Republic, Germany, Finland, Iceland and Portugal
- World Health Organization endorse TDS outside Europe
- How comparable are the TDS in their sampling design and how may this impact on results?



# What are Total Diet Studies?



## Criterion 1

- Representative for the population
- Covers 90 % of the German diet
- Includes highly contaminated foods, although they are consumed rarely (< 10 %)



## Criterion 2

- Foods are prepared as consumed



## Criterion 3

- Similar foods are pooled together to one sample to reduce the number of samples

# Standard Operating Procedures

**Preparation for food collection, sample preparation and analysis**

SOP  
01

**Food collection**

SOP  
02

**Reception of individual samples (at kitchen laboratory)**

SOP  
03

**Sample preparation (at kitchen / pre-analytical laboratory)**

SOP  
04

**Chemical analysis of laboratory samples**

SOP  
05

# Steps of the BfR MEAL Study

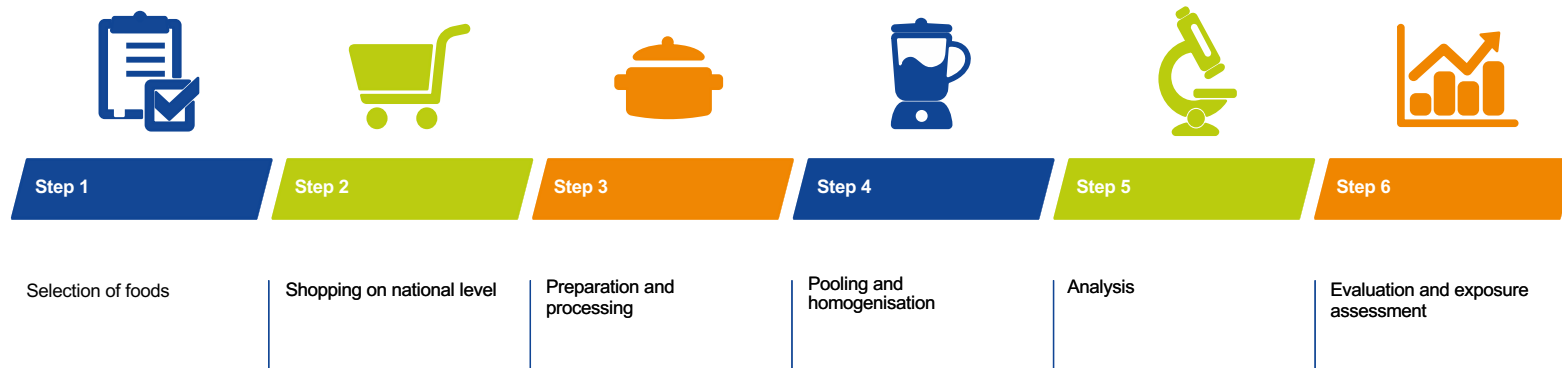
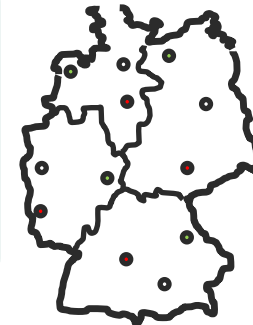


Image rights BfR

# Food collection





# Food collection



## Food sampling:

- 149 000 km with two transporters
- Subsamples purchased:
  - Elements 13,552
  - Tocopheroles 8,955
- Money spend on foods: 208,209 €

# Food preparation



# Steps of the BfR MEAL Study

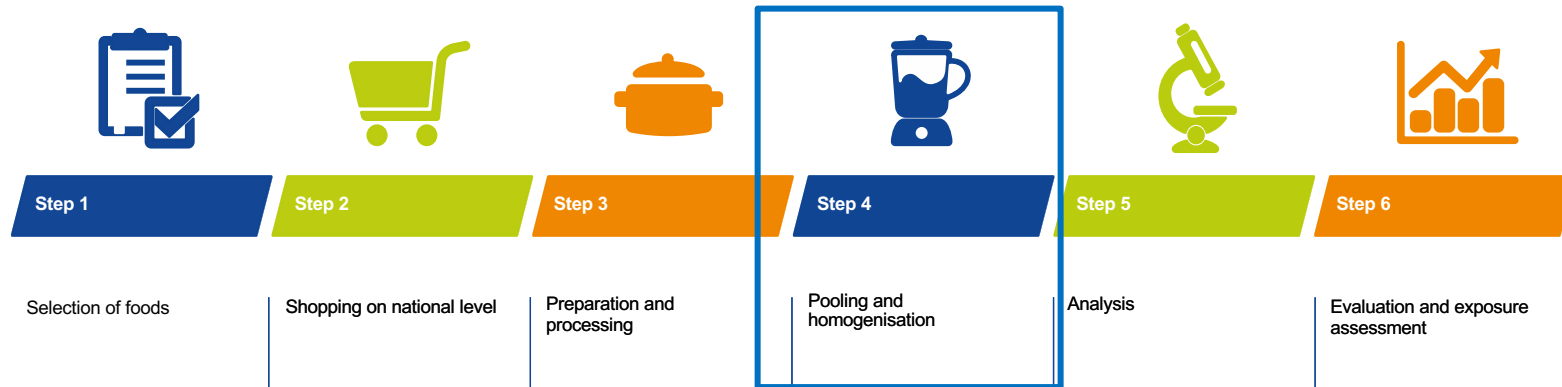


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# Pooling and homogenisation



Image rights BfR

► **3408 pooled samples**



Image rights BfR



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- 15 – 20  
Subsamples are  
pooled to one  
sample
- Representative  
pools for the  
average  
consumption in  
Germany
- No information on  
variability of  
substance levels  
in subsamples



# Food samples, sampling plan and analysis of the samples in Belgium

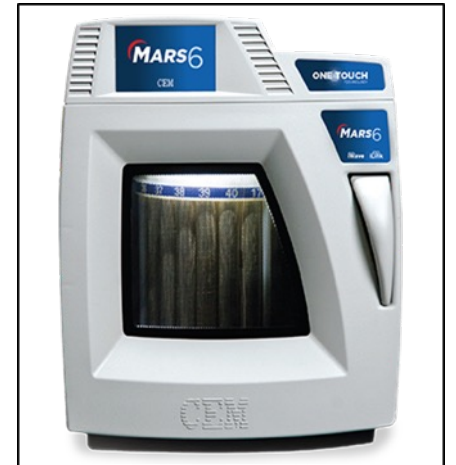
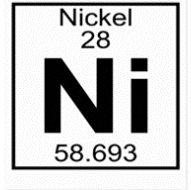
- Risk-based sampling plan

- ❖ In total 708 samples

- ❖ Three major food categories:

- Plant-based foods (N = 406)
- Foods of animal origin (N = 113)
- Drinks (N = 189)

- Microwave-assisted acid digestion, ICP-MS analysis



# Total Diet Studies in Europe



Exposure assessment of methylmercury in sample Articles

Irmela Sarvan<sup>a,\*</sup>, Anna Elena Kolbaum<sup>a</sup>, Ulrike Pabel<sup>a</sup>, Thorste Oliver Lindtner<sup>a</sup>

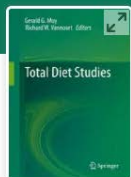
<sup>a</sup> Federal Institute for Risk Assessment (BfR), Max-Dohm-Straße 6-10, 10589, Berlin, Germany  
<sup>b</sup> University of Veterinary Medicine Hannover, Bünteweg 2, 30559, Hannover, Germany

## Chronic dietary exposure to nickel from selected foods consumed in Belgium

Mehrnoosh Babaahmadifooladi ✉ & Liesbeth Jacxsens

Pages 95–112, Received 17 Mar 2020, Accepted 25 Sep 2020, Published online: 05 Nov 2020

<https://doi.org/10.1080/19440049.2020.1833088>



**Total Diet Studies** pp 259–265 | [Cite](#)

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## Experiences in Total Diet Studies

[Jiri Ruprich M.V.D., Ph.D.](#) ✉ & [Irena Rehurkova](#)

DOI: 10.1016/j.envint.2021.106393 • Corpus ID: 231789051

## Infant total diet study in France: Exposure to substances migrating from food contact materials.

[V. Sirot](#), [G. Rivière](#), +5 authors [M. Hulin](#) • Published 30 January 2021 • Medicine • Environment international

[View on PubMed](#)

[doi.org](#)

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# Fifth WHO-TDS workshop Seoul



Workshop report: [here](#)

# CONCLUSIONS AND RECOMMENDATIONS

- All countries are encouraged to conduct total diet studies
- Summer School for TDS and software for exposure assessment “Monte Carlo Risk Assessment” as well as hands-on experience and other transfers of TDS expertise among countries
- WHO Collaborating Centres for Food Contamination Monitoring are encouraged to strengthen their role in supporting low-income countries in the conduct of TDS through capacity building



# Challenge 1: how to harmonize food coding

*Table 1: FoodEx2 food groups sampled and analysed in the pilot study*

FoodEx2 food groups	CZ	DE	FI	IS	PT
Grains and grain-based products	X	X	X	X	X
Meat and meat products	X	X	X	X	X
Fish, seafood, ...	X	X	X	X	X
Fruit and fruit products	X	X	X	X	X
Legumes, nuts, oilseeds and spices	X	X	X	X	X
Milk and dairy products	X	X	X	X	X
Coffee, cocoa, tea and infusions		X	X		
Composite dishes	X	X	X	X	X
Eggs and egg products	X	X	X	X	X
Starchy roots or tubers and products	X	X	X	X	X
Vegetables and vegetable products		X	X		

# EFSA Data Collection Framework



[Home](#) / [Data collection](#) / Data collection: chemical monitoring



## Data collection: chemical monitoring

# Harmonized exposure assessment (1)

## Food classification

- Mapping of food consumption data to analytical data obtained in TDS
- Use of FoodEx
  - International coding system, EFSA
  - International standards data formats



# Challenge 2: how to account for seasonal variation

*Table 2: Number of TDS samples collected and analysed in different seasons*

Campaign	Season	No. of TDS samples				
		CZ	FI	PT	DE	IS
1	Spring (March - June, 2014)	28	27	37	61	27
2	Summer (June - September, 2014)	27	25	37	62	26
3	Autumn (September - December, 2014)	27	29	33	61	27
4	Winter (December 2014 - March 2015)	27	27	41	56+26	26
total		109	108	148	240+26	106

# Seasonal and regional variation in German TDS

 **MCRA Training**  
Exposure, Hazard & Risk Assessment

/  ik workspace

/  TDS-based long ter...  
action

Training08    

**NOTE:** This is the **temporary MCRA Training environment**. MCRA is available at <https://mcra.rivm.nl>**TDS-based long term dietary exposure and risk assessment**  
Standard action - TDS-based long term dietary exposure and risk assessment     **Settings**

# Challenge 3: harmonised software for professionals

## Modelling approach

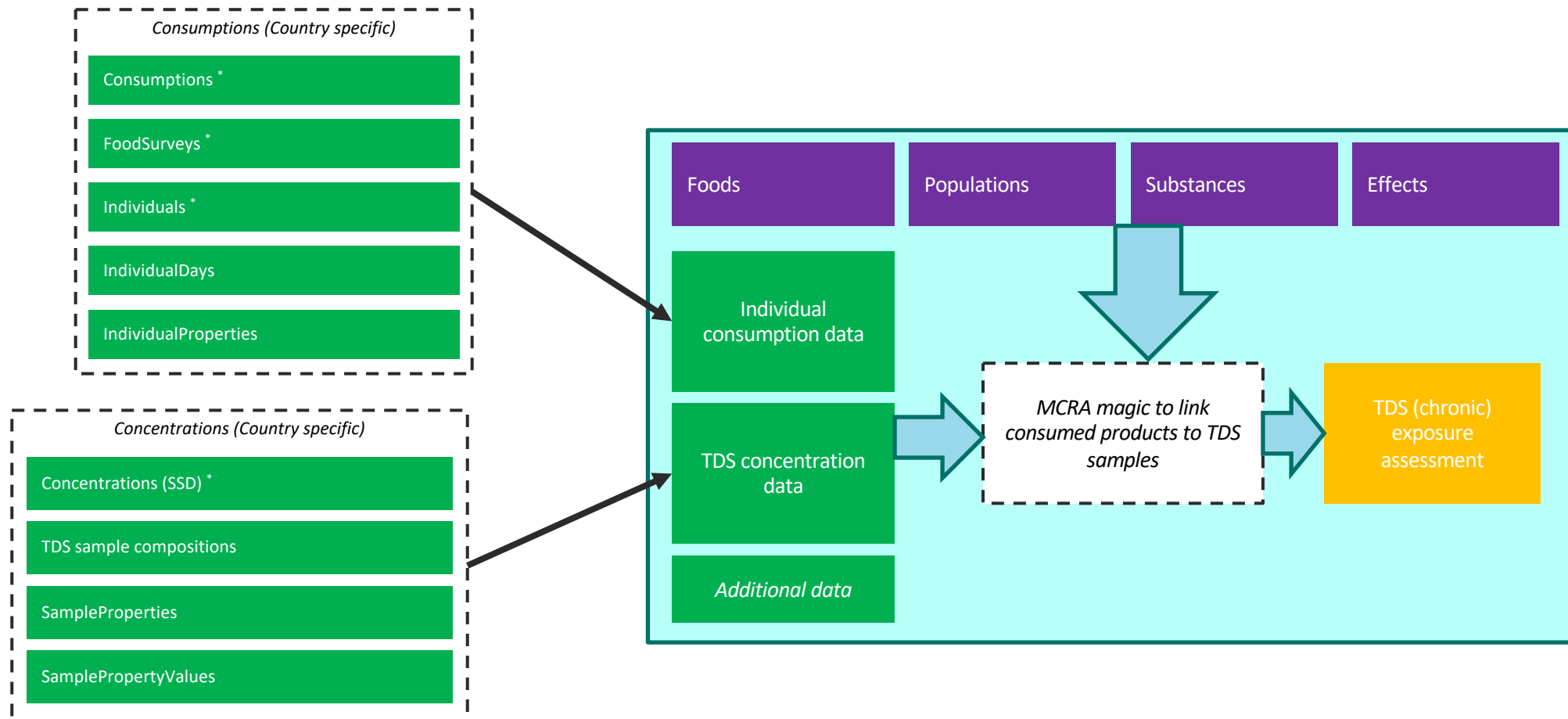


### Monte Carlo Risk Assessment (MCRA):

- Already in place and used and accepted and supported by EFSA
- Contained already important features for long-term exposure modelling

**Improved and **harmonised** exposure assessment based on national TDS data**

# Datasets and data organisation in MCRA



## Challenge 4: computational resources and Cloud solutions



- TDS centres might wish to train a large group of experts
- Universities may wish to train students (first request already received from the University of Ghent)
- Flexible and cheap, but someone needs to pay for the computational resources
- This MCRA environment can be set up and removed in a short time

<https://mcra-training.rivm.nl/>



# Recently added to MCRA thanks to FNS Cloud

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## Experiences in Total Diet Studies in the Czech Republic

[Jiri Ruprich M.V.D., Ph.D.](#)  & [Irena Rehurkova](#)

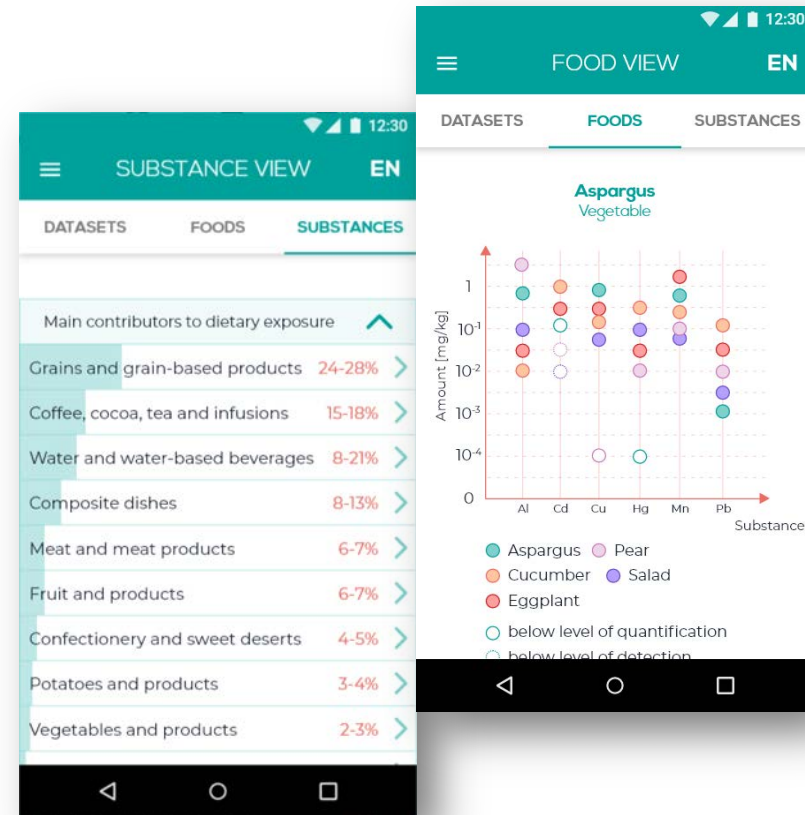
## Total Diet Study (TDS) in Portugal - A harmonised approach



Pitté, M., Pinchen, H., Castanheira, I., et al. (2018) Quality management framework for total diet study centres in Europe. *Food Chem.* 240, 405-414.

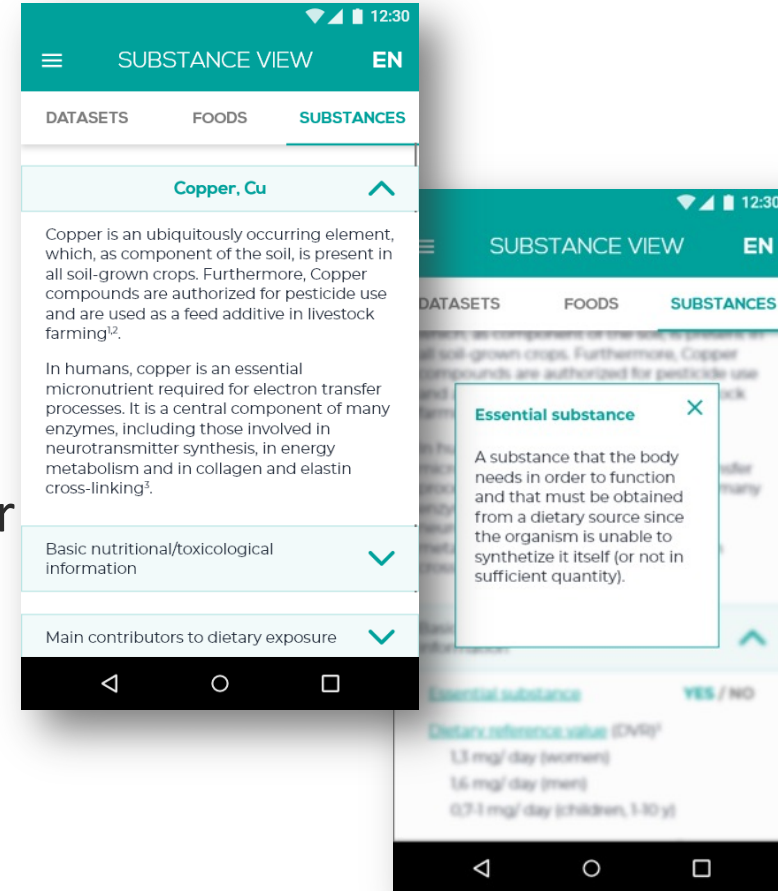
# Challenge 5: TDS data app for consumers

- and how to improve communication towards consumers
- **Dataset used:** TDS Exposure Study (MEAL study)



# User testing and training

- Usability testing scenario
- Supervised usability testing with 3-5 FNS partners
- The scenario is translated into German and used for supervised testing with participants selected from the German citizens
- The app is improved, based on the collected feedback



# Communication challenges

- Community of Practice, who are they and how to approach them?
- Online videos and training materials for teachers at universities and experts in TDS centres (link to FNS-Cloud catalogue)
- Training opportunities e.g. at BfR Summer Academy, EFSA or WHO Collaborative Centres
- Does the consumer understand technical information on Food Safety (e.g. what is meant with levels below Tolerable Daily Intake)

# FNS-Cloud Catalogue (1)



**FNS - Cloud**

Food Nutrition Security

**catalogues**

Browse FNS Cloud Catalogues, containing information about datasets related to the topics of food, nutrition and security, e-tools like apps and software to manage and analyse data and services, that are provided by FNS Cloud or our verified partners.



## Datasets

Search for datasets with data related to FNS topics. Gain access to the open data or contact data owners for access.



## Tools

Explore available apps, software and algorithms to analyse, manage and visualise your data.



## Services

Take advantage of services provided by FNS and verified partners, including data analysis, research and consultancy.



## Training and Education

Browse different solutions for training and education to learn more about food nutrition security.

# FNS-Cloud Catalogue (2)

- Datasets: Contaminants\_simplified\_SSD2\_BE-FPS\_Nickel\_FNS
- Tools: MCRA – Monte Carlo Risk Assessment
- Training and Education:
  - Introduction Online course Total Diet Studies (TDS) [https://youtu.be/I7gBnt5g\\_gU](https://youtu.be/I7gBnt5g_gU)
  - Lecture 1: International interest in Total Diet Studies (TDS) <https://youtu.be/cGRFwUNdRHk>
  - Lecture 2: Risk assessment based on TDS data <https://youtu.be/r0j-igvQGfc>
  - Lecture 3: TDS applied in Belgium for training courses of students (CoP) <https://youtu.be/r0j-igvQGfc>
  - TDS: Hands-on training master students using MCRA training environment in the cloud <https://youtu.be/xFvR4j1-s0s>

# Overall description in deliverable 5.9



Food Nutrition Security Cloud

**D5.9 DEMO01 Functionality Report: MCRA and low-end user apps**

**Food Nutrition Security Cloud**

**Deliverable 5.9**

D5.9 DEMO01 Functionality Report: MCRA and low-end user apps

**Due Date:**

**March 31, 2023**

DOI: 10.5281/zenodo.8262468

# Concluding remarks

- A number of EU Member States performed TDS
- Lack of harmonization might hamper comparison of TDS results across Europe or world-wide
- Harmonisation of coding, data transfer and software will optimize the use of TDS results in international risk assessment
- These improvements will benefit from cloud computing solutions, FNS Cloud videos and appsv (all available in the FNS Catalogue)





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