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Expert Models
for Decision Makers

Using Data and Predictive Models for New Product Development – to Assess Safety, Shelf Life and Health Benefits

4th April 2019

Sandrine Pigat
Head of Food & Nutrition at Creme Global

IFST Spring Conference 2019 (SC19)
'Nutritional Science over Gut Feel'

About Us

Creme Global is an independent data science technology company. Various industry and government partners funded the projects described here.

Content

- Data Science Challenges
- Predictive Modelling Case studies
    - Probabilistic Exposure Modelling
    - New Product Development and Health Impact
    - Product Stability and Shelf Life - Predictive Modelling
    - Modelling Industry Reformulation Efforts and Population Impacts

Data Science Challenges

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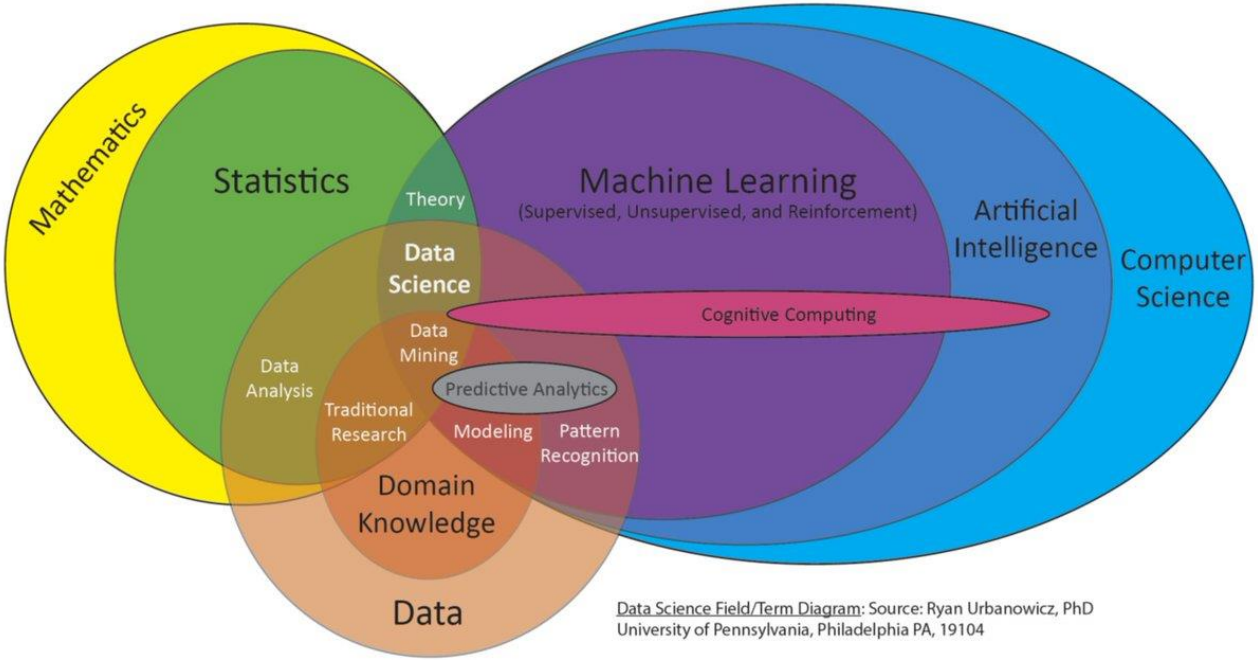
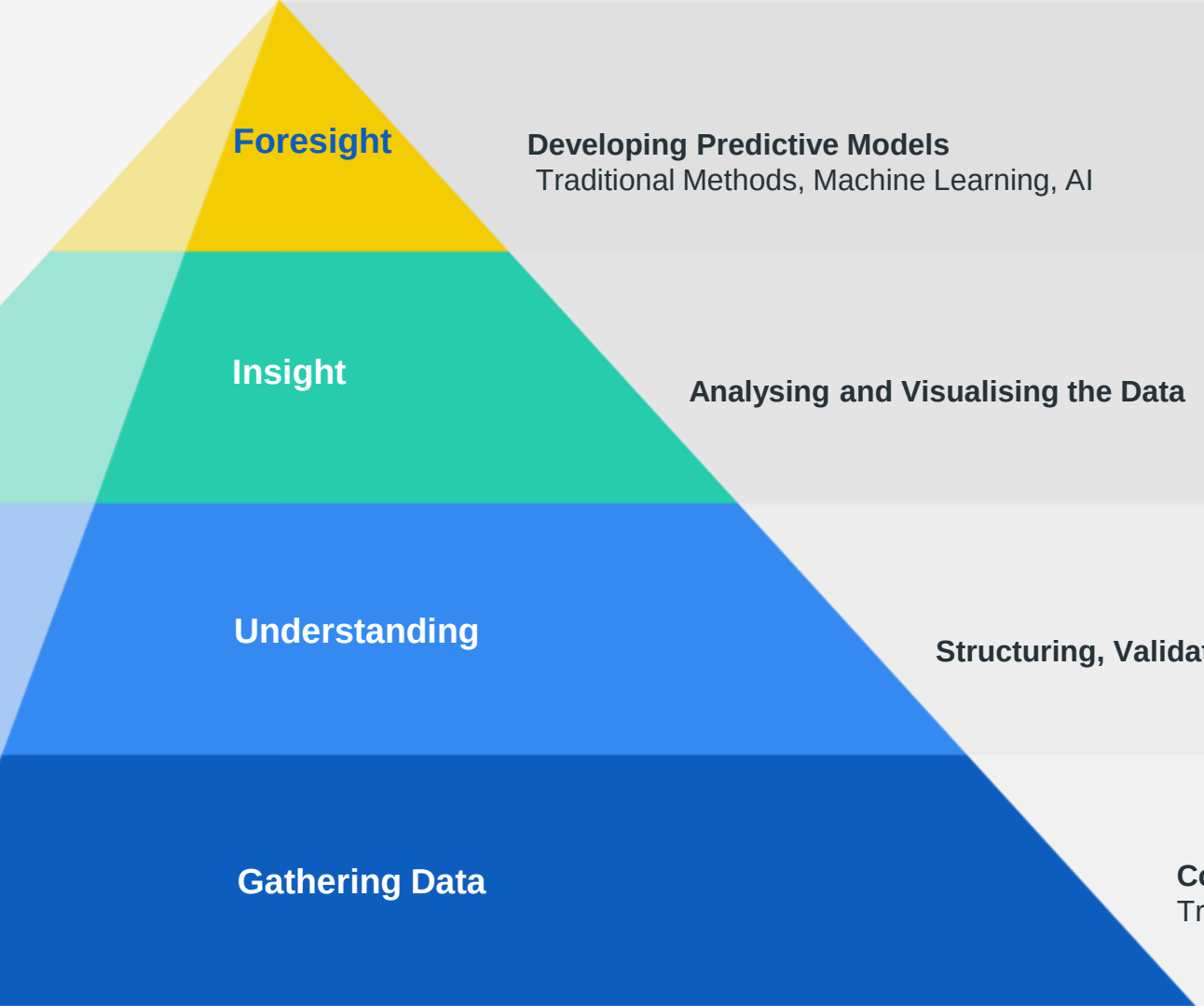
Multidisciplinary Approach



Data Science Field/Term Diagram: Source: Ryan Urbanowicz, PhD
University of Pennsylvania, Philadelphia PA, 19104

Data Science Challenges



Developing Predictive Models
Traditional Methods, Machine Learning, AI

Analysing and Visualising the Data

Structuring, Validating and Sharing

Collect the Data
Traditional Data, Big Data, IOT

Data Structure

Well Structured Data

Unstructured Data

Messy Data

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Alternative Data Sources

Market Research

KANTAR WORLDPANEL

nielsen

MINTEL

EUROMONITOR INTERNATIONAL

NPD GROUP

Crowd Sourced

QS Quantified Self

CodeCheck

DATA DONORS Share for good.

Online Data Gathering

foodbook24

food4me.org

myfood24

Industry Applications of Predictive Modelling

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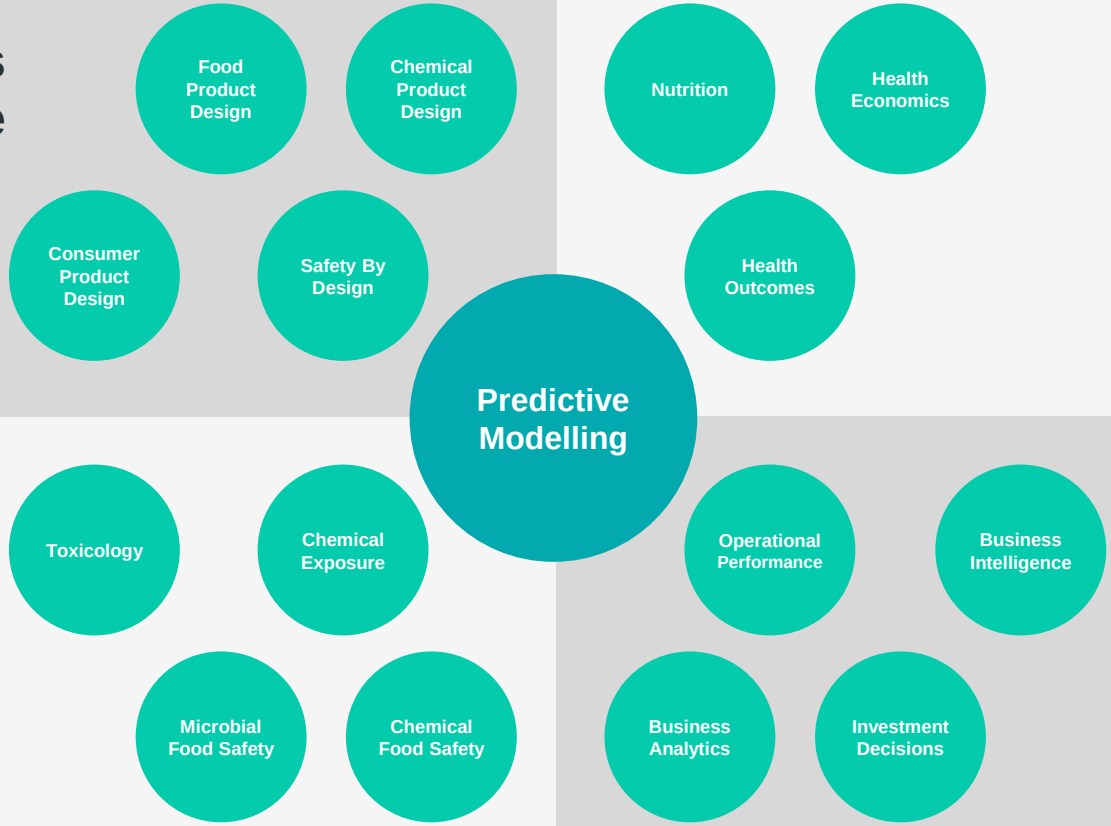

Predictive Modelling:
Case Studies

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Probabilistic Exposure Modelling

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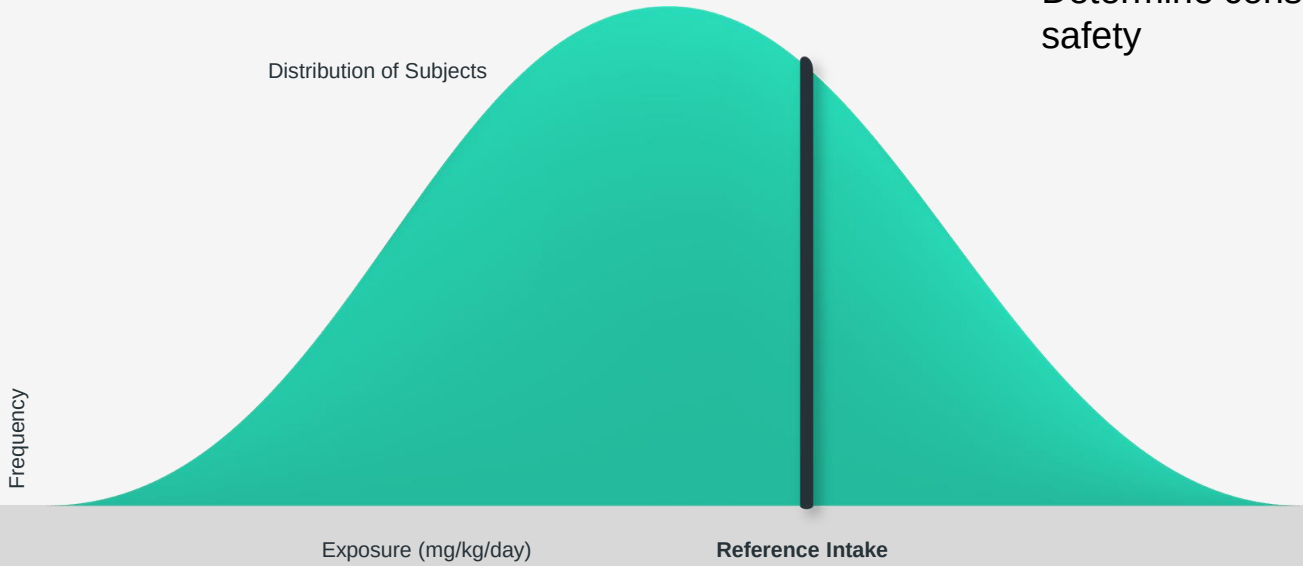
Exposure Assessments

Contaminants, additives, chemicals etc.

Determine consumer safety



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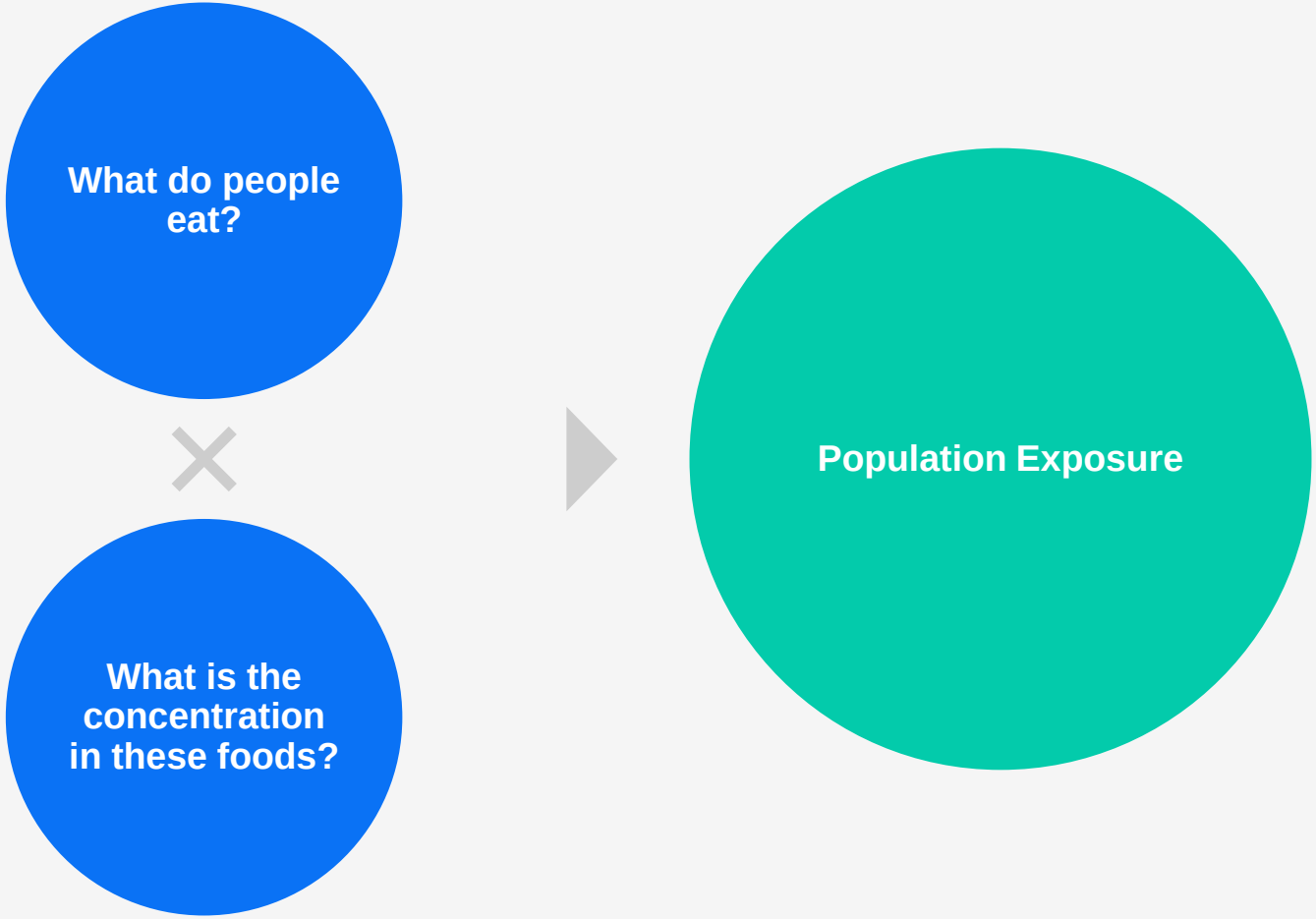
Data


What do people eat?
What is the concentration in these foods?
Population Exposure

From Worst Case to Probabilistic Exposure Modelling

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Diary Day 1

	FREQUENCY	AMOUNT
	x1	40 g
	x2	500 g
	x3	100 g
	x4	200 g

Diary Day 1

FREQUENCY	AMOUNT	SUBSTANCE CONCENTRATION
x1	40 g	0.6 %
x2	500 g	0.02 %
x3	100 g	1.5 %
x4	200 g	0.007 %

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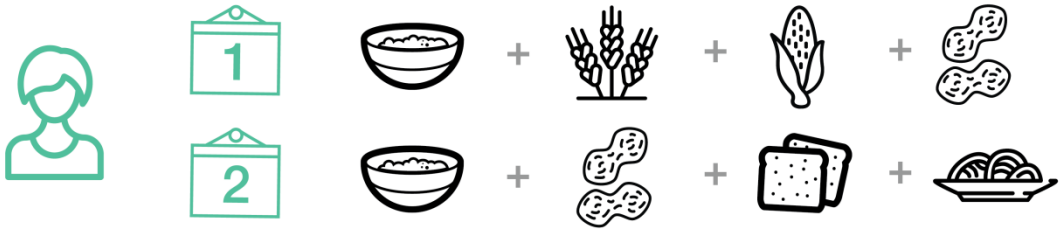
1


1
2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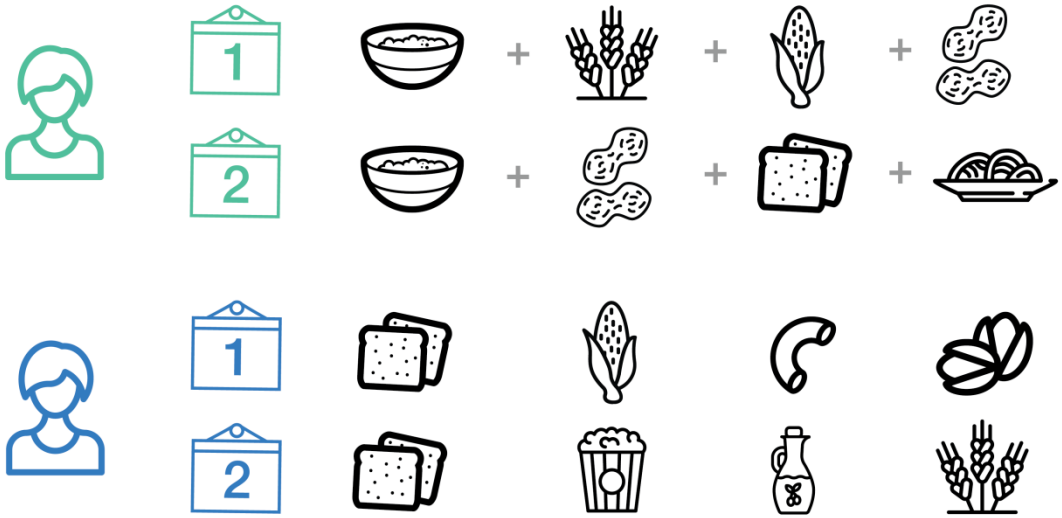
2
1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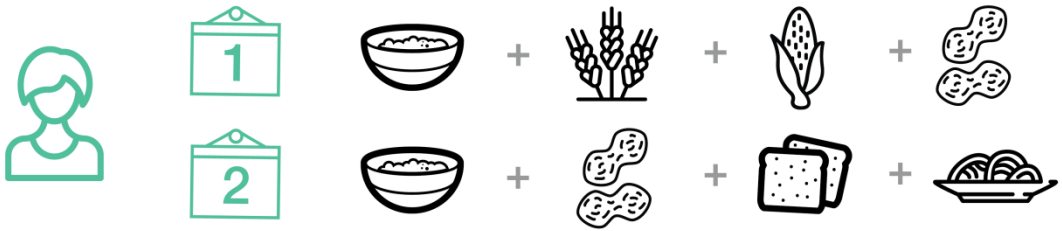
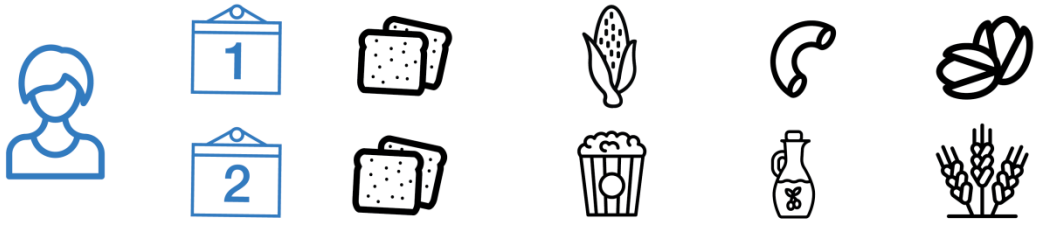
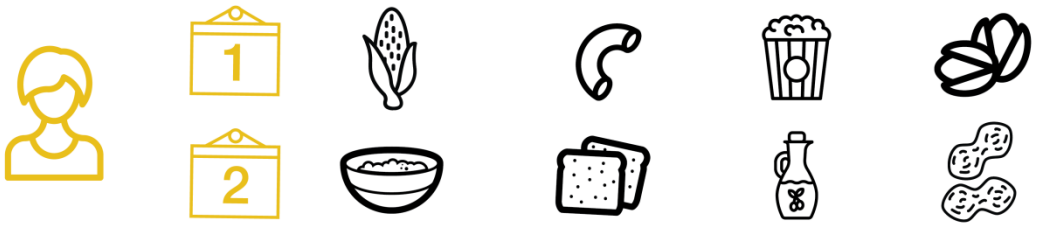


Daily Average



Daily Average



Daily Average

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Population Exposure

Lower

Higher

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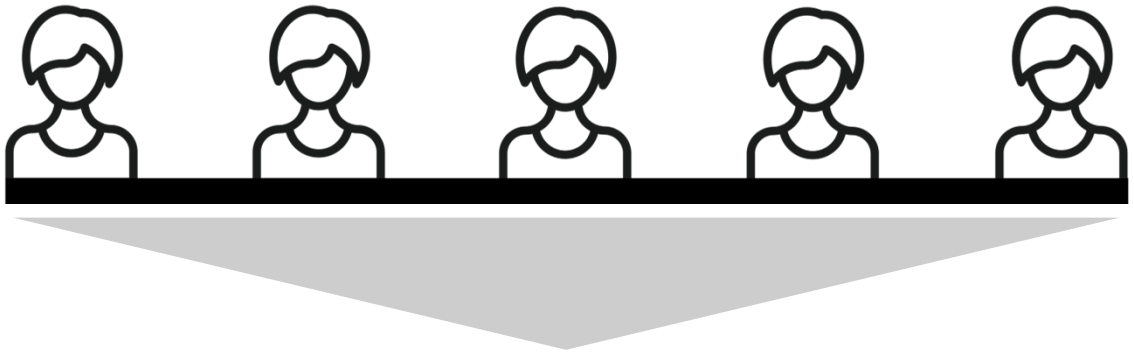
Population Exposure



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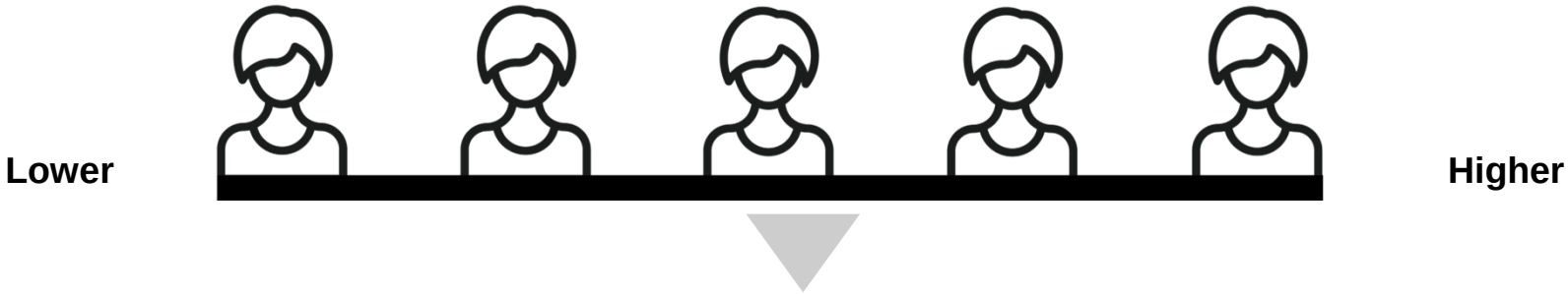
Population Exposure



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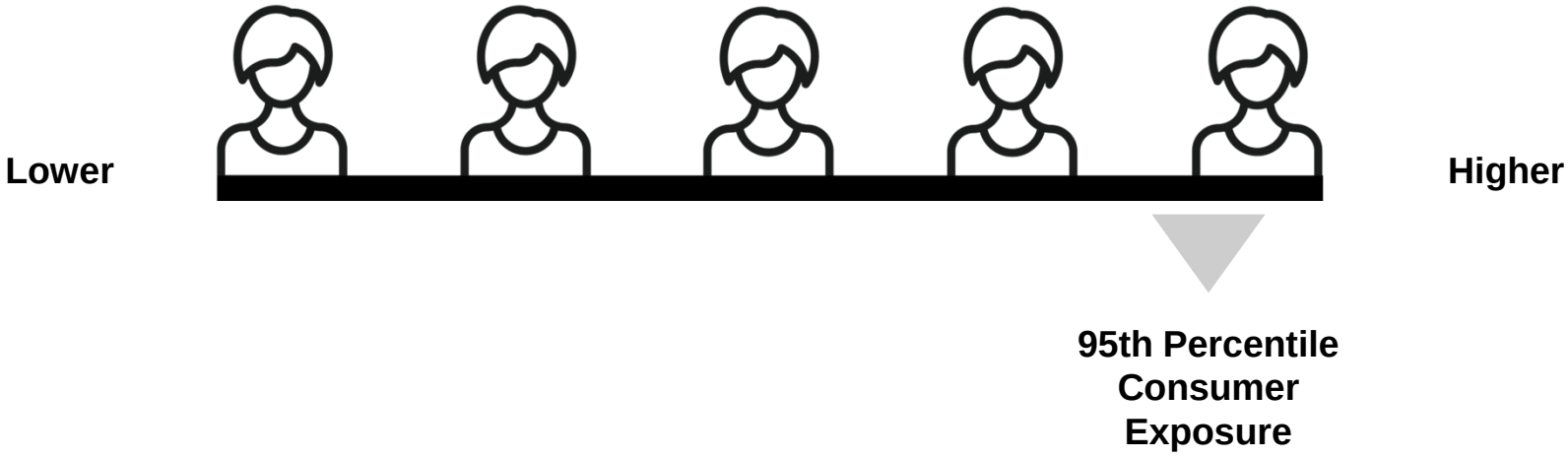
Population Exposure



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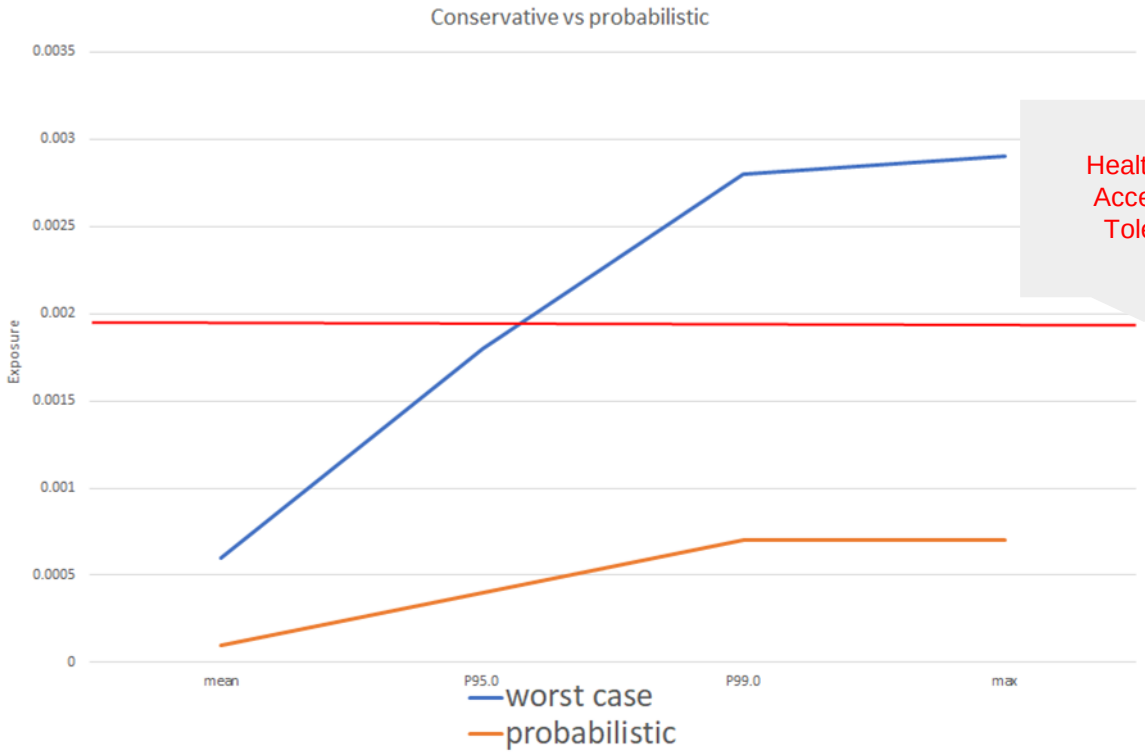
From Worst Case to Probabilistic Exposure Modelling



Health Based Threshold:
Acceptable Daily Intake
Tolerable Daily Intake

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New Product Development and Health Impact

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New Product Development - Impact on Potassium Intakes and Health Outcomes

Population:
consumers 45 years and older, drinking milk

Food/Food Group:
new product, high in potassium

Baseline:
food and nutritional intakes

Scenario:
replacement with new product Impact on population intakes

Impact on Health Parameter:
blood pressure

Dainelli L, Xu T, Li M, Zimmermann D, Fang H, Wu Y, Detzel P. 2017. Cost-effectiveness of milk powder fortified with potassium to decrease blood pressure and prevent cardiovascular events among the adult population in China: a Markov model. BMJ Open [Internet]. 7:e017136. Available from: http://bmjopen.bmj.com/lookup/doi/10.1136/bmjopen-2017-017136

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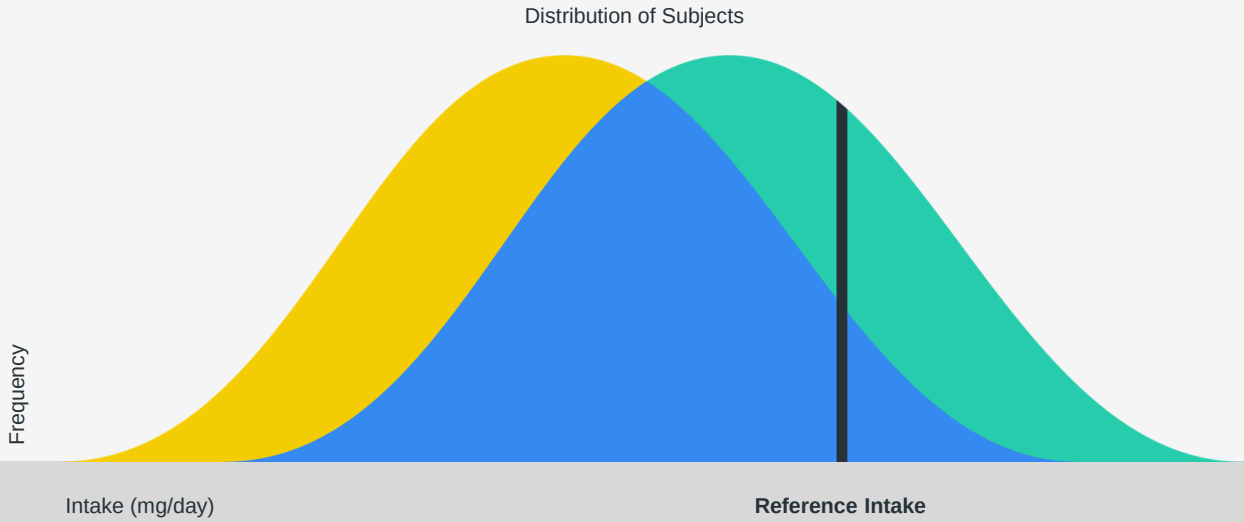
New Product Development - Impact on Potassium Intakes and Health Outcomes

Nutrient Intake before and after Scenario



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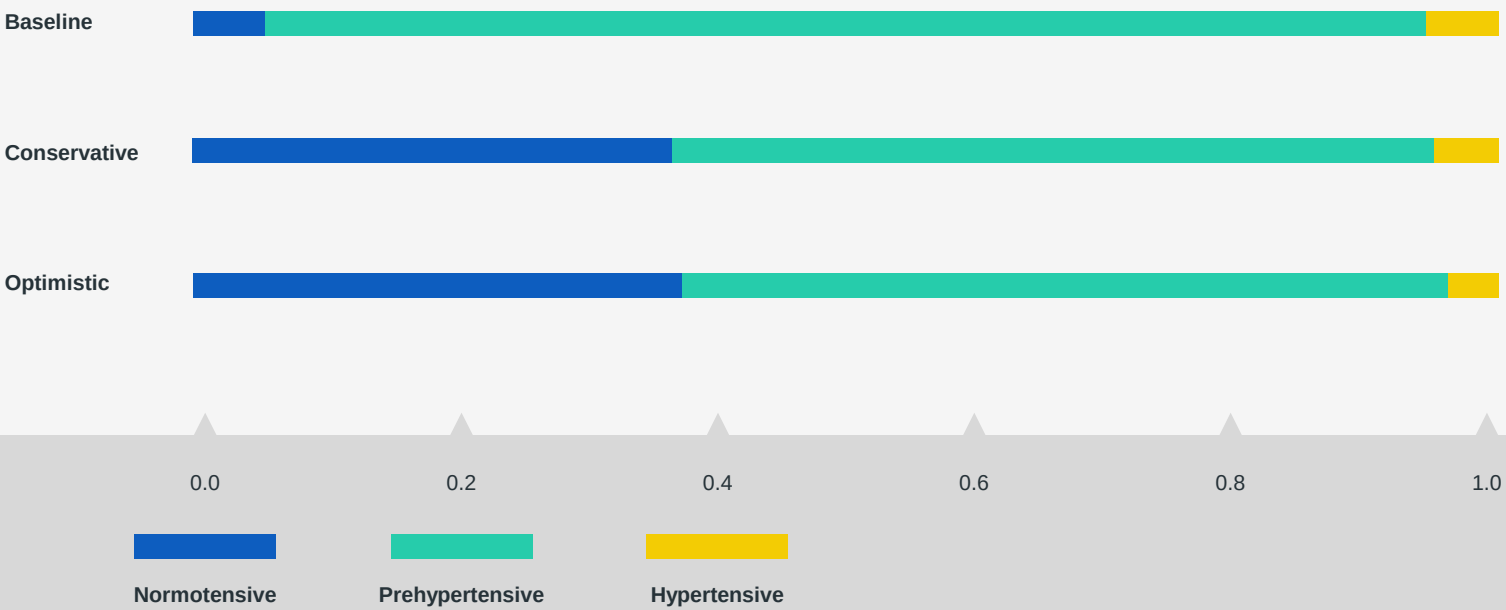
New Products and Predicting Health Outcomes

Impact on SBP in Product Consumers



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Product Stability and Shelf Life - Predictive Modelling

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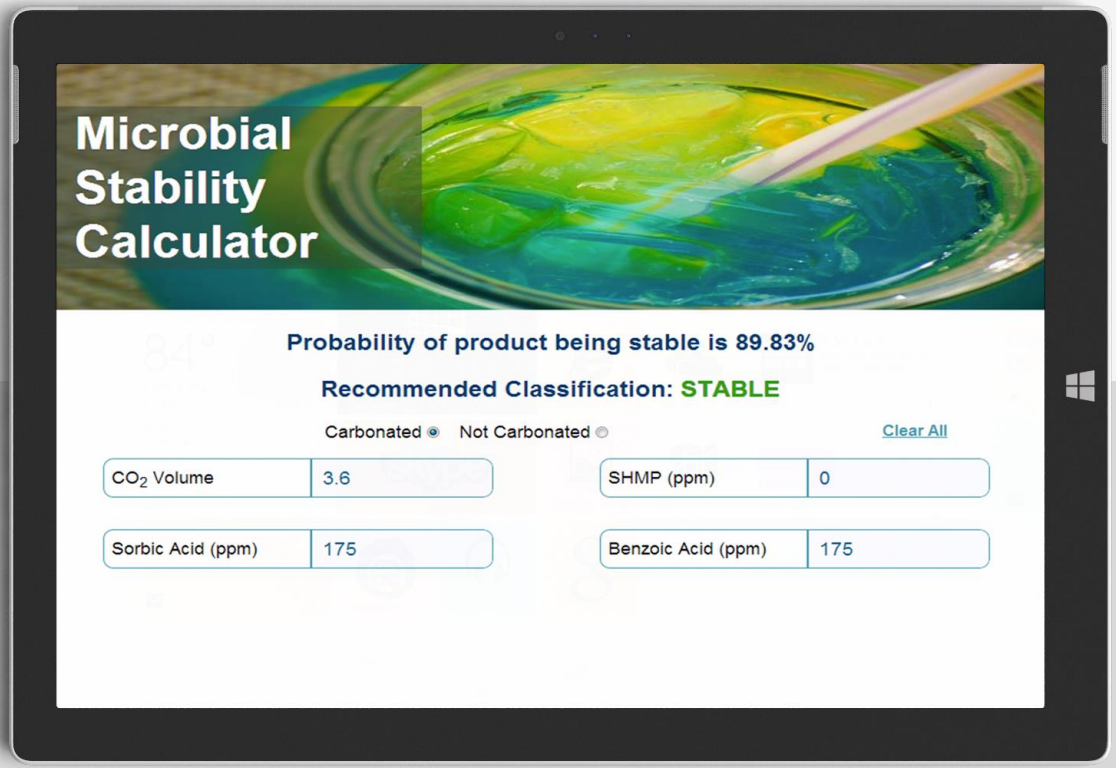
Microbial Stability Calculator



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Development of MSC

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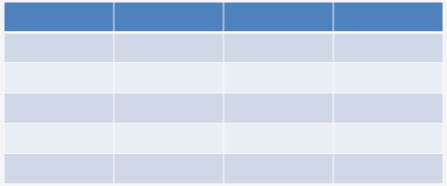
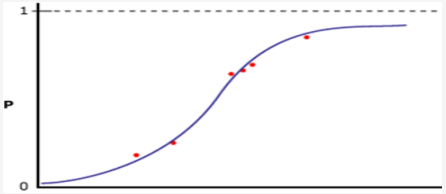


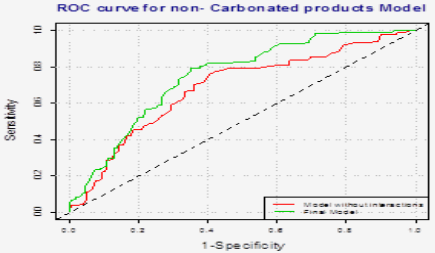
1

Data validation and visualisation



2

Statistical analysis



3

Sensitivity and specificity analysis

4

Software

Public Health Nutrition

Modelling Industry Reformulation Efforts and Population Impacts

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FDI Creme Global Reformulation Project

The Evolution of Food and Drink in Ireland 2005 – 2017

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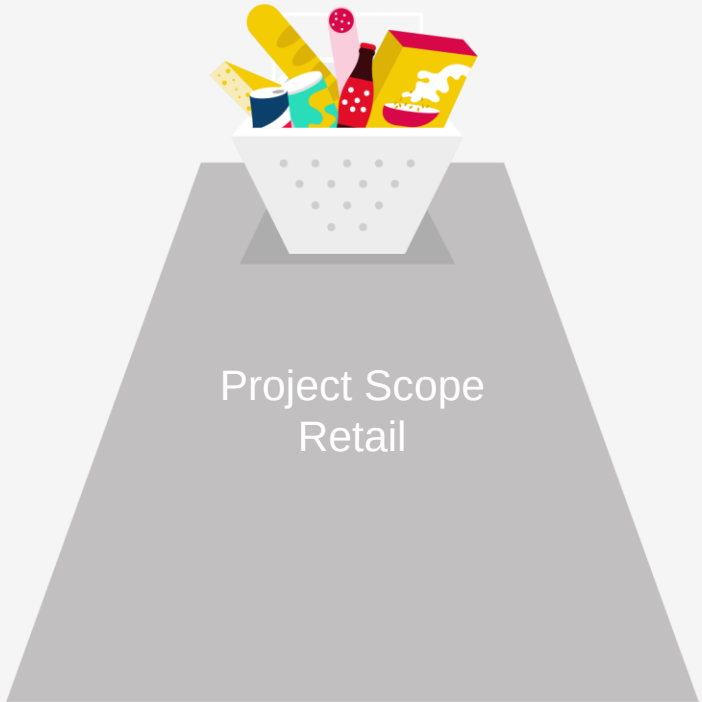
FDI Creme Global Reformulation Project Overview and Methodology

Estimate the impact of reformulation and the introduction of new products on the nutrient intakes of the Irish population.



Surveys Used:

The National Teens' Food Survey (2005 – 2006)
National Children's Food Survey (2003 – 2004)
National Adult Nutrition Survey (2008 – 2010)
National Pre-school Nutrition Survey (2010 – 2011)

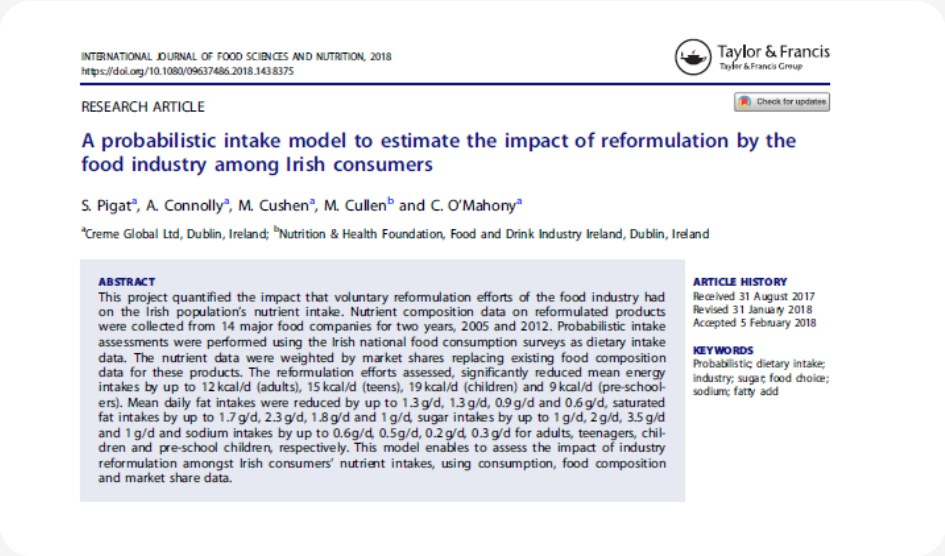
Nutrients:

Sodium
Fat
Saturated Fat
Sugar
Energy

Phase 1

Reformulated Products Only

Directly replaced survey foods – no scope for product choice changing between years.



INTERNATIONAL JOURNAL OF FOOD SCIENCES AND NUTRITION, 2018
https://doi.org/10.1080/09637486.2018.1438375

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

Check for updates

A probabilistic intake model to estimate the impact of reformulation by the food industry among Irish consumers

S. Pigat[a], A. Connolly[a], M. Cushen[a], M. Cullen[b] and C. O'Mahony[a]

[a]Creme Global Ltd, Dublin, Ireland; [b]Nutrition & Health Foundation, Food and Drink Industry Ireland, Dublin, Ireland

ABSTRACT

This project quantified the impact that voluntary reformulation efforts of the food industry had on the Irish population's nutrient intake. Nutrient composition data on reformulated products were collected from 14 major food companies for two years, 2005 and 2012. Probabilistic intake assessments were performed using the Irish national food consumption surveys as dietary intake data. The nutrient data were weighted by market shares replacing existing food composition data for these products. The reformulation efforts assessed, significantly reduced mean energy intakes by up to 12 kcal/d (adults), 15 kcal/d (teens), 19 kcal/d (children) and 9 kcal/d (pre-schoolers). Mean daily fat intakes were reduced by up to 1.3 g/d, 1.3 g/d, 0.9 g/d and 0.6 g/d, saturated fat intakes by up to 1.7 g/d, 2.3 g/d, 1.8 g/d and 1 g/d, sugar intakes by up to 1 g/d, 2 g/d, 3.5 g/d and 1 g/d and sodium intakes by up to 0.6 g/d, 0.5 g/d, 0.2 g/d, 0.3 g/d for adults, teenagers, children and pre-school children, respectively. This model enables to assess the impact of industry reformulation amongst Irish consumers' nutrient intakes, using consumption, food composition and market share data.

ARTICLE HISTORY
Received 31 August 2017
Revised 31 January 2018
Accepted 5 February 2018

KEYWORDS
Probabilistic; dietary intake; industry; sugar; food choice; sodium; fatty acid

Phase 2

Phase 2 uses similar principles to Phase 1 but in addition, Phase 2 takes account of new products and discontinued products

- Consumers' movement away from products popular in 2005 to products popular in 2017.
- Composition of the products changing.
- More data, giving a more holistic view of the market.

Consumer Basket

Data Collection Portal

15

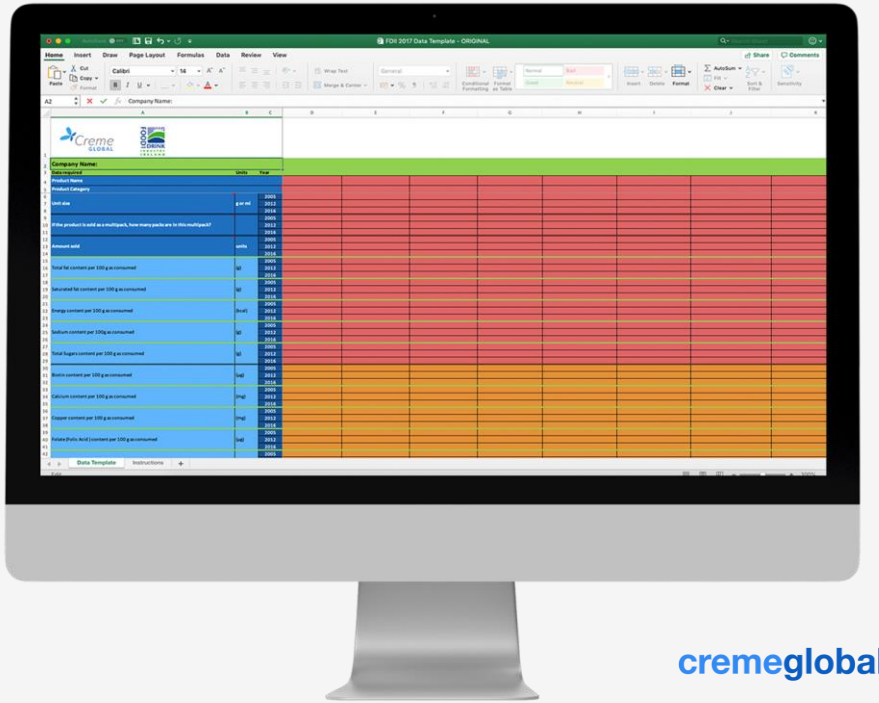
Companies

1,780

Food Products

23,305

Concentration data points collected



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Key Results

Direct reformulation of products on the market in both 2005 and 2017

These figures show the percentage reduction in nutrients from 235 products that were on the market in 2005 and remained on the market in 2017.

Total Fat

0.3%

Saturated Fat

10.1%

Energy

1.6%

Sodium

28.0%

Sugar

8.0%

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Sugar Intake Reductions

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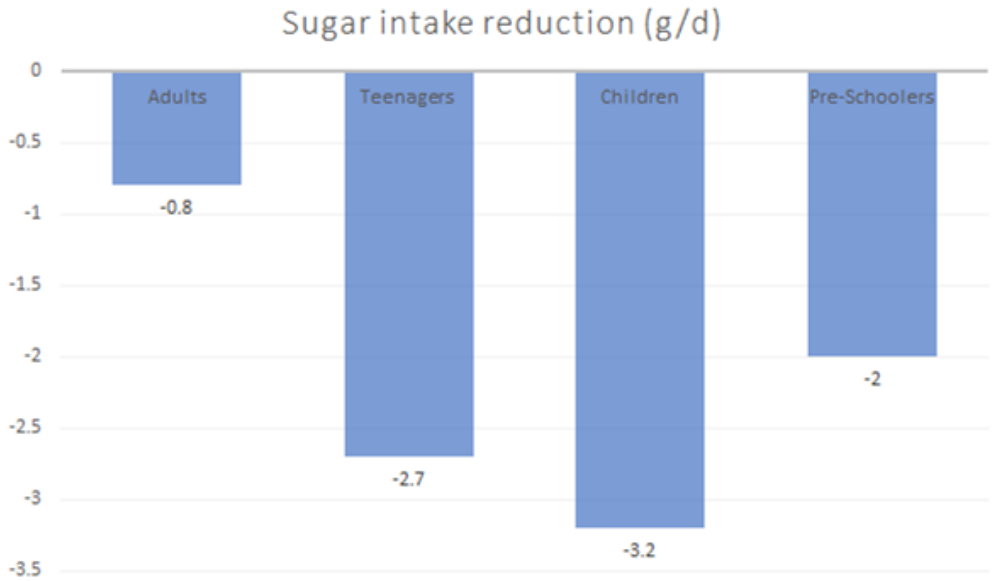
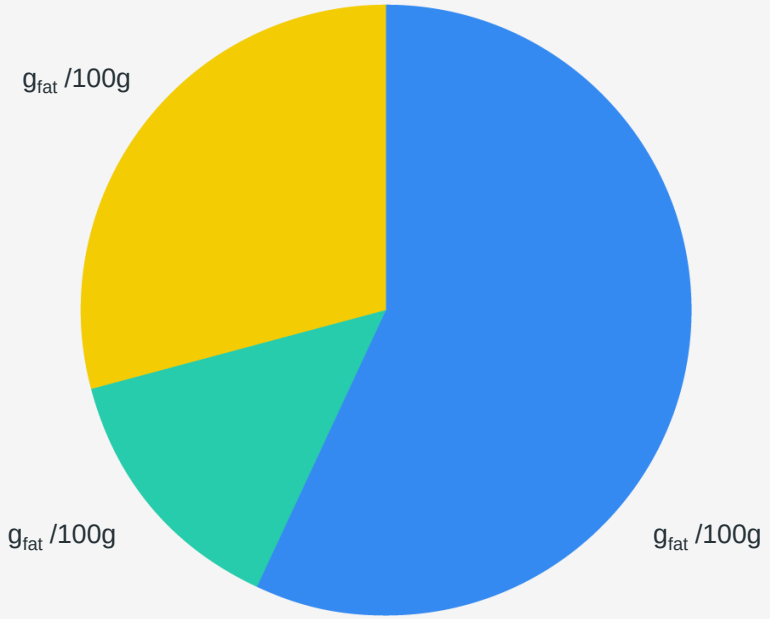


Associating market share with concentration values

2005

Product 1 Product 2 Product 3



Associating market share with concentration values

2017

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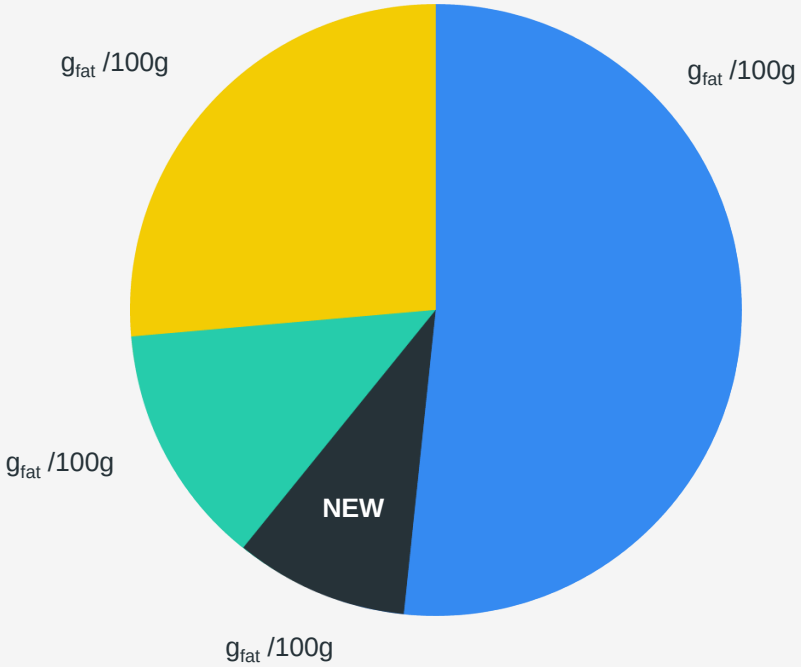
New product enters the market

Product 1 Product 2 Product 3 Product 4



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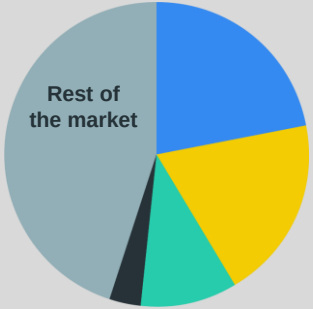
Optimistic Scenario

2005

2017

Conservative Scenario



2005

2017

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Challenges

- Expertise, understand methodologies, opportunities and limitations
- Data availability
- Up-to-date data
- Data quality, acceptability
- Uncertainties

Opportunities

- Using data and models to faster inform product development, consumer health and safety
- Use of technologies and tools
- Use of multidisciplinary capabilities

Thank You.

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