CSO 10th Administrative Data Seminar

10th Dec 2021

University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Linking Irish Dietary Patterns and Nutritional Status Data to Health Outcomes

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Linking food intake data to health outcomes

Food **consumption** data

i.e. what we are habitually eating

Food **composition** data

i.e. nutrient content of food

Health/lifestyle data

BMI, BP, smoking, disease/health outcome

National Nutrition Surveys

Irish Universities Nutrition Alliance (IUNA)

- Development of national databases of dietary intake and health status
- National nutrition surveys of the population from age 1 to 90 years
- Research related to nutrition, public health and food safety
- Support work of agencies responsible for food and nutrition policy and regulation in Ireland and the EU

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Dr Janette Walton (MTU)

Dr Breige McNulty (UCD)

Professor Albert Flynn (UCC)

Dr Laura Kehoe (UCC)

Professor John Kearney (TUDublin)

UCC
University College Cork, Ireland
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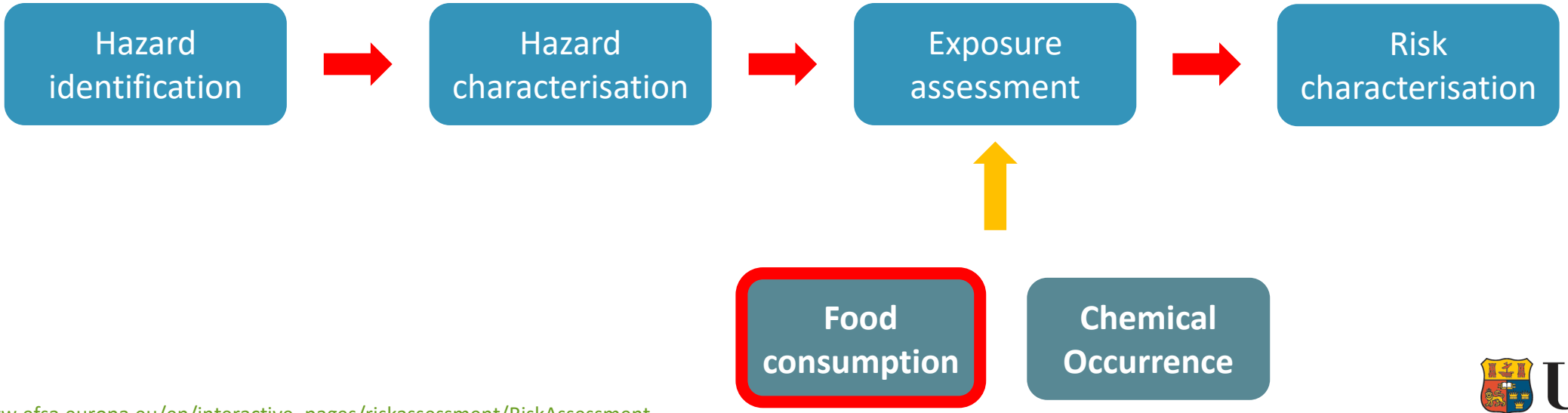
Application of national nutrition surveys

1. Food safety

How exposed are we to risks within the food chain?

- Additives
- Pesticides
- Packaging materials
- Food toxins



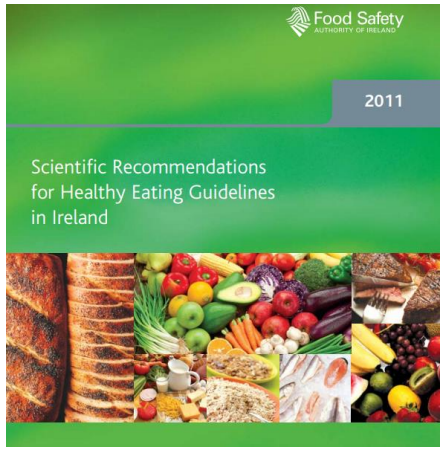
https://www.efsa.europa.eu/en/interactive_pages/riskassessment/RiskAssessment

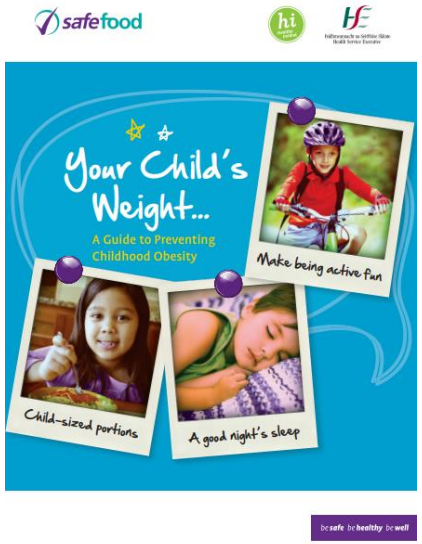
Application of national nutrition surveys

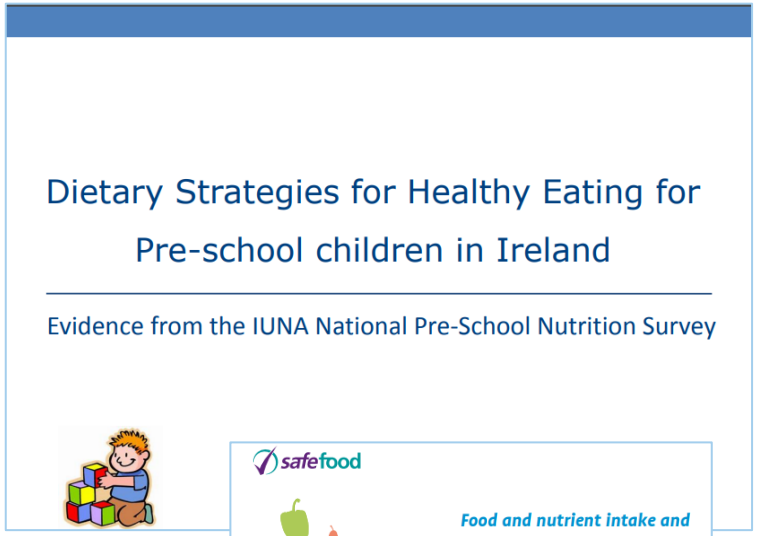
2. Nutrition

What are the dietary habits of a population group?

- Population nutritional status
- Healthy eating guidelines
- Obesity and diet-related diseases
- Efficacy and safety of food fortification & supplement use
- Industry







Dietary assessment method

Weighed food record over ~4 days

Biobanked serum and urine samples

Used to capture **information about the specific eating occasion itself**

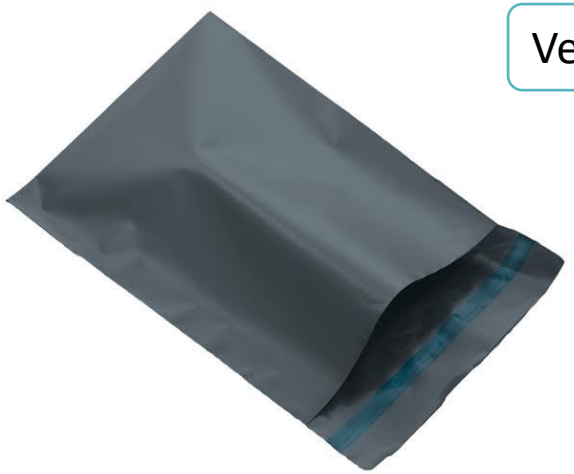
- The day & date
- The time
- The name the participant gave the meal, e.g. breakfast, snack, drink, dinner, supper, etc.
- Where the meal was prepared
- Where the meal was eaten
- Social context
- Self-feeding/fed by caregiver

Food diary template

TODAY'S DATE	DAY (Please circle one)	THIS MEAL IS CALLED	TIME	WHERE MEAL OR SNACK WAS PREPARED	WHERE THE MEAL WAS EATEN	WHO DID THE CHILD EAT THIS MEAL WITH	WHO FED THE CHILD THIS MEAL	OFFICE USE
_____	Mon Tues Wed Thurs Fri Sat Sun	_____ (e.g. snack, drink, lunch)	_____	_____ (e.g. home, crèche)	_____ (e.g. in car, at table, in front of TV)	_____ (e.g. parent, on their own, childminder)	_____ (e.g. self-fed, dad, childminder)	D_____ M_____

CONTAINER TYPE & WEIGHT	DETAILED FOOD OR DRINK DESCRIPTION (Please include brand and cooking method)	AMOUNT OR WEIGHT (g) OF ITEM SERVED	WEIGHT OF CONTAINERS WITH LEFTOVERS	DESCRIPTION OF ANY LEFTOVERS	PACKAGE FOOD WAS IN		QM	Fort
					TYPE	SIZE		
MY 1st EMPTY CONTAINER IS A _____ AND IT WEIGHS _____			MY 1st EMPTY CONTAINER WITH ANY LEFTOVERS WEIGHS _____					
MY 2ndEMPTY CONTAINER IS A _____ AND IT WEIGHS _____			MY 2nd EMPTY CONTAINER WITH ANY LEFTOVERS WEIGHS _____g					
MY 3rdEMPTY CONTAINER IS A _____ AND IT WEIGHS _____			MY 3rd EMPTY CONTAINER WITH ANY LEFTOVERS WEIGHS _____ g					

Food packaging

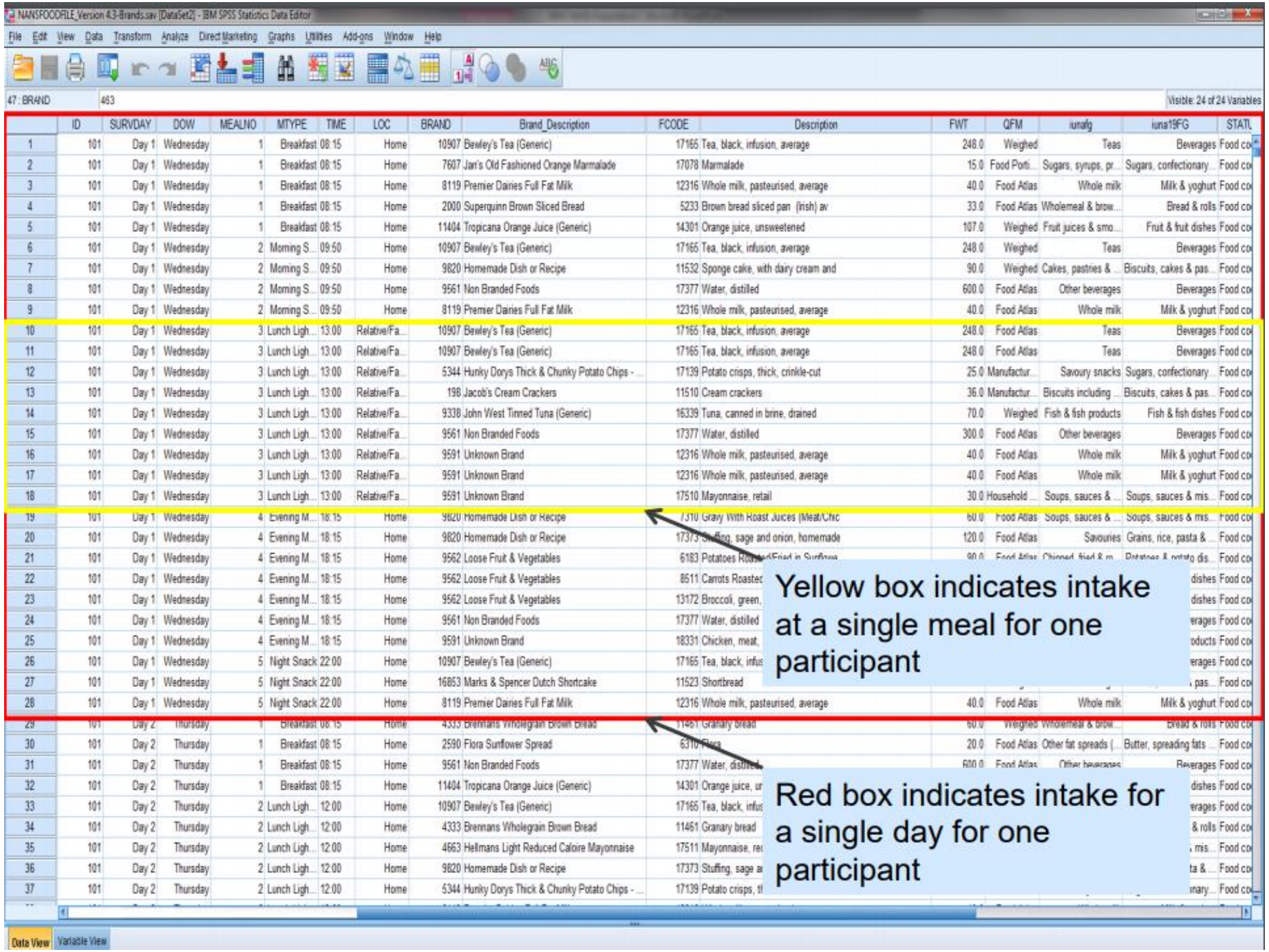


Participants are provided with sealable bags for clean, dry food packaging

Verification of foods consumed

Allows recording of food ingredients

Data on packaging type and migratory chemicals


NANSFOODFILE_Version 4.3-Brands.sav [DataSet2] - IBM SPSS Statistics Data Editor
File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help
47 : BRAND
463
Visible: 24 of 24 Variables
ID SURVDAY DOW MEALNO MTYPE TIME LOC BRAND Brand_Description FCODE Description FWT QFM iunafg iuna19FG STATL
1 101 Day 1 Wednesday 1 Breakfast 08:15 Home 10907 Bewley's Tea (Generic) 17165 Tea, black, infusion, average 248.0 Weighed Teas Beverages Food co
2 101 Day 1 Wednesday 1 Breakfast 08:15 Home 7607 Jan's Old Fashioned Orange Marmalade 17078 Marmalade 15.0 Food Porti... Sugars, syrups, pr... Sugars, confectionary... Food co
3 101 Day 1 Wednesday 1 Breakfast 08:15 Home 8119 Premier Dairies Full Fat Milk 12316 Whole milk, pasteurised, average 40.0 Food Atlas Whole milk Milk & yoghurt Food co
4 101 Day 1 Wednesday 1 Breakfast 08:15 Home 2000 Superquinn Brown Sliced Bread 5233 Brown bread sliced pan (Irish) av 33.0 Food Atlas Wholemeal & brow... Bread & rolls Food co
5 101 Day 1 Wednesday 1 Breakfast 08:15 Home 11404 Tropicana Orange Juice (Generic) 14301 Orange juice, unsweetened 107.0 Weighed Fruit juices & smo... Frut & fruit dishes Food co
6 101 Day 1 Wednesday 2 Morning S... 09:50 Home 10907 Bewley's Tea (Generic) 17165 Tea, black, infusion, average 248.0 Weighed Teas Beverages Food co
7 101 Day 1 Wednesday 2 Morning S... 09:50 Home 9820 Homemade Dish or Recipe 11532 Sponge cake, with dairy cream and 90.0 Weighed Cakes, pastries & ... Biscuits, cakes & pas... Food co
8 101 Day 1 Wednesday 2 Morning S... 09:50 Home 9561 Non Branded Foods 17377 Water, distilled 600.0 Food Atlas Other beverages Beverages Food co
9 101 Day 1 Wednesday 2 Morning S... 09:50 Home 8119 Premier Dairies Full Fat Milk 12316 Whole milk, pasteurised, average 40.0 Food Atlas Whole milk Milk & yoghurt Food co
10 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 10907 Bewley's Tea (Generic) 17165 Tea, black, infusion, average 248.0 Food Atlas Teas Beverages Food co
11 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 10907 Bewley's Tea (Generic) 17165 Tea, black, infusion, average 248.0 Food Atlas Teas Beverages Food co
12 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 5344 Hunky Dorys Thick & Chunky Potato Chips - ... 17139 Potato crisps, thick, crinkle-cut 25.0 Manufactur... Savoury snacks Sugars, confectionary... Food co
13 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 198 Jacob's Cream Crackers 11510 Cream crackers 36.0 Manufactur... Biscuits including ... Biscuits, cakes & pas... Food co
14 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 9338 John West Tinned Tuna (Generic) 16339 Tuna, canned in brine, drained 70.0 Weighed Fish & fish products Fish & fish dishes Food co
15 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 9561 Non Branded Foods 17377 Water, distilled 300.0 Food Atlas Other beverages Beverages Food co
16 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 9591 Unknown Brand 12316 Whole milk, pasteurised, average 40.0 Food Atlas Whole milk Milk & yoghurt Food co
17 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 9591 Unknown Brand 12316 Whole milk, pasteurised, average 40.0 Food Atlas Whole milk Milk & yoghurt Food co
18 101 Day 1 Wednesday 3 Lunch Ligh... 13:00 Relative/Fa... 9591 Unknown Brand 17510 Mayonnaise, retail 30.0 Household ... Soups, sauces & ... Soups, sauces & mis... Food co
19 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9820 Homemade Dish or Recipe 7310 Gravy With Roast Juices (Meat/Chic 60.0 Food Atlas Soups, sauces & ... Soups, sauces & mis... Food co
20 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9820 Homemade Dish or Recipe 17373 Stuffing, sage and onion, homemade 120.0 Food Atlas Savouries Grains, rice, pasta & ... Food co
21 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9562 Loose Fruit & Vegetables 6183 Potatoes Roast/Fried in Sunflowe... 90.0 Food Atlas Chipped, fried & m... Potatoes & potato dis... Food co
22 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9562 Loose Fruit & Vegetables 8511 Carrots Roasted dishes Food co
23 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9562 Loose Fruit & Vegetables 13172 Broccoli, green, dishes Food co
24 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9561 Non Branded Foods 17377 Water, distilled erages Food co
25 101 Day 1 Wednesday 4 Evening M... 18:15 Home 9591 Unknown Brand 18331 Chicken, meat, oducts Food co
26 101 Day 1 Wednesday 5 Night Snack 22:00 Home 10907 Bewley's Tea (Generic) 17165 Tea, black, infus erages Food co
27 101 Day 1 Wednesday 5 Night Snack 22:00 Home 16853 Marks & Spencer Dutch Shortcake 11523 Shortbread pas... Food co
28 101 Day 1 Wednesday 5 Night Snack 22:00 Home 8119 Premier Dairies Full Fat Milk 12316 Whole milk, pasteurised, average 40.0 Food Atlas Whole milk Milk & yoghurt Food co
29 101 Day 2 Thursday 1 Breakfast 08:15 Home 4333 Brennans Wholegrain Brown Bread 11461 Granary bread 60.0 Weighed Wholemeal & brow... Bread & rolls Food co
30 101 Day 2 Thursday 1 Breakfast 08:15 Home 2590 Flora Sunflower Spread 6310 Flora 20.0 Food Atlas Other fat spreads (... Butter, spreading fats Food co
31 101 Day 2 Thursday 1 Breakfast 08:15 Home 9561 Non Branded Foods 17377 Water, distilled 600.0 Food Atlas Other beverages Beverages Food co
32 101 Day 2 Thursday 1 Breakfast 08:15 Home 11404 Tropicana Orange Juice (Generic) 14301 Orange juice, ur dishes Food co
33 101 Day 2 Thursday 2 Lunch Ligh... 12:00 Home 10907 Bewley's Tea (Generic) 17165 Tea, black, infus erages Food co
34 101 Day 2 Thursday 2 Lunch Ligh... 12:00 Home 4333 Brennans Wholegrain Brown Bread 11461 Granary bread & rolls Food co
35 101 Day 2 Thursday 2 Lunch Ligh... 12:00 Home 4663 Hellmans Light Reduced Calorie Mayonnaise 17511 Mayonnaise, re mis... Food co
36 101 Day 2 Thursday 2 Lunch Ligh... 12:00 Home 9820 Homemade Dish or Recipe 17373 Stuffing, sage a ta &... Food co
37 101 Day 2 Thursday 2 Lunch Ligh... 12:00 Home 5344 Hunky Dorys Thick & Chunky Potato Chips - ... 17139 Potato crisps, t nary... Food co
Yellow box indicates intake at a single meal for one participant
Red box indicates intake for a single day for one participant
Data View
Variable View

Linking food intake data to health outcomes

Food **consumption** data

i.e. what we are habitually eating

Food **composition** data

i.e. nutrient content of food

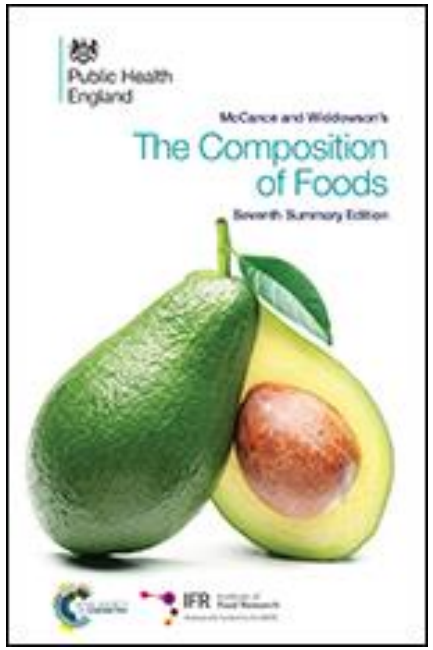
Health/lifestyle data

BMI, BP, smoking, disease/health outcome

Converting food intake to nutrient intake

Amount of food consumed	×	Nutrient composition of food	=	Daily nutrient intake from food
(g/d)		(kcal/100g)		(kcal/d)

UK food composition data



supplemented with Irish data

EuroFIR
European Food Information Resource

Linking food intake data to health outcomes

Food **consumption** data

i.e. what we are habitually eating

Food **composition** data

i.e. nutrient content of food

Health/lifestyle data

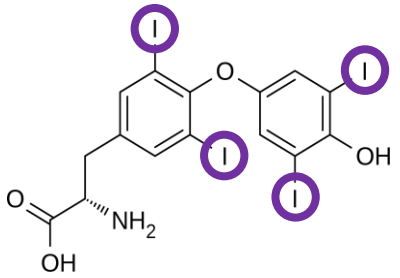
BMI, BP, smoking, disease/health outcome

Case study: Iodine status in Irish women

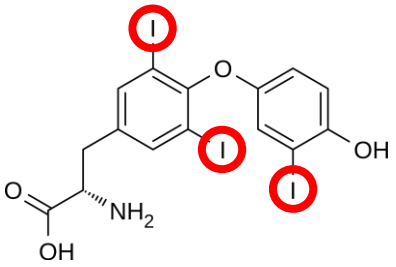
Background

Iodine is an essential component of **thyroid hormone synthesis**.

Globally, it is estimated that **1.88 billion individuals** have inadequate iodine intake. [1]



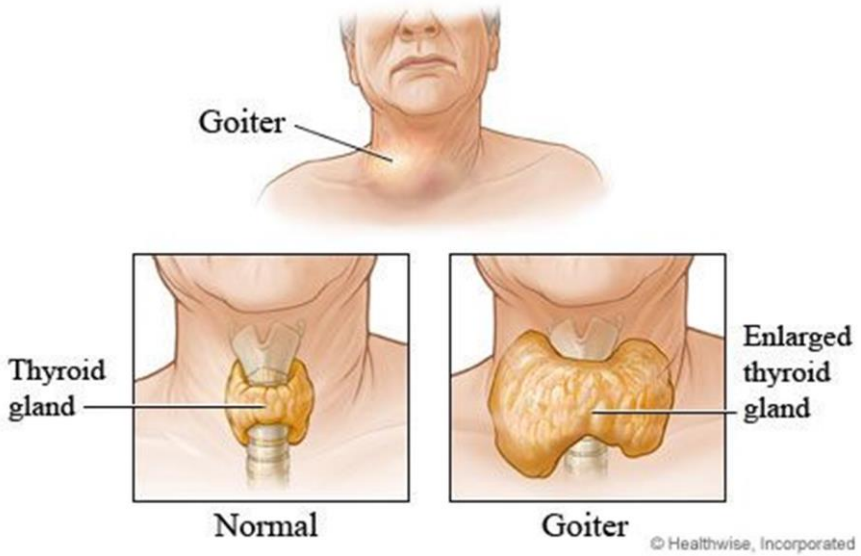
Thyroxine (T4)



Triiodothyronine (T3)

The spectrum of iodine deficiency disorders

Life stage	Effects
Foetus	Abortions Stillbirths Congenital anomalies Increased perinatal mortality Increased infant mortality Neurological cretinism: mental deficiency, deaf mutism, spastic diplegia, and squint Myxedematous cretinism: mental deficiency and dwarfism Psychomotor defects
Neonate	Neonatal goitre Neonatal hypothyroidism
Child and Adolescent	Goitre Juvenile hypothyroidism Impaired mental function Retarded physical development
Adult	Goitre with its complications Hypothyroidism Impaired mental function



High risk populations

- Pregnant women
- Breastfeeding women
- Women of reproductive age
- Children < 3y

1. WHO (2006)

Consequences of iodine deficiency

Pregnant women and infants

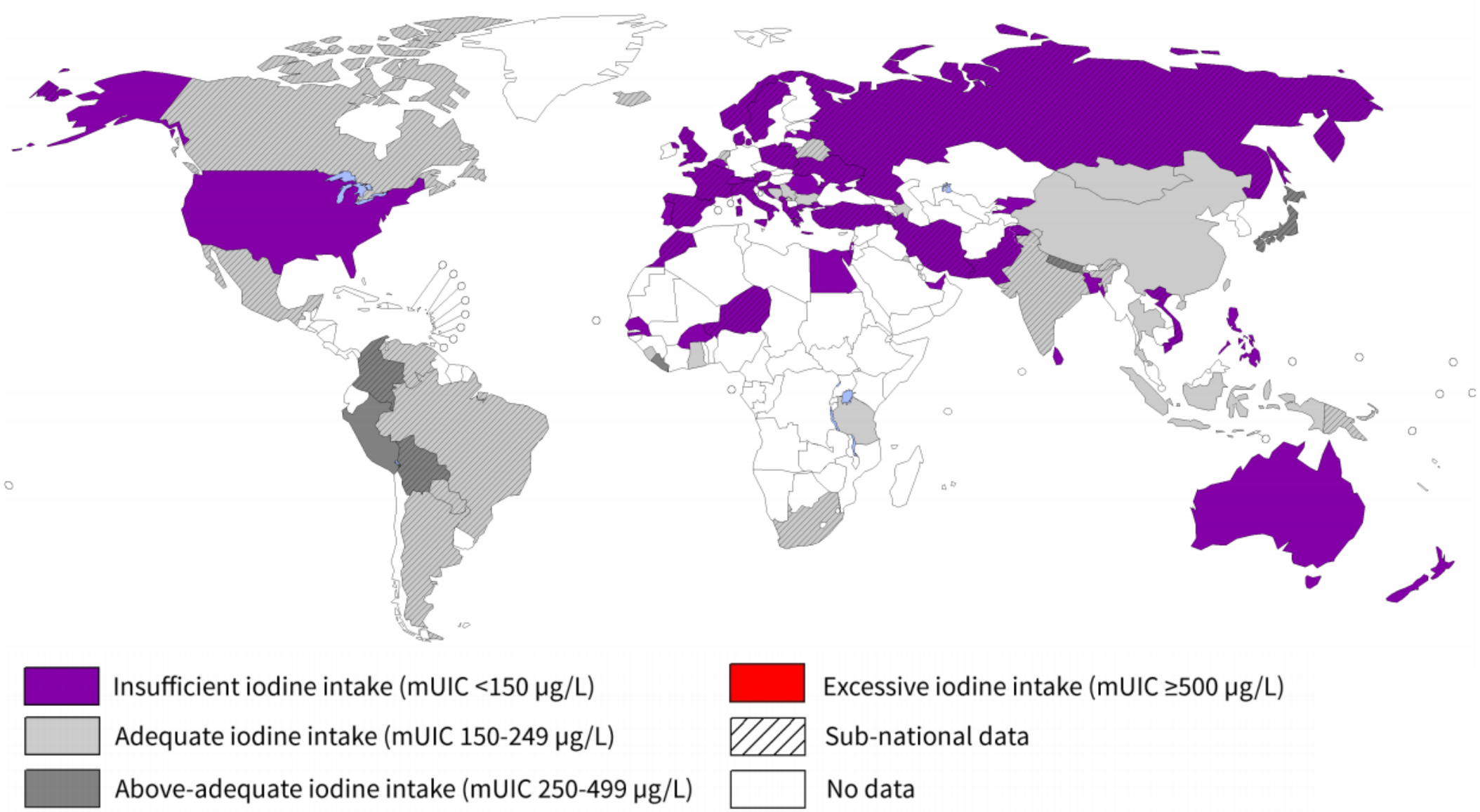
Severe iodine deficiency in pregnancy can result in:

- Maternal and fetal hypothyroidism
- Increased risk of pregnancy loss
- Impaired infant growth
- Infant neurologic and cognitive deficits
- Cretinism

The magnitude of the consequences is dependent on the **timing** and **severity** of the deficiency.

While severe iodine deficiency is well-characterised, the effects of mild-to-moderate deficiency are less clear

Insufficient iodine status in pregnant women based on median UIC



Gizak *et al*. (2018) Poster at Nutrition 2018, the American Society for Nutrition Annual Conference

Three key challenges

1. Lack of a biomarker of individual iodine status

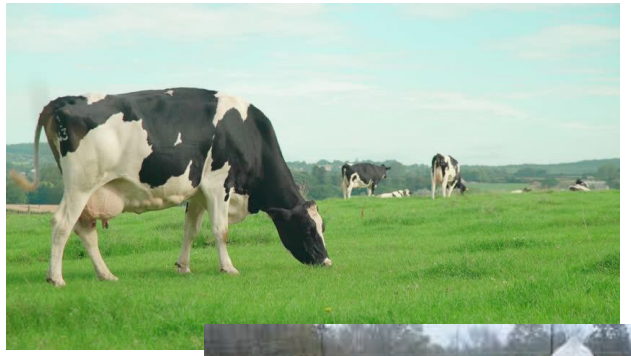
Median urinary iodine concentration (UIC)

- most commonly used indicator at a *population level*
- typically sampled in *school-children* to determine population status
- heavily influenced by day-to-day variation in water and protein intakes
    - Therefore *inappropriate for assessment of individual status*

Can thyroid hormones be used as a proxy indicator of iodine status?

2. Difficulty in obtaining reliable estimates of iodine intake

Considerable variability in iodine food composition



Use of iodine-fortified feeds in winter

European Journal of Clinical Nutrition
https://doi.org/10.1038/s41430-017-0030-9

ARTICLE

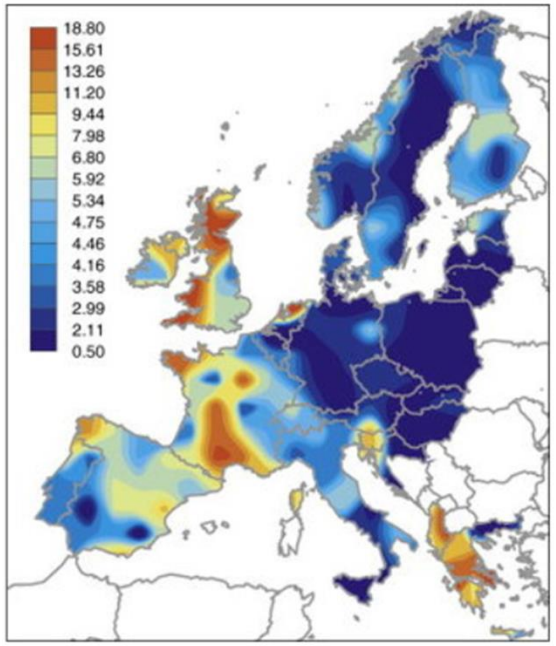
Variation in iodine food composition data has a major impact on estimates of iodine intake in young children

Áine Hennessy[1,2] · Carol ní Chaoimh[1,2] · Elaine K. McCarthy[1,2] · Ciara Kingston[1] · Alan D. Irvine[3,4,5] · Jonathan O'B. Hourihane[2,6] · Louise C. Kenny[2,7] · Deirdre M. Murray[2,6] · Mairead Kiely[1,2]

Variability in food composition has a large impact on assessments of iodine intake, particularly among young children for whom milk contributes a large proportion of their daily nutrient intake.

Other sources of variability

Use of iodine-containing teat disinfectants during milking



Variability in soil iodine content

Particular concern when milk is destined for infant milk formula.

Recent data from Teagasc have shown that 28% of farm supplies had milk iodine levels above the limit of 100mg/kg set out for milk destined for infant milk formula.

3. Relationship between maternal iodine status and infant neurodevelopment

Implications of severe iodine deficiency are well recognised and described; but the benefits of correcting *mild-to-moderate iodine deficiency* are less clear due to a lack of RCTs

- *Which specific neurodevelopmental domains?*
- *To what extent?*

Case study: Iodine status in Irish women
Data from NANS 2008-2010

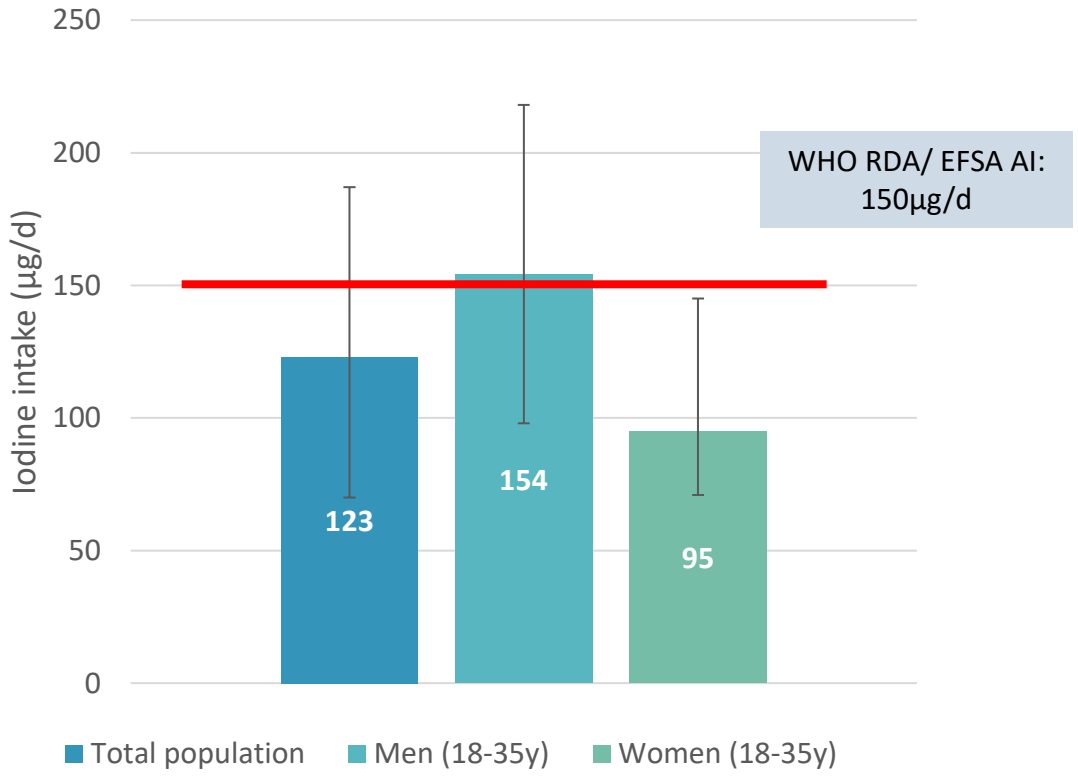
Iodine intake and status in Irish women using national nutrition survey data

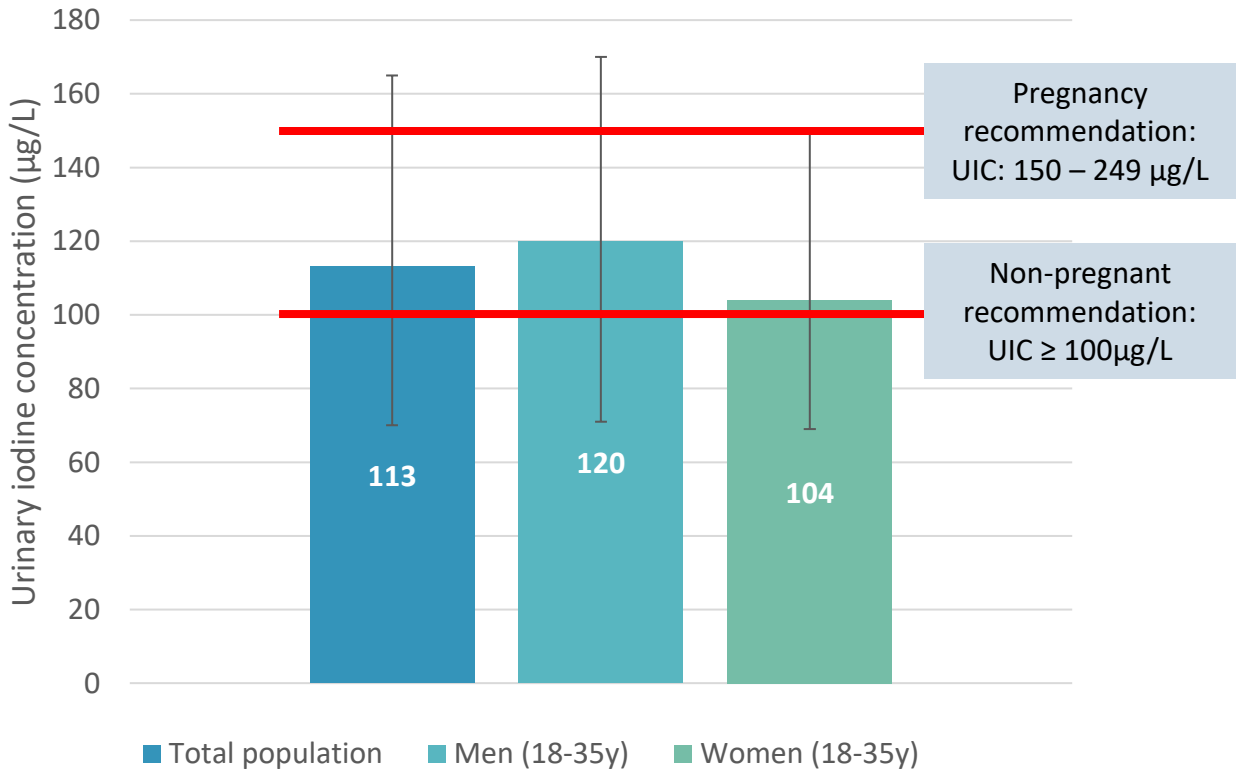
British Journal of Nutrition (2017), 117, 422–431
doi:10.1017/S0007114516004347

Iodine intakes and status in Irish adults: is there cause for concern?

Breige A. McNulty[1]*, Anne P. Nugent[1], Janette Walton[2], Albert Flynn[2], Christina Tlustos[3] and Michael J. Gibney[1]

[1]UCD Institute of Food and Health, University College Dublin, Belfield, Dublin 4, Republic of Ireland
[2]School of Food and Nutritional Sciences, University College Cork, Cork, Republic of Ireland
[3]Food Safety Authority of Ireland, Abbey Court, Lower Abbey Street, Dublin 1, Republic of Ireland





- 65% of Irish women of childbearing age are not getting enough iodine from their diet.
- When the pregnancy reference value is applied, 77% of women do not meet it.

Source of iodine in Irish women of childbearing age

Dairy [3]

54% of daily intake

Fish

6%

Eggs

6%

< 5% of salt sold in Ireland [4]

3. McNulty *et al*. (2017) *Br J Nutr* **117**, 422-431.
4. Lazarus & Smyth (2008) *Lancet* **372**, 888.

Iodine status in pregnant women in Ireland?

Nawoor *et al* (2006)

Women attending the National Maternity Hospital (n = 54)

Summer (n = 36); Winter (n = 18)

55% deficient in summer, 23% deficient in winter.

Responding to gaps in iodine nutrition research

Science Foundation Ireland For what's next

In the absence of a biomarker of individual iodine status, can thyroid hormones (± urinary iodine concentration and dietary intake), be used to identify women at risk of iodine deficiency and suboptimal neurodevelopmental outcomes in their infants?

Infant
Irish Centre for Maternal and Child Health Research

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh | School of Food and Nutritional Sciences

Science Foundation Ireland Starting Investigator Research Grant

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh

Iodine status in pregnant women in Ireland?

SEVENTH FRAMEWORK PROGRAMME

IMPROVED

- Conducting large scale investigation of iodine status in early pregnancy (n=1,510)

Can thyroid hormones be used as a proxy indicator of iodine status?

- Evaluate the relationship between maternal **thyroid hormone status** and maternal urinary iodine concentration in early pregnancy

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COMBINE Assessments

Day 2 | 1 month | 2 months | 4 months | 6 months | 9 months | 12 months | 18 months | 24 months

Anthropometry
All Visits

Questionnaires
All Visits

Blood samples
Birth, 12 & 24 months

Body composition

Day 2 – 4 months

Maternal attachment & postnatal depression

2 months

Visual Habituation

4 – 9 months

12 & 24 months

Bayleys III

12 – 24 months

MacArthur Bates CDI

18 & 24 months

BABYSCREEN APP, Child Behaviour Checklist & Greenspan Social Emotional and Adaptive Behaviour

Types of Questionnaires

Early Life Environment
Baby's Health
Baby's Nutrition
Eating Behaviour
Nutritional Supplements
Vaccinations
Sun Exposure
Sleeping patterns

Relationship between maternal iodine status and infant neurodevelopment?

SEVENTH FRAMEWORK PROGRAMME

IMPROvED

Maternal UIC related to maternal Tg in early gestation?

Science Foundation Ireland sfi For what's next

Combine

Related to indices of neurodevelopment at 12, 18 and 24 months?

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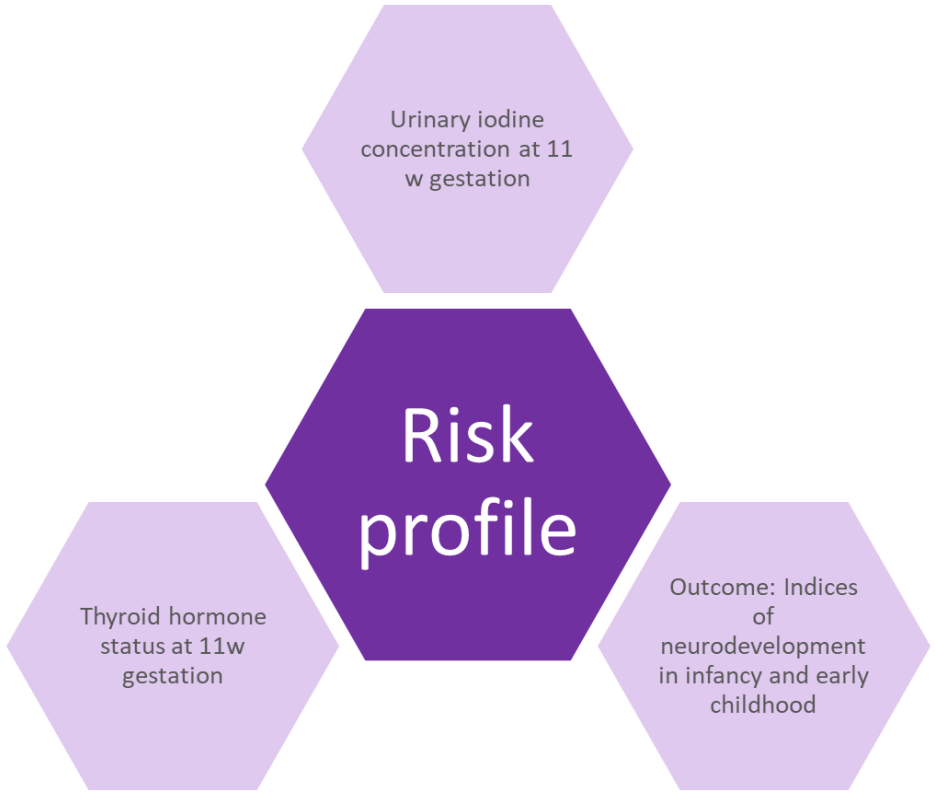
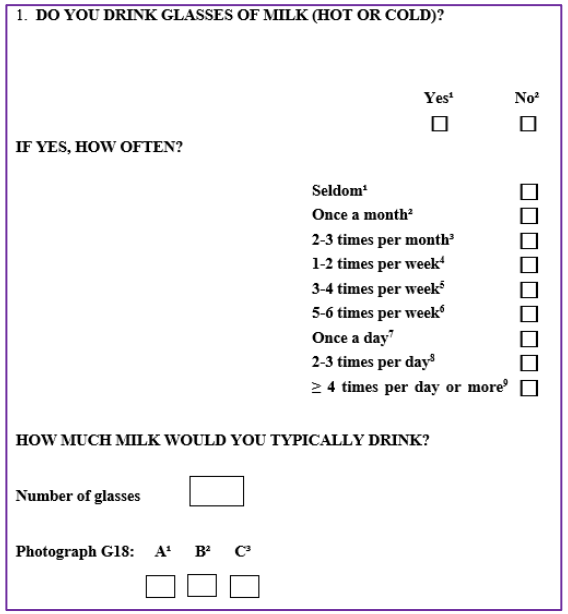
Key impacts of this project



Predictive model using clinically validated health outcomes

Thyroid hormones as a proxy biomarker of iodine status?

Trimester-specific normative reference ranges



1. **DO YOU DRINK GLASSES OF MILK (HOT OR COLD)?**

	Yes[1]	No[2]
	☐	☐

IF YES, HOW OFTEN?

Seldom[1]	☐
Once a month[2]	☐
2-3 times per month[3]	☐
1-2 times per week[4]	☐
3-4 times per week[5]	☐
5-6 times per week[6]	☐
Once a day[7]	☐
2-3 times per day[8]	☐
≥ 4 times per day or more[9]	☐

HOW MUCH MILK WOULD YOU TYPICALLY DRINK?

Number of glasses ☐

Photograph G18: A[1] B[2] C[3] ☐ ☐ ☐

Reliable screening tool to assess iodine intake

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A TRADITION OF INDEPENDENT THINKING

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Thank you

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