



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

17F231 - National Teen's Food Consumption Survey II

Final Report

This project was funded under the Department of
Agriculture, Food and the Marine Competitive Funding
Programme.

SUMMARY

In this three-year collaborative project, a national dietary survey was conducted in teenagers aged 13-18 years in Ireland. The objective of the survey was to establish a comprehensive database of food consumption, lifestyle and health status in teenagers. The data were analysed to assess compliance of food and nutrient intakes with dietary recommendations, the prevalence of overweight and obesity, physical activity patterns and factors affecting food choice and eating behaviour. In addition, urine samples have been analysed to assess salt intake and blood samples analysed to assess vitamin D, iron and folate status. The main findings were presented at an online stakeholder workshop held in June 2021. Reports and scientific papers have been finalised and detailed data are published at www.iuna.net.

The database is designed to facilitate estimation of food and nutrient intakes and exposures to a range of food chemicals, including pesticides, additives and contaminants. It will be an important resource for government agencies concerned with developing healthy eating guidelines and obesity prevention and with food safety risk assessment. It will also be used to guide new product development and product reformulation in the Irish food industry.

Key findings include:

- Intakes of fruit and vegetables are low, average intake of less than 3 servings a day, well below the recommended 5-7-a-day.
- Intakes of sugar, salt and saturated fat are higher than recommended.
- Most adolescents are getting sufficient vitamins and minerals, but significant numbers have inadequate intakes of vitamin D, calcium, vitamin C, folate, vitamin A, riboflavin and vitamin B6.
- Recent dietary changes include reduced intake of milk, potatoes, fruit juice and sugar-sweetened drinks, and increased intake of pasta, rice and savouries, fruit and water.
- Nearly one in four adolescents are classified as overweight or obese, with levels being higher than the previous survey.

KEYWORDS

dietary survey, teenagers.

ACRONYM

NTFC II

PROJECT COORDINATOR, INSTITUTION

Dr Breige McNulty, University College Dublin.

EMAIL

breige.mcnulty@ucd.ie

COLLABORATORS, INSTITUTION

Prof Albert Flynn, University College Cork.

Dr John Kearney, Technological University Dublin.

Dr Janette Walton, Cork Institute of Technology.

PUBLICATION DATE

July 2022

Section 1 - Research Approach & Results

Start Date

01 November 2018

End Date

31 December 2021

Research Programme

Food Institutional Research Measure

TRL Scale

TRL 6: Technology demonstrated in relevant environment

NRPE Priority area

Food for Health

Total DAFM Award

€1,325,007.00

Total Project Expenditure

€1,129,522.00

Rationale for undertaking the Research

The overall objective of the survey was to establish a comprehensive nationally representative database of food consumption, lifestyle and health status in teenagers aged 13-18 years in the Republic of Ireland (ROI). These updates the 2005-06 data for this group and complements more recent data on preschool children, school children and adults. The project also aimed to analyse the new data to assess status of diet, lifestyle and health in teenagers aged 13-18 years, including compliance of food and nutrient intakes with dietary recommendations, the prevalence of overweight and obesity, physical activity patterns and factors affecting food choice and eating behaviour. In addition, data collection aimed to facilitate the updating of the extensive IUNA databases, including nutrient composition of foods and to compile data and restructure databases for future assessment of exposure to food ingredients, chemicals, packaging materials, residues, contaminants, allergens, bioactives and microorganisms.

The ROI database is designed to address both nutrition and food safety issues of relevance to the development and implementation of public health policy, food safety risk assessment and to the needs of the food industry. The data provide science-based food and nutrition policy advice for governmental agencies for development of healthy eating guidelines and obesity prevention in teenagers. They will underpin new product development and promotion and guide food reformulation by the Irish food industry. They will also support the role of the governmental agencies to carry out food safety risk assessments, foodborne disease outbreak investigations and food crisis management, and nutritional safety assessment.

Methodology

In this three-year collaborative project (UCC, UCD, TU Dublin, MTU) a national dietary survey was conducted in 428 teenagers aged 13-18 years in Ireland. Data on food consumption were collected in a representative sample of teenagers aged 13-18 years (n 428) in the Republic of Ireland using a 4-day food record (semi-weighed). The study also collected data on body weight, lifestyle, including physical activity, determinants of food choice, urine, biofluids and composition of foods and food recipes.

Food composition databases were updated and restructured to facilitate future analyses of exposure to food ingredients, packaging materials, residues, contaminants, allergens, bioactives and microorganisms. Urine samples were stored to facilitate future analyses of nutrition and metabolic indicators, markers of food intake and for estimating exposure to food chemicals.

Data were analysed to estimate intakes of foods and nutrients and compliance with dietary recommendations, to establish the prevalence of overweight and obesity, to investigate physical activity patterns and compliance with guidelines, to identify psychological, social and attitudinal determinants of food choice and eating behaviour. Salt intake was estimated from urine excretion and blood samples were analysed to assess vitamin D, iron and folate status. Findings were disseminated to relevant stakeholders.

Project Results

A national food consumption database for teenagers aged 13-18 years (n=428) in the Republic of Ireland was established. The electronic database contains data for a nationally representative sample of 428 teenagers, balanced by season, on food and nutrient intakes, anthropometric measurements, health and lifestyle, physical activity and food choice and eating behaviour. The project has also further developed the complementary IUNA databases on foods and their composition for nutrients, ingredients, additives, and packaging. A first void morning urine sample was collected from 96% of teenagers and a blood sample was collected from 57% of teenagers.

The food consumption database, together with the complementary IUNA databases, is designed to facilitate estimation of food and nutrient intakes and exposures to a range of food chemicals, including pesticides, additives and contaminants. It is an important resource for government agencies concerned with developing healthy eating guidelines and obesity prevention and with food safety risk assessment. It will also be used to guide new product development and product reformulation and health-oriented marketing in the Irish food industry.

The data were analysed to assess compliance of food and nutrient intakes with dietary recommendations, the prevalence of overweight and obesity, physical activity patterns and factors affecting food choice and eating behaviour. In addition, urine have been analysed to assess salt intake and blood samples to assess vitamin D, iron and folate status. The main findings were presented at a stakeholder workshop in June 2021. Reports and scientific papers have been finalised. A summary and final report and detailed data are published at www.iuna.net.

Key findings include:

- Intakes of fruit and vegetables are low, average intake of less than 3 servings a day, well below the recommended 5-7-a-day.
- Intakes of sugar, salt and saturated fat are higher than recommended.
- Most adolescents are getting sufficient vitamins and minerals, but significant numbers have inadequate intakes of vitamin D, calcium, vitamin C, folate, vitamin A, riboflavin and vitamin B6.
- Recent dietary changes include reduced intake of milk, potatoes, fruit juice and sugar-sweetened drinks, and increased intake of pasta, rice and savouries, fruit and water.
- Nearly one in four adolescents are classified as overweight or obese, with levels being higher than the previous survey.

Section 2 - Research Outputs

Summary of Project Findings

Food industry:

The research provides new scientific knowledge to underpin new food product development and promotion by the Irish food industry and to assess impact of food reformulation on dietary intakes in the population. The project PIs and researchers have on-going active engagement with the food industry and provide relevant data from the project to support the needs of the Irish Food industry and food industry bodies. These include Glanbia, Kelloggs, Danone, Atlantia Clinical Trials, FDII, Nutrition and Health Foundation, National Dairy Council, Beverage Council of Ireland, FHI-Food for Health Ireland, Meat Technology Ireland.

Regulatory authorities/policy makers:

The research provides new data for science-based food and nutrition policy advice for national and EU agencies required for development of national nutrition policy and healthy eating guidelines and food safety risk assessment. The project PIs and researchers have on-going active engagement with regulatory authorities and policy makers and provide relevant data from the project to a range of stakeholders to inform policy making at national and EU level, including DAFM, FSAI, Saferood, HSE, DoHC, EFSA. Policy issues addressed include healthy eating guidelines, salt and saturated fat reduction programmes, obesity prevention, safety of nutritional supplements, reformulation, exposure to food additives and contaminants.

Scientific community:

The research has resulted in a significant output of research papers that have been published in international journals in addition to many published conference abstracts and contributions (national and international). These have made important contributions to scientific knowledge in this field. The anonymised research data are available for sharing with other researchers outside the project consortium.

Benefit for Irish society /citizens:

This research has provided evidence to support policy makers, health care professionals and the food industry to help inform and promote good dietary habits.

Summary of Staff Outputs

Research Output	Male	Female	Total Number
PhD Students	0	5	5
Post Doctorates	0	4	4
MSc Students	0	2	2
Research Technicians/ Assistants	0	2	2

Summary of Academic Outputs

Research Outputs	Total Number	Details
Peer Reviewed Conference Papers	10	<ol style="list-style-type: none"> 1. Daly, A., O'Sullivan, E., McNulty, B., Walton, J., & Kearney, J. (2020). Age, sex & BMI are associated with different eating behaviour styles in Irish teens. Proceedings of the Nutrition Society, 79(OCE2), E351. doi:10.1017/S0029665120002992 (13th European Nutrition Conference, FENS 2019, 15–18 October 2019, Malnutrition in an Obese World: European Perspectives) 2. Kent, G., Kehoe, L., McCarthy, R., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2021). Characterising the plant-based component of the Irish diet in terms of its micronutrient content. Proceedings of the Nutrition Society, 80(OCE1), E20. doi:10.1017/S0029665121000215 (Nutrition Society - Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty) 3. Heslin, A., Walton, J., Flynn, A., Kearney, J., & McNulty, B. (2021). Percentage body fat and metabolic health in Irish adolescents – preliminary analysis from the National Teens' Food Survey II. Proceedings of the Nutrition Society, 80(OCE3), E121. doi:10.1017/S0029665121002445 (Irish Section Conference, 22–24 June 2021, Nutrition, health and ageing — translating science into practice) 4. Kirwan, L., Nugent, A., Walton, J., Flynn, A., & McNulty, B. (2021). What's the score? Adaptation of probability of adequate nutrient intake scores to the National Adult

		<p>Nutrition Survey database using European reference values. Proceedings of the Nutrition Society, 80(OCE3), E128. doi:10.1017/S0029665121002512 (Nutrition Society - Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty)</p> <p>5. Rusu, I., Kehoe, L., Buffini, M., Kearney, J., McNulty, B., Flynn, A., & Walton, J. (2021). The role of breakfast in the diets of school-aged children (5–12Y) in Ireland. Proceedings of the Nutrition Society, 80(OCE1), E38. doi:10.1017/S0029665121000392 (Nutrition Society - Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty)</p> <p>6. Daly AN, O'Sullivan EJ, Kearney JM. Considerations for health and food choice in adolescents. Proc Nutr Soc. 2022 Mar;81(1):75-86. doi: 10.1017/S0029665121003827. (Nutrition Society - Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty)</p> <p>7. Kent, G., Kehoe, L., McCarthy, R., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2021). Characterising the plant based component of the Irish diet in terms of its micronutrient content. Proceedings of the Nutrition Society, 80(OCE1), E20. doi:10.1017/S0029665121000215 (Nutrition Society - Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty)</p> <p>8. Rusu, I., Kehoe, L., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2020). The role of breakfast in the diets of Irish adults (18–90y). Proceedings of the Nutrition Society, 79(OCE2), E458. doi:10.1017/S0029665120004061 (13th European Nutrition Conference, FENS 2019, 15–18 October 2019, Malnutrition in an Obese World: European Perspectives)</p> <p>9. O'Mahony, A., Kehoe, L., O'Sullivan, E., Nugent, A., McNulty, B., Flynn, A., & Walton, J. (2021). Macronutrients, dietary fibre and salt intake and compliance with recommendations in women of child-bearing age (WCBA) (18–50y) in Ireland. Proceedings of the Nutrition Society, 80(OCE5), E215. doi:10.1017/S0029665121003438 (Nutrition Society Summer Conference, 6–8 July 2021, Nutrition in a changing world)</p> <p>10. Kent, G., Kehoe, L., Flynn, A., & Walton, J. (2022). Plant-based diets: A review of the definitions and nutritional role in the adult diet. Proceedings of the Nutrition Society, 81(1), 62-74. doi:10.1017/S0029665121003839 (Nutrition Society Conference on Nutrition, health and ageing – translating science into practice)</p>
Publications in Peer Reviewed Scientific Journals	3	<p>1. Kirwan LB, Walton J, Flynn A, Nugent AP, McNulty BA. An Evaluation of Probability of Adequate Nutrient Intake (PANDiet) Scores as a Diet Quality Metric in Irish National Food Consumption Data. Nutrients. 2022 Feb 26;14(5):994. doi: 10.3390/nu14050994. PMID: 35267969; PMCID: PMC8912666.</p> <p>2. Kent G, Kehoe L, Flynn A & Walton J (2021) Plant-based diets: a review of the definitions and nutritional role in the adult diet. Proceedings of the Nutrition Society, 1-13. doi:10.1017/S0029665121003839</p> <p>3. Daly, A., O'Sullivan, E., Walton, J., McNulty, B., & Kearney, J. (2021). Eating behaviour styles in Irish teens: A cross-sectional study. Public Health Nutrition, 24(8), 2144-2152. doi:10.1017/S1368980020003055</p>
PhD Theses	5	<p>1. Laura Kirwan - Building an Evidence Base for Sustainable Diets in the Irish population (2022)</p> <p>2. Aoibhin Moore Heslin - Association of dietary quality with adiposity and inflammatory biomarkers in Irish adolescents. (2023)</p> <p>3. Grainne Kent: Plant-based diets in the Irish population (2022)</p> <p>4. Ioana Rusu: Dietary quality of the Irish population and influence of eating location (2022)</p> <p>5. Aisling Daly – Eating Behaviours in Irish Teenagers (2022)</p>
Masters Theses	1	<p>Abigail O'Mahony: Nutrient intakes, compliance with recommendations and key sources in women of child-bearing age (18-50y) in Ireland Dietary intake of women of child-bearing age in Ireland (2022)</p>
Training Courses	47	<p>1. Epigeum Research Integrity Course (Online) - Breige McNulty - July 2018</p> <p>2. Epigeum Human subjects protections (online) - Breige McNulty - July 2018</p> <p>3. Epigeum Research Integrity Course (Online) - Albert Flynn - July 2019</p> <p>4. Epigeum Research Integrity Course (Online) - John Kierney - Dec 2019</p> <p>5. Epigeum Research Integrity Course (Online) – Janette Walton – Dec 2019</p> <p>6. Epigeum Research Integrity Course (Online) – Ioana Rusu – Dec 2019</p> <p>7. Epigeum Research Integrity Course (Online) – Grainne Kent – Dec 2019</p> <p>8. Epigeum Research Integrity Course (Online) – Laura Kehoe – July 2020</p> <p>9. Epigeum Research Integrity Course (Online) – Abigail O'Mahony – July 2020</p>

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10. Epigeum Research Integrity Course (Online) – Stephanie Rahil – July 2020
 11. Epigeum Research Integrity Course (Online) – Laura Kirwan – June 2020
 12. Epigeum Research Integrity Course (Online) – Aoibhin Moore Heslin – June 2020

Ioana Rusu

13. CIT – Research Ethics in QUestionnaIRE Design (Dec 2019)
14. CIT STAT9006 Data Analysis with R – Ioana Rusu (Jan-Mar 2020)
15. UCC UW1201 Global Sustainable Development: Interdisciplinary Perspectives (Jan-April 2020)
16. UCC IT MicroSessions - Online (Oct 2020)
17. Nutrition Society (Online) Systematic Reviews: how to perform and interpret (Oct 2020)
18. MTU Research Skills Development (Oct – Dec 2020)

Grainne Kent

19. CIT – Research Ethics in QUestionnaIRE Design (Dec 2019)
20. UCC FS6634 – Leadership for Agri-Food Research Students (Feb 2020)
21. UCC IT MicroSessions - Online (Oct 2020)
22. UCC - PG6003 Teaching and Learning for Graduate Studies (Oct 2020 – April 2021)
23. MTU 0 Research Skills Development (Oct - Dec 2020)

Abigail O'Mahony

24. CIT – Research Ethics in QUestionnaIRE Design (Dec 2019)
25. UCC IT MicroSessions - Online (Oct 2020)

Laura Kirwan

26. UCD FDSC40670 - PhD Skills (Jan-Jun 2019)
27. UCD STAT40740 - Multivariate Analysis (Jan-Jun 2019)
28. UCD FDSC50060 Advanced Statistics in RStudio Module (Sept-Dec 2020)
29. UCD FDSC50010 Effective Leadership and Management Skills Module (Sept-Dec 2020)
30. UCD PHPS40860 Economics and Management Module (Sept-Dec 2020)
31. Graduate Studies Workshop: Presenting your Research with Confidence (Dec 2020)
32. European Science Diplomacy Online Course (Jun 2020)
33. UCD FDSC50020 Media Skills Agriculture & Food (Jan - May 2021)
34. UCD FDSC50050 Science Writing and Presentation Skills (Jan - May 2021)

Aoibhin Moore Heslin

35. UCD FDSC50060 Advanced Statistics in RStudio Module (Sept-Dec 2020)
36. UCD FDSC50050 Science Writing and Presenting Skills (Feb 2020)
37. UCD FDSC50040 Statistical Analysis Research (Jun 2020)
38. Managing Your PhD (Jan 2020)
39. UCD FDSC50060 Advanced Statistics (Autumn 2020) UCD PHPS40460
40. Biostatistics II (Spring 2021)

Aisling Daly

41. TUD - GRSO1001 Research Methods (Autumn 2020)
42. TUD - GRSO1012 Research Integrity (Spring 2020)
43. TUD - THEDH1001 Teaching in Higher Education (Spring 2021)
44. TUD - LAW9201 Going Dark: Law Enforcement in a Cyber Environment (Spring 2021)
45. UCD - PHPS40460 Biostatistics (Spring 2019)
46. TUD - FCFS9002 9002 Transitions across the Lifespan (Autumn 2020)
47. TUD - GRSO1011 Information Retrieval & Literature Reviews (Spring 2020)

National Reports

2

1. Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II Summary Report
2. Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II - Main Report

Both available at www.iuna.net

Pending Publications: Publications in Peer reviewed Scientific Journals	12	<ol style="list-style-type: none"> 1. Aoibhín Moore Heslin, Aisling O’Donnell, Laura Kehoe, Janette Walton, Albert Flynn, John Kearney, Breige McNulty. (2022) Adolescent overweight and obesity in Ireland - trends and socio-demographic influences between 1990 and 2020. <i>International Journal of Obesity</i>. (In preparation) 2. Aoibhín Moore Heslin, Aisling O’Donnell, Laura Kehoe, Janette Walton, Albert Flynn, John Kearney, Breige McNulty. (2023) Assessment of the quality of dietary intake amongst Irish adolescents and relationships with body composition and metabolic health. <i>International Journal of Obesity</i>. (In preparation) 3. O’Donnell, A., Kehoe, L., Nugent, A., Kearney, J., Walton, J., Flynn, A., McNulty, B. (2022). Dietary fat intakes in Irish teenagers: changes between 2005 and 2020. <i>European Journal of Nutrition</i>. (In preparation) 4. O’Donnell, A., Kehoe, L., Nugent, A., Kearney, J., Walton, J., Flynn, A., McNulty, B. (2022). An investigation into physical activity levels, sedentary behaviour and screen time usage in the Irish population. <i>European Journal of Nutrition</i> (In preparation) 5. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). Assessment of the environmental impact of food consumption in Ireland - informing a transition to more sustainable diets. <i>Nutrients</i>. (In preparation) 6. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). An economic analysis of food consumption and implications for the transition to sustainable diets in Ireland. <i>European Journal of Nutrition</i> (In preparation) 7. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). Modelling healthy and sustainable diets in Ireland. <i>European Journal of Nutrition</i> (In preparation) 8. Grainne Kent, Laura Kehoe, Breige A McNulty, Anne P Nugent, Albert Flynn & Janette Walton (2022) A standardised methodological approach for characterising the plant-based component of population or individual diets. <i>Journal of Food Composition and Analysis</i> (Under Review). 9. Kevin D Cashman, Laura Kehoe, John Kearney, Breige A McNulty, Janette Walton & Albert Flynn (2022) Adequacy of calcium and vitamin D in a nationally representative sample of Irish teenagers aged 13-18 years. <i>European Journal of Nutrition</i> (Under review). 10. Laura Kehoe, Albert Flynn, John Kearney, Breige A McNulty & Janette Walton (2022) Food and nutrient intakes and compliance with recommendations in teenagers in Ireland: Findings from the National Teens’ Food Survey II (2019-20) and changes since 2005-06. <i>Nutrients</i> (in preparation). 11. Maeve L O’Connell, Stephanie O’Regan, Emma O’Sullivan, Maria Buffini, John Kearney, Breige A McNulty, Albert Flynn, Janette Walton & Laura Kehoe (2022) Development of the National Children’s Food Survey II and National Teens’ Food Survey II Dietary Supplement Databases. <i>Journal of Food Composition and Analysis</i> (in preparation). 12. Laura Kehoe, Breige A McNulty, John Kearney, Albert Flynn & Janette Walton (2022) Updating of the Irish Food Composition Database: 2017 – 2022. <i>Journal of Food Composition and Analysis</i> (in preparation).
Pending publication: Peer reviewed Conference Papers	6	<ol style="list-style-type: none"> 1. Cliodhna McGowan, Emma O’Sullivan, Laura Kehoe, Breige A. McNulty, John M Kearney, Albert Flynn, Janette Walton. (2022) Intakes and sources of dietary fibre in a nationally representative sample of teenagers (13-18 years) in Ireland. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society. 2. Emma O’Sullivan, Maeve L O’Connell, Stephanie O’Regan, Maria Buffini, John M Kearney, Breige A McNulty, Albert Flynn, Janette Walton, Laura Kehoe (2022). Characterising the food supplements consumed by children and teenagers in Ireland. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society. 3. Niamh M Walsh, Janette Walton, John M Kearney, Breige A McNulty, Albert Flynn, Laura Kehoe (2022) Micronutrient intakes in a nationally representative sample of teenagers (13-18 years) in Ireland: prevalence of inadequate intakes and risk of excess. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society. 4. A. Moore Heslin, A. O’Donnell, L. Kehoe, J. Walton, A. Flynn, J. Kearney, B.A. McNulty. (2022) Socio-demographic and environmental factors associated with adolescent overweight and obesity in Ireland – preliminary analysis from the National Teen’s Food Survey II. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.

5. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney, and Breige A. McNulty. (2022). An evaluation of the probability of adequate nutrient intake (PANDiet) and nutrient rich diet (NRD) scoring systems as metrics of diet quality for sustainable diet research in the Irish population. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.
6. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney, Breige A. McNulty (2022) An economic analysis of food consumption and implications for the transition to sustainable diets in Ireland. Submitted to the International Congress of Nutrition for publication in Ann Nutr Metab.

Open access journal or repository	1	INDI article: Walton J, Flynn A & Kehoe L. (2021) Diet, lifestyle and body weight of Irish teenagers – current status and changes over time. Nutrition & Dietetic Review. 6(4):15-18
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Intellectual Property

The project has established new Databases for the NTFsII that the partners hold. A Consortium agreement and data management plan govern the use of new knowledge generated in the project and plan for preserving and sharing the data. The data management plan provides for preserving the data and for other organisations to access the data in order to maximize the benefits of knowledge transfer and commercialisation for Ireland. Access to the anonymised research data, together with appropriate documentation, is available for sharing and informed use by the scientific and academic community and for policy purposes. Access to IP for commercial use for the benefit of Ireland is by way of the granting of non-exclusive IP licence (s) on fair commercial terms.

Summary of other Project Outputs

Project Outputs	Details	Total Number
New Technology	Recipe database: This project has updated the Recipe Database that contains a collection of customised recipes compiled since 1997. The composition data for these recipes are essential in analysing the nutrient intake of the Irish population, while details on the individual ingredients making up the recipes are needed for updating of the Food Classification Database and the Raw Commodities Database	1

Potential Impact related to Policy, Practice and Other Impacts

Impact	Details
Socio-Economic	This project has resulted in further development and exploitation of the IUNA state of the art national databases of food consumption and food composition. These data provide Irish industry with a key resource for product development and product promotion and as an evidence base to support their nutrition and health orientated marketing, including investigating the dietary roles of foods, intakes of nutrients and bioactive constituents, risk-benefit of food fortification and nutritional supplements, relationship of food and nutrient intake to body weight and health, exposure assessment to food additives. NTFSII database - Database for the National Teens' Food Survey - nationally representative data on food consumption in teenagers aged 13-18 years designed to address both nutrition and food safety issues of relevance to the development and implementation of public health policy, food safety risk assessment and to the needs of the food industry. This research project has further developed the complementary IUNA database on foods and their composition.
Socio-Economic	Irish Food Composition database for nutrients: This project has updated the Irish Food Composition Database for nutrients (Black et al., 2011). This contains data on energy and macro- and micronutrients for Irish foods and recipes for composite dishes (both restaurant and home cooked foods), reformulated foods, nutrient supplements, fortified foods, and foods for young children. It also contains nutrient composition data for UK from McCance & Widdowson's 'Composition of Foods'. It is a key resource for estimation of intakes of a wide range of nutrients from foods, including fortified foods and food supplements.
Socio-Economic	Recipe database: This project has updated the Recipe Database that contains a collection of customised recipes compiled since 1997. The composition data for these recipes are essential in analysing the nutrient intake of the Irish population, while details on the individual ingredients making up the recipes are needed for updating of the Food Classification Database and the Raw Commodities Database
Socio-Economic	National report: Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II - Summary Report Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II - Main Report Both available at www.iuna.net .

Dissemination Activities

Activity	Details
Workshops at which results were presented	<p>Stakeholder Workshop:</p> <p>The main findings were presented at a online stakeholder workshop on 10th June 2021. Dr Janette Walton presented, 'National Teens' Food Survey II: Applications & Methods'. Dr Laura Kehoe presented 'What are Irish teenagers eating? Current intakes and changes over time' and Dr Breige McNulty presented 'Body Weight & Lifestyle of Irish teenagers: Current status and changes over time'. There were approximately 100 attendees including academic researchers, industry members, key stakeholders and media personnel. Key stakeholders in attendance included the FSAI, DAFM, DOH, HSE and Saferood, food industry. Both slides and recording on the workshop are available at www.iuna.net.</p>
Seminars at which results were presented	<ol style="list-style-type: none"> 1. Gráinne Kent delivered a presentation and conference abstract 'Characterising the plant-based component of the Irish diet in terms of its nutritional quality' at the Federation of European Nutrition Societies Conference (October 2019). 2. Amy Fahy delivered a presentation and conference abstract 'Dietary determinants of iron intake in women of child-bearing age (WCBA) (18-50y) in Ireland' at the Federation of European Nutrition Societies Conference (October 2019). 3. Ioana Rusu delivered a presentation and conference abstract 'The role of breakfast in the diets of Irish adults' at the Federation of European Nutrition Societies Conference (October 2019). 4. Laura Kehoe delivered a presentation and conference abstract 'The role of fortified foods and nutritional supplements in the diets of older Irish adults' at the Federation of European Nutrition Societies Conference (October 2019). 5. Aisling Daly delivered a presentation and conference abstract 'Age, sex & BMI are associated with different eating behaviour styles in Irish teen' at the Nutrition Society Irish Section Summer Conference (June 2020). 6. Aoibhin Moore Heslin delivered a presentation and conference abstract 'Percentage body fat and metabolic health in Irish adolescents – preliminary analysis from the National Teens' Food Survey II' at the Nutrition Society Irish Section Summer Conference (June 2021). 7. Laura Kirwan delivered a presentation and conference abstract 'What's the score? Adaptation of probability of adequate nutrient intake scores to the National Adult Nutrition Survey database using European reference values at the Nutrition Society Irish Section Summer Conference (June 2021). 8. Iona Rusu delivered a presentation and conference abstract 'The role of breakfast in the diets of school aged children (5–12Y) in Ireland' at the Nutrition Society Irish Section Summer Conference (June 2021). 9. Aisling Daly delivered a presentation and conference abstract 'Eating behaviour styles in Irish teens: A cross-sectional study' at the Nutrition Society Irish Section Summer Conference (June 2021). 10. Aisling Daly delivered a presentation and conference abstract 'Eating behaviour styles in Irish teens: A cross-sectional study' at the Nutrition Society Irish Section Summer Conference (June 2021). 11. Grainne Kent delivered a presentation and conference abstract ' Plant-based diets: A review of the definitions and nutritional role in the adult diet' at the Nutrition Society Irish Section Summer Conference (June 2021). 12. Aisling Daly delivered a presentation and conference abstract 'Considerations for health and food choice in adolescents' at the Nutrition Society Irish Section Winter Conference (December 2021). 13. Laura Kirwan delivered a presentation and conference abstract 'Preliminary environmental analyses of Irish adult food consumption data to facilitate a transition to sustainable diets' at the Nutrition Society Irish Section Winter Conference (December 2021). 14. Breige McNulty presented twice at the UCD Institute of Food and Health -Nutrition and Health Public Lecture series - Adolescents Nutrition - What is important? June 2020 & January 2022 www.ucd.ie/foodandhealth/eventsoutreach/foodandhealthpubliclectures/ 15. Janette Walton presented at an online webinar - NutriPD community Dietary Survey Research in Ireland a snapshot (September 2021)
Other	<ol style="list-style-type: none"> 1. Ongoing informal and formal meetings with the FSAI through active engagement on scientific committees 2. Informal meetings on additive exposure (2021/2022) with Emer O'Reilly, Acting Chief Specialist - Chemical Safety, FSAI (Dr Breige McNulty) 3. Informal meetings on reformulation (2021/2022) with Nuala Collins, Public Health Nutrition Safety Manager, FSAI (Dr Breige McNulty) 4. Ongoing informal and formal meetings with the FSAI through active engagement on scientific committees – (Albert Flynn – Chair FSAI Scientific Committee, Janette Walton & Laura Kehoe–Nutrition Sub Committee, Breige McNulty – Chemical Safety Sub-Committee) 5. Ongoing informal and formal meetings with the EFSA through active engagement on scientific committees (Breige McNulty – EFSA Network on Food Consumption Data, John Kearney – EFSA Working Group on Traditional Foods from Third Countries) 6. Informal engagement with agencies and public health professionals through hosting of the National Teens' Food Survey II Launch, Dublin, September 2019 e.g., FSAI, DOH, HSE, DAFM and Saferood. (Prof. Albert Flynn, Prof. John Kearney, Dr Breige McNulty, Dr Janette Walton, Dr Laura Kehoe, and members of the research team)
Other	<ul style="list-style-type: none"> • Dr Breige McNulty EFSA meeting – 14th Network on Food Consumption Data 11th April 2022 • NTFSSII summary reports and thank you letters posted out to post primary schools which participated in NTFSSII – December 2021

Website and social media	The IUNA website, Facebook and Twitter platforms to disseminate the outcomes The Website has been updated to a more modern user-friendly website and has almost 3000 users over last 6 months (over 5000 sessions from these 3000 users), we have 455 Facebook followers and 1,297 Twitter followers.) The website now hosts the summary findings and the main report with detailed findings from the NTFS II. In addition to links to all peer received publications.
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Knowledge Transfer Activities

Identify knowledge outputs generated during this project.	<ul style="list-style-type: none"> National Teens' Food Survey II: Summary Report, including main findings of the survey on food and nutrient intakes. Available online at www.iuna.net National Teens' Food Survey II: Main Survey Report, including detailed data on food and nutrient intakes. Available online at www.iuna.net National Teens' Food Survey II: Database, data files on food and nutrient intakes. Available from project principal investigators.
Identify any knowledge transfer activities executed within the project.	<ul style="list-style-type: none"> Dr Emer O'Reilly, Chief Specialist Chemical Safety, FSAI. National Teens' Food Survey II: Database. For food safety risk assessment, including monitoring exposure to food chemicals such as additives and contaminants. EFSA on-going mandates on the revision of tolerable upper intake levels for selected vitamins and minerals (M-20200158; M-2021-00058).
List any impacts resulting from the knowledge transferred during the project.	<p>FSAI. National Teens Food Survey II: Main Survey Report. For a report on Guidance for Food Businesses: the Safety of Vitamins and Minerals in Food Supplements. Establishing Maximum Safe Levels and Risk Assessment Approach for Products Marketed in Ireland (Revision2). FSAI, 2020. Available at: https://www.fsai.ie/news_centre/press_releases/vitamins_minerals_guidance_06082020.html</p> <p>FSAI. National Teens Food Survey II: Main Survey Report. For a Report of the Scientific Committee of the Food Safety Authority of Ireland. The Safety of Vitamins and Minerals in Food Supplements – Establishing Tolerable Upper Intake Levels and a Risk Assessment Approach for Products Marketed in Ireland (Revision 2). FSAI 2020.</p>

Section 3 – Leveraging, Future Strategies & Reference

Leveraging Metrics

Type of Funding Resource	Funding €	Summary
Exchequer National Funding	€1,241,131.00	DAFM FIRM competitive call 2019: National Adult Nutrition Survey II (NANS II) (2020-2022) €1,241,131 to MTU, UCD, UCC, TU Dublin
Non-Exchequer National Funding	€354,917.00	PI HDHL 2021 Call - Standardised measurement, monitoring and/or biomarkers to study food intake, physical activity and health (STAMIFY) Successful Grant Title: Dietary Assessment & Further Development of Biomarkers for All (Dietary Deal) Collaborators: Lead PI Dr Janette Walton, MTU in collaboration with IT Sligo, German Institute of Human Nutrition Potsdam, IMDEA Food Institute Spain and San Carlos hospital Spain. Reference: JPI HDHL 2021 STAMIFY Call, project reference: JPI-HDHL-2021-3-A Total budget: €1,010,800 Budget to Ireland (MTU, IT Sligo) €354,917
Other	€73,473.00	FSAI Funding - Research (UCD) Food Reformulation – Food Categories Data Analysis The Diet of the Irish Population - the Role of Flour Fortification. Additive Assessment in the Irish Population
Exchequer National Funding	€1,239,113.65	DAFM FIRM competitive call 2021: Field to fork assessment and mitigation of mycotoxin exposure risk on the Island of Ireland (Mycotox-I)

Future Strategies

This research builds on and further develops existing collaborations in the area of the food and health sciences. The databases established on food consumption and health provide scientific data to underpin innovation and competitiveness in the Irish food industry and to ensure that development and implementation of policy for food safety and nutrition at national and EU level is strongly evidence-based and reflects national needs including (but not limited to) the development of healthy eating guidelines, exposure assessments for food chemical and risk-benefit analyses for nutritional supplements and fortified foods. The on-going research programme has positioned Ireland at the forefront of research on food consumption and health in the EU.

Project Publications

Papers in Peer Reviewed Scientific Journals:

1. Kirwan LB, Walton J, Flynn A, Nugent AP, McNulty BA. An Evaluation of Probability of Adequate Nutrient Intake (PANDiet) Scores as a Diet Quality Metric in Irish National Food Consumption Data. *Nutrients*. 2022 Feb 26;14(5):994. doi: 10.3390/nu14050994. PMID: 35267969; PMCID: PMC8912666.
2. Kent G, Kehoe L, Flynn A & Walton J (2021) Plant-based diets: a review of the definitions and nutritional role in the adult diet. *Proceedings of the Nutrition Society*, 1-13. doi:10.1017/S0029665121003839
3. Daly, A., O'Sullivan, E., Walton, J., McNulty, B., & Kearney, J. (2021). Eating behaviour styles in Irish teens: A cross-sectional study. *Public Health Nutrition*, 24(8), 2144-2152. doi:10.1017/S1368980020003055

Pending Publication:

4. Aoibhín Moore Heslin, Aisling O'Donnell, Laura Kehoe, Janette Walton, Albert Flynn, John Kearney, Breige McNulty. (2022) Adolescent overweight and obesity in Ireland - trends and socio-demographic influences between 1990 and 2020. *International Journal of Obesity*. (In preparation)
5. Aoibhín Moore Heslin, Aisling O'Donnell, Laura Kehoe, Janette Walton, Albert Flynn, John Kearney, Breige McNulty. (2023) Assessment of the quality of dietary intake amongst Irish adolescents and relationships with body composition and metabolic health. *International Journal of Obesity*. (In preparation)
6. O'Donnell, A., Kehoe, L., Nugent, A., Kearney, J., Walton, J., Flynn, A., McNulty, B. (2022). Dietary fat intakes in Irish teenagers: changes between 2005 and 2020. *European Journal of Nutrition*. (In preparation)
7. O'Donnell, A., Kehoe, L., Nugent, A., Kearney, J., Walton, J., Flynn, A., McNulty, B. (2022). An investigation into physical activity levels, sedentary behaviour and screen time usage in the Irish population. *European Journal of Nutrition* (In preparation)
8. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). Assessment of the environmental impact of food consumption in Ireland - informing a transition to more sustainable diets. *Nutrients*. (In preparation)
9. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). An economic analysis of food consumption and implications for the transition to sustainable diets in Ireland. *European Journal of Nutrition*. (In preparation)
10. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney and Breige A. McNulty (2022). Modelling healthy and sustainable in Ireland. *European Journal of Nutrition*. (In preparation)
11. Grainne Kent, Laura Kehoe, Breige A McNulty, Anne P Nugent, Albert Flynn & Janette Walton (2022) A standardised methodological approach for characterising the plant-based component of population or individual diets. *Journal of Food Composition and Analysis* (Under Review).
12. Kevin D Cashman, Laura Kehoe, John Kearney, Breige A McNulty, Janette Walton & Albert Flynn (2022) Adequacy of calcium and vitamin D in a nationally representative sample of Irish teenagers aged 13-18 years. *European Journal of Nutrition* (Under review).
13. Laura Kehoe, Albert Flynn, John Kearney, Breige A McNulty & Janette Walton (2022) Food and nutrient intakes and compliance with recommendations in teenagers in Ireland: Findings from the National Teens' Food Survey II (2019-20) and changes since 2005-06. *Nutrients* (in preparation).
14. Maeve L O'Connell, Stephanie O'Regan, Emma O'Sullivan, Maria Buffini, John Kearney, Breige A McNulty, Albert Flynn, Janette Walton & Laura Kehoe (2022) Development of the National Children's Food Survey II and National Teens' Food Survey II Dietary Supplement Databases. *Journal of Food Composition and Analysis* (in preparation).
15. Laura Kehoe, Breige A McNulty, John Kearney, Albert Flynn & Janette Walton (2022) Updating of the Irish Food Composition Database: 2017 – 2022. *Journal of Food Composition and Analysis* (in preparation).

Peer reviewed Conference Papers:

16. Daly, A., O'Sullivan, E., McNulty, B., Walton, J., & Kearney, J. (2020). Age, sex & BMI are associated with different eating behaviour styles in Irish teens. *Proceedings of the Nutrition Society*, 79(OCE2), E351. doi:10.1017/S0029665120002992
17. Kent, G., Kehoe, L., McCarthy, R., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2021). Characterising the plant-based component of the Irish diet in terms of its micronutrient content. *Proceedings of the Nutrition Society*, 80(OCE1), E20. doi:10.1017/S0029665121000215
18. Heslin, A., Walton, J., Flynn, A., Kearney, J., & McNulty, B. (2021). Percentage body fat and metabolic health in Irish adolescents – preliminary analysis from the National Teens' Food Survey II. *Proceedings of the Nutrition Society*, 80(OCE3), E121. doi:10.1017/S0029665121002445
19. Kirwan, L., Nugent, A., Walton, J., Flynn, A., & McNulty, B. (2021). What's the score? Adaptation of probability of adequate nutrient intake scores to the National Adult Nutrition Survey database using European reference values. *Proceedings of the Nutrition Society*, 80(OCE3), E128. doi:10.1017/S0029665121002512
20. Rusu, I., Kehoe, L., Buffini, M., Kearney, J., McNulty, B., Flynn, A., & Walton, J. (2021). The role of breakfast in the diets of school-aged children (5–12Y) in Ireland. *Proceedings of the Nutrition Society*, 80(OCE1), E38. doi:10.1017/S0029665121000392
21. Daly AN, O'Sullivan EJ, Kearney JM. Considerations for health and food choice in adolescents. *Proc Nutr Soc*. 2022 Mar;81(1):75-86. doi: 10.1017/S0029665121003827.
22. Kent, G., Kehoe, L., McCarthy, R., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2021). Characterising the plant based component of the Irish diet in terms of its micronutrient content. *Proceedings of the Nutrition Society*, 80(OCE1), E20. doi:10.1017/S0029665121000215
23. Rusu, I., Kehoe, L., McNulty, B., Nugent, A., Flynn, A., & Walton, J. (2020). The role of breakfast in the diets of Irish adults (18–90y). *Proceedings of the Nutrition Society*, 79(OCE2), E458. doi:10.1017/S0029665120004061
24. O'Mahony, A., Kehoe, L., O'Sullivan, E., Nugent, A., McNulty, B., Flynn, A., & Walton, J. (2021). Macronutrients, dietary fibre and salt intake and compliance with recommendations in women of child-bearing age (WCBA) (18–50y) in Ireland. *Proceedings of the Nutrition Society*, 80(OCE5), E215. doi:10.1017/S0029665121003438
25. Kent, G., Kehoe, L., Flynn, A., & Walton, J. (2022). Plant-based diets: A review of the definitions and nutritional role in the adult diet. *Proceedings of the Nutrition Society*, 81(1), 62-74. doi:10.1017/S0029665121003839

Pending publication - Peer reviewed Conference Papers:

26. Cliodhna McGowan, Emma O'Sullivan, Laura Kehoe, Breige A. McNulty, John M Kearney, Albert Flynn, Janette Walton. (2022) Intakes and sources of dietary fibre in a nationally representative sample of teenagers (13-18 years) in Ireland. Submitted to Nutrition Society Irish Section Meeting for publication in *Proceedings of the Nutrition Society*.

27. Emma O'Sullivan, Maeve L O'Connell, Stephanie O'Regan, Maria Buffini, John M Kearney, Breige A McNulty, Albert Flynn, Janette Walton, Laura Kehoe (2022). Characterising the food supplements consumed by children and teenagers in Ireland. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.
28. Niamh M Walsh, Janette Walton, John M Kearney, Breige A McNulty, Albert Flynn, Laura Kehoe (2022) Micronutrient intakes in a nationally representative sample of teenagers (13-18 years) in Ireland: prevalence of inadequate intakes and risk of excess. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.
29. A. Moore Heslin, A. O'Donnell, L. Kehoe, J. Walton, A. Flynn, J. Kearney, B.A. McNulty. (2022) Socio-demographic and environmental factors associated with adolescent overweight and obesity in Ireland – preliminary analysis from the National Teen's Food Survey II. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.
30. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney, and Breige A. McNulty. (2022). An evaluation of the probability of adequate nutrient intake (PANDiet) and nutrient rich diet (NRD) scoring systems as metrics of diet quality for sustainable diet research in the Irish population. Submitted to Nutrition Society Irish Section Meeting for publication in Proceedings of the Nutrition Society.
31. Laura B. Kirwan, Janette Walton, Albert Flynn, Anne P. Nugent, John Kearney, Breige A. McNulty (2022) An economic analysis of food consumption and implications for the transition to sustainable diets in Ireland. Submitted to the International Congress of Nutrition for publication in Ann Nutr Metab.

PhD & MSc Theses:

32. Laura Kirwan - Building an Evidence Base for Sustainable Diets in the Irish population (2022)
33. Aoibhin Moore Heslin - Association of dietary quality with adiposity and inflammatory biomarkers in Irish adolescents (2023)
34. Grainne Kent: Plant-based diets in the Irish population (2022)
35. Ioana Rusu: Dietary quality of the Irish population and influence of eating location (2022)
36. Aisling Daly – Eating Behaviours in Irish Teenagers (2022)
37. Abigail O'Mahony: Nutrient intakes, compliance with recommendations and key sources in women of child-bearing age (18-50y) in Ireland (2022)

Other:

38. National Report: Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II - Summary Report www.iuna.net
39. National Report: Irish Universities Nutrition Alliance (2021) National Teens' Food Survey II - Main Report www.iuna.net
40. INDI article: Walton J, Flynn A & Kehoe L. (2021) Diet, lifestyle and body weight of Irish teenagers – current status and changes overtime. Nutrition & Dietetic Review. 6(4):15-18 Summary of Academic Outputs