

# Diet Quality Assessment in Adults with Cystic Fibrosis

*Comparison to Population Dietary Guidelines - A Cross-  
Sectional Study.*

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Poster Number: P339



# Project Funding

Health Research Charities Ireland /  
Health Research Board Joint Funding  
Scheme 2020 [HRCI-HRB-2020-025].



# Project Design

- Application placed a large emphasis on PPI.
- Case study of excellence.



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## **PPI in the HRCI/HRB Joint Funding Scheme: Case study of excellence**

*Cystic Fibrosis Ireland/University of Limerick: Exploring diet quality in Cystic Fibrosis*

Published 2021

**[hrci.ie](http://hrci.ie)**



# Background

## Advancements in Treatments & Clinical Practice

Improved **Lung & pancreatic** function [1]; Intestinal **pH** [2].

Resulting in:

- Reduced **resting energy expenditure**.
- Improved food & nutrient **absorption**.
- Improved nutritional status (**BMI**).
- Increased **life expectancy**:
  - *F508del-CFTR* genotype & Kaftrio: **71.6 years old** predicted survival age [3].



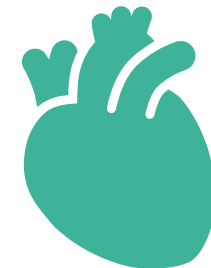
## Emerging Metabolic Clinical Comorbidities

Prevalence of **overweight / obesity**: **40%** [4]

- 2001-2018: +1.1%/year.
- 2018-2021: +3.5%/year.

Prevalence of **cardiovascular disease (CVD)** risk factors:

- Dyslipidaemia: **62%** ( $n = 108$ ; pancreatic insufficiency (PI): **81%**) [5].
- History of Ischaemic heart disease: **22.5%** ( $n = 422$ ) [6].



# Systematic Review (SR) on Diet in CF

## SR Title

- **What do people with cystic fibrosis eat? Diet quality, macronutrient and micronutrient intakes (compared to recommended guidelines) in adults with cystic fibrosis – a systematic review** (Submitted for publication in JCF) [7].

## SR Aim

- To synthesise and assess existing literature on **dietary intakes** of **adult PWCF**, focusing on **macro-** and **micro-nutrient intakes** and **diet quality** in relation to nutrition **guidelines**.

## Inclusion Criteria

- Studies examining **clinically stable** (no previous lung transplant or recent pulmonary exacerbations) **adults with CF** which included assessment of **nutritional intake**, **habitual** diets, diet **patterns** or diet **quality** using dietary assessment methods.

## Key Findings

1. **19** cohorts: **724** adults with CF.
2. Overall, **poor diet quality** was reported for adults with CF.
3. **Lack of data** available on **diet quality** in CF.
4. Most adult CF cohorts **achieved adequate energy intakes** (Europe / Australasia: 110-200%; USA: 125%).
5. Studies reporting total energy intake (TEI) from **fat** (30.0-39.4%) were above CF guidelines (clinically stable: 20-30%).
6. **Micronutrient & oral nutritional** supplements helpful in **achieving** most micronutrient recommendations.
7. In the current era of variant-specific therapies, intakes reported may pose a risk for developing **diet related chronic diseases** (i.e., obesity, CVD, type-II diabetes).

# SR on Diet in CF

Table 1. Diet quality assessment using validated tool (HEIFA-2013 / HEI-2015) and food serves/day.

Dietary Measure	Bass <i>et al.</i> * (USA)	Bellissimo <i>et al.</i> ~ (USA)	USA Guidelines <sup>a</sup>	Armaghanian <i>et al.</i> * (Australia)	Alfred Group* (Australia)	Australian Guidelines <sup>b</sup>
DQS (0-100)	46.0 (13.2)	48.3 (9.9)	59 <sup>c</sup>	-	63.5 (8.2) <sup>d</sup>	-
Wholegrains (%)	-	18 (6)	-	-	-	-
Refined grains (%)	-	82 (16)	-	-	-	-
Grains (serves)	-	-	6	8.2 (2.6)	-	4-6
Fruit (serves)	-	-	2	1.9 (1.4)	-	2
_ % met guidelines	-	-	-	-	8.3	-
Vegetables (serves)	-	-	2.5	5.2 (2.8)	1.4	5-6
_ % met guidelines	-	-	-	-	0	-
Protein foods (serves)	-	-	5.5	3.7 (1.6)	-	2-3
Dairy (serves)	-	-	3	2.5 (1.5)	2.6	2.5
_ % met guidelines	-	-	-	-	45.8	-
Discretionary foods (%E)	-	-	-	-	29	-

\*uses mean (SD). ~ uses median (IQR). a Dietary Guidelines for Americans - RDA per 2000kcal (8). b Australian Dietary Guidelines (47). c USA population HEI-2015 score (8). d Obtain through assessment against HEIFA-2013. DQS are obtained through assessment against HEI-2015 unless stated otherwise. Abbreviations: DQS Diet Quality Score, SD Standard Deviation, IQR Interquartile Range, RDA Recommended Daily Allowance HEI Healthy Eating Index, HEIFA Healthy Eating Index for Australian Adults.

# Study Aim

To analyse habitual **dietary intakes** of clinically stable Irish adults with CF, comparing to **CF dietary guidelines** and assess **diet quality** with **population specific healthy eating guidelines**.



# Methods



**Study design:** Observational, cross-sectional study.



**Eligibility assessment:** Online screening questionnaire.



1. EQ-5D-5L

2. PAGI/PAC-SYM

3. CFQ-R



**Quantitative data:** Demographic & self-reported health questionnaire.



**Dietary data:** 3-day food diary via Libro from Nutritics (mobile app) & food frequency questionnaire.



**Inclusion Criteria:** Adults  $\geq 18$  years of age with a diagnosis of CF, living in Ireland.



**Exclusion criteria:**

1. Not on stable regimen for  $\geq 4$  weeks prior to commencing the study with no recent pulmonary exacerbations involving the administration of oral or intravenous antibiotics or glucocorticoids.
2. Following a prescription diet for another medical condition (e.g., coeliac disease, are pregnant).
3. Post-transplant.





# Methods: Participant Recruitment

## Irish CF Hospital Clinics

Ospidéal OL  
UL Hospitals

Cork  
University  
Hospital

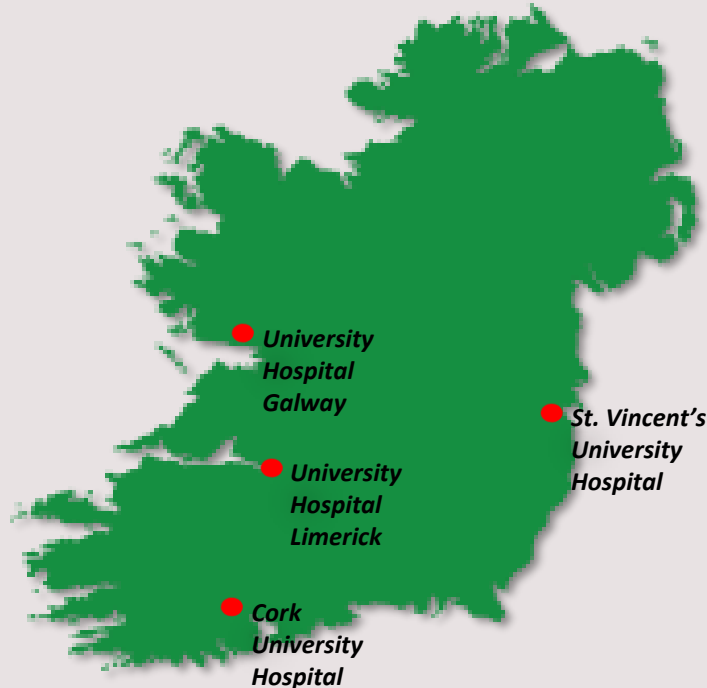
Galway University Hospitals  
Ospidéal na h-Ollscoile Gaillimh  
UNIVERSITY HOSPITAL GALWAY  
MERLIN PARK UNIVERSITY HOSPITAL

ST. VINCENT'S  
UNIVERSITY HOSPITAL  
Elm Park

## Online Recruitment

CF Ireland membership forums &  
social media profile  
advertisements

Cystic  
Fibrosis  
Ireland



Cystic Fibrosis Ireland @cf\_ireland

over 18  
interested in being a part of a timely & important study

Prof @AudreyTierney (Discipline Lead in Human Nutrition & Dietetics) & Cian Greaney (PhD student) of @UL are seeking people with CF who are to inform current & future dietary practices in CF. PM for more info.

Cystic Fibrosis Ireland

Researchers in University of Limerick are exploring Diet Quality in Cystic Fibrosis.

Complete a 20-minute survey & a diet diary and receive a €50 'One4All' gift card!

Are you 18 years or older?

Are you living with Cystic Fibrosis?

Are you interested in participating in this short study?

We would love to hear from you. If you want to find out more or to check your eligibility you can call, text our email our research team.

Contact our research assistant Cian at:  
Cian.Greaney@ul.ie  
08331979494

Principal Investigator  
Prof Audrey Tierney (UL)

10:00 AM - Sep 4, 2022

# Methods: Data Collection

Questionnaires

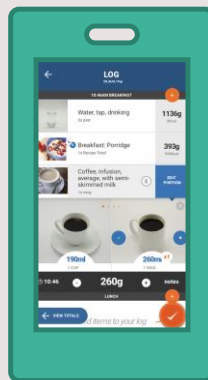


Castor Electronic Data Capture System

3-Day Food Diary



Libro from Nutritics Ltd.



Exploring diet quality in Cystic Fibrosis (CF) - enablers and barriers to eating a healthy diet in CF • Live (v4151)

Surveys Last updated on 15 May 2023, 12:57 PM (local time) [Reload](#) [Ad](#)



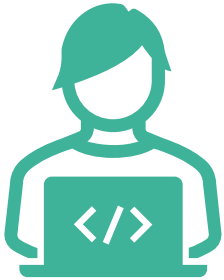
<input type="checkbox"/>	Participant ID ↓	Site ↑↓	Package name ↑↓	Status ↑↓	Assigne...	Progress ↑↓	Created on ↑↓	Planned on ↑↓	Sent on ↑↓	Completed on ↑↓	Sent via
<input type="checkbox"/>	110074	University of Limeri	Exploring diet quality in Cystic F	In Progress		<div style="width: 50%;"></div>	21 Nov 2022	21 Nov 2022	21 Nov 2022		Email invite
<input type="checkbox"/>	110075	University of Limeri	Exploring diet quality in Cystic F	Sent		<div style="width: 100%;"></div>	22 Nov 2022	22 Nov 2022	22 Nov 2022		Email invite
<input type="checkbox"/>	110076	University of Limeri	Exploring diet quality in Cystic F	Locked		<div style="width: 100%;"></div>	23 Nov 2022	23 Nov 2022	23 Nov 2022	23 Nov 2022	Email invite
<input type="checkbox"/>	110077	University of Limeri	Exploring diet quality in Cystic F	Sent		<div style="width: 100%;"></div>	23 Nov 2022	23 Nov 2022	23 Nov 2022		Email invite
<input type="checkbox"/>	110078	University of Limeri	Exploring diet quality in Cystic F	Locked		<div style="width: 100%;"></div>	23 Nov 2022	23 Nov 2022	23 Nov 2022	15 Dec 2022	Email invite
<input type="checkbox"/>	110079	University of Limeri	Exploring diet quality in Cystic F	Locked		<div style="width: 100%;"></div>	24 Nov 2022	24 Nov 2022	24 Nov 2022	09 Dec 2022	Email invite
<input type="checkbox"/>	110080	University of Limeri	Exploring diet quality in Cystic F	Locked		<div style="width: 100%;"></div>	28 Nov 2022	28 Nov 2022	08 Dec 2022	08 Dec 2022	Email invite
<input type="checkbox"/>	110081	University of Limeri	Exploring diet quality in Cystic F	In Progress		<div style="width: 20%;"></div>	06 Dec 2022	06 Dec 2022	06 Dec 2022		Email invite
<input type="checkbox"/>	110082	University of Limeri	Exploring diet quality in Cystic F	Completed		<div style="width: 100%;"></div>	28 Dec 2022	28 Dec 2022	28 Dec 2022	09 Jan 2023	Email invite
<input type="checkbox"/>	110083	University of Limeri	Exploring diet quality in Cystic F	In Progress		<div style="width: 10%;"></div>	05 Jan 2023	05 Jan 2023	05 Jan 2023		Email invite

LOG x

New Libro Log - 3 + X DAYS 13 MAY 2022 NOTES EXPORT TO

	FOOD	ACTIVITY	Day 1	Day 2	Day 3
<b>Breakfast</b>					
x	Coffee, instant, made up with wa...				260g
x	Coffee, instant, made up with wa...			260g	
x	Coffee, instant, made up with wa...		260g		
x	Porridge, made with low fat milk				365g
x	Porridge, made with low fat milk			365g	
x	Porridge, made with low fat milk		365g		
<b>Lunch</b>					
x	Milk, semi-skimmed, pasteurise...				250g

# Methods: Data Assessment



*SPSS Statistics*



*Nutrition Guideline Comparisons*

# Irish Food Serve Guidelines

## The Food Pyramid

For adults, teenagers and children aged five and over

*Discretionary Foods*

*Fats, Spreads & Oils*

*Protein Sources*

*Dairy Products*

*Grains*

*Fruits & Vegetables*

Not needed for good health.

Foods and drinks high in fat, sugar and salt



NOT every day

Most people consume snacks high in fat, sugar and salt and sugar sweetened drinks up to 6 times a day (Healthy Ireland Survey 2016). There are no recommended servings for Top Shelf foods and drinks because they are not needed for good health.

Fats, spreads and oils



In very small amounts

Use as little as possible. Choose mono or polyunsaturated reduced-fat or light spreads. Choose rapeseed, olive, canola, sunflower or corn oils. Limit mayonnaise, coleslaw and salad dressings as they also contain oil. Always cook with as little fat or oil as possible – grilling, oven-baking, steaming, boiling or stir-frying.

Meat, poultry, fish, eggs, beans and nuts



2 Servings a day

Choose lean meat, poultry (without skin) and fish. Eat oily fish up to twice a week. Choose eggs, beans and nuts. Limit processed salty meats such as sausages, bacon and ham.

Milk, yogurt and cheese



3 Servings a day

5 for children age 9-12 and teenagers age 13-18

Choose reduced-fat or low-fat varieties. Choose low-fat milk and yogurt more often than cheese. Enjoy cheese in small amounts. Women who are pregnant or breastfeeding need 3 servings a day.

Wholemeal cereals and breads, potatoes, pasta and rice



3-5\* Servings a day

Up to 7\* for teenage boys and men age 19-50

Wholemeal and wholegrain cereals are best. Enjoy at each meal. The number of servings depends on age, size, if you are a man or a woman and on activity levels. Watch your serving size and use the Daily Servings Guide below.\*

Vegetables, salad and fruit



5-7 Servings a day

Base your meals on these and enjoy a variety of colours. More is better. Limit fruit juice to unsweetened, once a day.

Needed for good health. Enjoy a variety every day.



# Results: Demographics & Self-Reported Health

## No. of Participants

$n = 42$  (35.7% male)



## Age (years)

$33.8 \pm 10.8$



## FEV1%

$79.4 \pm 22.6$



## Pancreatic Insufficiency

52.4%



## CF-Related Diabetes

26.2%



## Fat-Soluble Vit. Supp.

85.6%



## BMI (kg/m<sup>2</sup>)

Mean  $\pm$  SD:  $23.8 \pm 3.4$

Underweight (<20): 9.5%

Normal (20-24.9): 57.1%

Overweight/obese (>25): **33.4%**



# Macronutrient & Micronutrient Intakes

Table 2. Energy, macronutrient and micronutrient intakes in Irish adults with CF compared to CF nutrition guidelines.

Nutrient Measure	Dietary Intake (mean ± SD)			CF Nutrition Guidelines (1, 8, 9)	
	Male	Female	p-value	Male	Female
Energy (% gen. pop. guideline)	119.9 ± 45.3		0.168	110-200	
Fat (% TEI)	37.6 ± 5.3		0.546	20-30 (clinically stable)	
Carbohydrate (% TEI)	42.8 ± 6.2		0.890	45-60	
Protein (% TEI)	18.5 ± 4.1		0.444	15-20	
Saturated Fat (% TEI)	14.0 ± 2.9		0.101	<10	
Total Sugar (% TEI)	16.9 ± 5.6		0.927	<10	
Free Sugar (% TEI)	7.1 ± 4.0	5.0 ± 3.3	0.015	<5	
Fibre (g)	23.4 ± 9.6		0.072	25-35	
Vitamin A (µg) ret. eq.	968.5 ± 641.1	1060.6 ± 732.7	0.506	750	650
Vitamin D (µg)	6.9 ± 9.0		0.646	20-100	
Vitamin E (mg)	9.9 ± 3.7	9.9 ± 6.5	0.581	13	11
Vitamin K (µg)	59.4 ± 65.1		0.537	1000-10000	
Calcium (mg)	1049.6 ± 538.9		0.989	≥950	
Iron (mg)	12.6 ± 4.3	10.7 ± 5.4	0.101	8	18

Micronutrient intakes provided exclude supplementary contribution. Values are represented as male/female in cases where gender-specific nutrition guidelines exist, or significant differences were found.







Abbreviations: SD standard deviation, gen. pop. general population, % TEI percentage of total energy intake, ret. Eq. retinol equivalent.

## Nutrition Guidelines



Highlighted sections indicate where a **nutrient** is **above** or **below** the recommended **dietary intake** relative to nutrition **guidelines**. Sections in **green** indicate a **significant difference** ( $p < 0.05$ ) between **males & females**.

# Results: Serve intake compared to Irish Food Serve Guidelines

						
<u>Food Group</u>	<i>Fruits &amp; Vegetables</i>	<i>Grains</i>	<i>Dairy Products</i>	<i>Protein Sources</i>	<i>Fats, Spreads &amp; Oils</i>	<i>Discretionary Foods</i>
<u>Serves/day</u> (Mean ± SD)	2.6 ± 1.7 serves/day	2.4 ± 1.2 serves/day	2.0 ± 1.4 serves/day	2.7 ± 1.3 serves/day	2.0 ± 1.6 serves/day	5.7 ± 2.9 serves/day
<u>% of Participants Meeting / Over Guidelines</u>	11.9% met	21.4% met	14.3% met	52.4% over	61.9% over	97.6% over
<u>Irish Food Serve Guidelines [9]</u>	5-7 serves/day	3-5 serves/day (males 19-50 years old: up to 7)	3 serves/day	2 serves/day	Very small amounts	Not every day



Highlighted sections indicate where a **nutrient** is **above** or **below** the recommended **dietary intake** relative to nutrition **guidelines**.



# Implications of Findings

## Diet Quality



Based on comparisons to serving guidelines in Ireland, **diet quality** would seem **suboptimal** in adults with CF, with **high fat & EDNP foods** being **overconsumed** to achieve energy targets.

## Risk of Diet-Related Chronic Disease



**Saturated fat & sugar intakes** are **above** heart health **guidelines**, indicating a potential **risk** for adults with CF to develop **metabolic type diseases** with **sustained intakes** & at risk **phenotypes**.

## Importance of Micronutrient Supp.

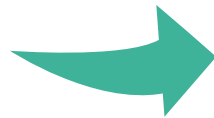


Intakes of **fat-soluble vitamins D, E & K** are all **suboptimal**, highlighting the **importance** fat-soluble vitamin **supplementation** in CF. This study indicates that **females** with CF in Ireland are **far below** **iron intake recommendations**.



# Future Directions & Take-Home Message

## Future Directions



To assess **interrelationship** between **diet quality** & **patient reported outcome measures**



Collect **experiences & views** on **nutrition** in adults with CF to assess **drivers** of food & dietary **choices**, & **enablers & barriers** to dietary **change**.

## Take Home Message



- Long-term **consequences** of **EDNP diets** in people with CF are **unknown**.
- **Adverse effects** associated with long-term suboptimal dietary intakes could pose **equal risk** to **people with CF** in diet-related **chronic disease development** as for the general population.
- **Revision** of **dietary guidelines** & **practice change** in the medical nutritional therapy of CF for optimal nutritional & health outcomes is **necessary**.



# Acknowledgement & References

## Acknowledgements

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