CoDiet

COMBATTING DIET RELATED NON-COMMUNICABLE DISEASE THROUGH ENHANCED SURVEILLANCE

D8.10 Practice Abstract Batch 1

Deliverable number D8.10

Work Package WP8	Communication, Dissemination & Exploitation
Task 8.1	Defining and Implementing a Communications and Dissemination Plan
Task Leader	Imperial College London
Prepared by	Harry Jenkins
Contributors	Joram Posma, Antoine Lain, Donghee Choi, Gary Frost, Isabel Garcia Perez, George Mylonas, Natalia Zaldua, Ines Barretxeguren, Franco Sassi, Heather Lodge, Jack Olney
Version	1.0
Delivery Date	28/06/2024

Funded by the European Union
UK Research and Innovation

Foreword

The work described in this report was developed under the project **CoDiet - Combatting Diet related non-communicable disease through enhanced surveillance** (Grant Agreement number: 101084642; Call: HORIZON-CL6-2022-FARM2FORK-01; Topic: HORIZON-CL6-2022-FARM2FORK-01-10). Any additional information, if needed, should be required to:

Project Coordinator:
Itziar Tueros – *itueros@azti.es* | AZTI |

WP8 Leader:
Harry Jenkins – *harry.jenkins19@imperial.ac.uk* | Imperial College London |

Dissemination Level		
PU	Public, fully open	X
SEN	Sensitive, limited under the conditions of the Grant Agreement	
Classified R-UE/EU-R	EU RESTRICTED under the Commission Decision No2015/444	
Classified C-UE/EU-C	EU CONFIDENTIAL under the Commission Decision No2015/444	
Classified S-UE/EU-S	EU SECRET under the Commission Decision No2015/444	

Funded by the European Union

CoDiet is part of the Horizon Europe programme supported by the European Union.

TABLE OF CONTENTS

1 Introduction

This document is a compilation of the first batch of Practice Abstracts for the CoDiet project. They aim to provide end-users with concise and easy-to-understand information about different areas of the project.

Within the context of the CoDiet, end-users include health professionals such as scientists, public health workers, and nutritionists; policymakers and non-governmental organisations; the food industry; and the general public including groups at higher risk of developing non-communicable diseases.

The practice abstracts will be shared at the EU-level following the 'EIP-AGRI common format' which will be made available in the EIP-AGRI project database on the EU CAP Network website.[1] The content developed for these Practice Abstracts will also be disseminated through the CoDiet website and social media accounts (X; LinkedIn).

Each abstract includes a short summary of the problem the research area is trying to tackle, how CoDiet is going to address this, and, where applicable, what has taken place within the first 18 months of the project.

A second batch of practice abstracts will be submitted at the end of the project (December 2027).

2 Practice Abstracts

2.1 AI-assisted literature review

There is a huge amount of existing research about the links between diet and non-communicable diseases. Understanding what already exists is key to developing new insights, but reviewing this information manually is time-consuming and expensive.

Using a kind of artificial intelligence (AI) called natural language processing (NLP), including recent large language models (LLMs), we have analysed published literature related to the CoDiet project using existing tools and newly developed methods, achieving human performance.

Of 3,699 relevant, openly-available articles, 500 were selected. These were manually annotated by 2 independent human experts, after NLP methods identified 243,916 potentially relevant biomedical entities (such as molecules or diseases) across 13 categories.

This is the largest dataset annotated in the biomedical domain with multiple categories of entities, including 9 completely novel categories. Compared to NLP methods, human annotators added over 80 entities on average per document, resulting in a dataset with 3x as many annotations as the next-largest full-text dataset (from 2018).

Our data were then used to investigate relationships between entities, with insulin resistance-glucose, waist circumference-glucose, woman-cholesterol and age-cholesterol as the most common relations identified - each appearing in over 8% of documents.

Current work is focussed on improving methods for discovering new relations between entities and updating existing NLP methods to include the novel human-made annotations in recognising entities

[1] At the time of publishing, the EIP-AGRI common format for 'Horizon multi-actor projects 2021-2027' is not yet available. These Practice Abstracts will be submitted to the EIP-AGRI Database once this is made available, expected in summer 2024.

across the entire dataset. This will allow new tools to be developed for and evaluated on new data focussed on a wider domain (diet) that can be used in CoDiet and beyond.

2.2 Dietary intake assessment: multiomics

Current assessment of dietary intake, such as food diaries, is fundamentally flawed with misreporting of up to 70%. This limits our understanding of the relationship between diet consumed in the home and non-communicable disease risk.

To address this fundamental problem, CoDiet will use 'omic' technology to objectively assess dietary intake. The cornerstone of this is methodology developed by Garcia, Posma and Frost, which uses a technique called nuclear magnetic spectroscopy to reveal the chemical makeup of urine samples in order to understand dietary quality based on hundred of small molecules excreted in the urine. Using this technology, our team has demonstrated how individuals respond to the same diet differently.

In CoDiet this technology will be enhanced by also monitoring the fat content of red blood cells, which has been demonstrated to relate to the fatty acid profile and dietary quality consumed.

CoDiet will also investigate changes to the microbes in the gut and the molecules they produce as they break down different foods, and assess how this relates to dietary intake, such as fibre consumption. In addition, meat, animal products and fat intake will be investigated through aminoacids profiles, acylcarnites and lipids profiles.

Finally, the impact of diet on the risk of developing non-communicable diseases will be assessed by investigating changes in clinical risk factors such as weight, cholesterol, triglycerides, inflammatory markers, and more.

2.3 Dietary intake assessment: intelligent, wearable camera technology

Our current understanding of the relationship between diet and the development of non-communicable disease (NCD, e.g., cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, dementia) is limited by several factors. These include a lack of understanding of dietary mechanisms that drive NCD, inaccurate tools to collect dietary information, poor understanding of the role of personalised nutrition, lack of data in vulnerable groups where NCDs are often over-represented. The overarching aim of CoDiet is to develop a series of tools, which will address the current gaps in our knowledge and lead to the development of a tool that will assess dietary induced NCD risk.

Current methodologies rely on self-reporting, which is burdensome, subjective, and prone to errors, bias, and misreporting. These methodologies also lack accuracy and the ability to perform continuous assessment of type and quantity of dietary intake, daily, and in people's own environment.

To address the above limitations, we are developing intelligent wearable camera technology supported by AI, as a passive dietary intake assessment tool. This technology can automatically and pervasively capture all the eating episodes of the user throughout the day. The system is designed to detect and capture food intake and is optimised for measuring the portion size as well as eating behaviours of the users.

The cameras are currently being tested as part of CoDiet's pilot study in the UK, Spain, Ireland and Greece in order to assess the effectiveness and adoptability of this technology as a research tool.

2.4 Dietary intake assessment: assessing non-communicable disease risk through non-invasive technologies

Throughout CoDiet, we are evaluating the use of several commercial, non-invasive technologies that can measure the risk of non-communicable diseases (NCDs) in different ways. These are vital to CoDiet's efforts to assess the link between dietary intake and the development of NCDs.

The devices being tested are:

- **AGE Reader**: A sensor that measures the presence of molecules called advanced glycosylated end products (AGE) in skin, which contribute to cellular and molecular ageing. Excessive AGE accumulation may be linked to the development of diseases such as diabetes, cardiovascular diseases or kidney failure. By resting your arm on the device for just a few seconds, the AGE Reader uses ultraviolet light to assess your levels of these compounds.
- **SA 3000 P**: A tool that measures blood volumes reaching the index finger to obtain information on arterial stiffness and to analyse the Autonomic Nervous System, which is responsible for involuntary actions like heart rate and blood pressure. This information can help identify potential heart problems early.
- **InBody 970**: A high-tech device that analyses the body composition of individuals, such as total body water, proteins, minerals and fat, using electric currents. Inadequate body composition with a high percentage of fat is a risk factor for many non-communicable diseases, such as diabetes, cardiovascular disease, and stroke.

Monitoring the risk of developing NCDs whilst recording dietary intake is vital to understanding how what we eat affects this risk, and can help guide personalised recommendations on how to live healthier in order to prevent NCD development in the first place.

2.5 Analysis of food environment policies to improve diets in six EU countries: Estonia, Finland, Italy, Spain, Portugal, Slovenia

Unhealthy dietary patterns, both rich in sugar, saturated fat and salt (HFSS foods) and low in fruits and vegetables, play an important role in the development of non-communicable diseases (NCDs). NCDs represent one of the biggest burdens for public health in the European Union. Therefore, it is vital for the different nations to implement best practice policies to reduce intake of these unhealthy diets.

As part of CoDiet, we analysed policies implemented in six European countries aimed at reducing exposure to and intake of unhealthy foods. Emphasis was placed on policies addressing food environments, such as regulations around food composition, marketing, labelling, provision in certain settings and taxation. In addition, special attention was placed on monitoring and evaluation efforts and how equity was taken into account in policy design and monitoring.

Across the six countries, most promise of impact and effectiveness was shown in policies targeting composition of HFSS foods, taxation of sugar-sweetened beverages, provision of meals in schools and restriction of marketing to children.

Based on these findings, we will develop 'best practice' approaches to designing, implementing and monitoring these policies. Causal loop diagrams (CLDs) will be created, based on evidence from literature, to map how the factors and processes in the policies influence each other. These CLDs will be submitted to interpretation and evaluation by stakeholders in the different countries, and submitted to simulation to estimate the effect on health outcomes.

Eventually, the aim is to inform and convince policymakers of the impact these policies can have on the health of their population and the impact they might have on health inequities in their country.