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Concepts and procedures for mapping food and health research infrastructure: New insights from the EuroDISH project

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ABSTRACT

Background: Recent initiatives in Europe have encouraged the formalisation of research infrastructure to unify fragmented facilities, resources and services; and to facilitate world-class research of complex public health challenges, such as those related to non-communicable disease. How this can be achieved in the area of food and health has, to date, been unclear.

Scope and approach: This commentary paper presents examples of the types of food and health research facilities, resources and services available in Europe. Insights are provided on the challenge of identifying and classifying research infrastructure. In addition, suggestions are made for the future direction of food and health research infrastructure in Europe. These views are informed by the EuroDISH project, which mapped research infrastructure in four areas of food and health research: Determinants of dietary behaviour; Intake of foods/nutrients; Status and functional markers of nutritional health; Health and disease risk of foods/nutrients.

Key findings and conclusion: There is no objective measure to identify or classify research infrastructure. It is therefore, difficult to operationalise this term. EuroDISH demonstrated specific challenges with identifying the degree an organisation, project, network or national infrastructure could be considered a research infrastructure; and establishing the boundary of a research infrastructure (integral hard or soft facilities/resources/services). Nevertheless, there are opportunities to create dedicated food and health research infrastructures in Europe. These would need to be flexible and adaptable to keep pace with an ever-changing research environment and bring together the multi-disciplinary needs of the food and health research community.

1. Introduction

Research infrastructure provides a platform for inter-disciplinary/multi-national collaboration to facilitate world-class research (EC, 2013). This is designed to create an opportunity for large scale innovative research, as well as the efficient use of resources and the transfer of knowledge/best practice across borders

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(ERA, 2013). The exact nature of a research infrastructure can be various; ranging from major equipment, to sets of instruments, or knowledge containing resources (e.g., collections, archives or data banks). Furthermore, these infrastructures can exist in a single site, as a network of distributed sites, or within a virtual framework (ESFRI, 2010). A well-known example of research infrastructure is CERN, the European Organisation for Nuclear Research. This is a single-sited laboratory-based research infrastructure, that was established in Geneva in 1954 to assist with the study of particle physics. CERN is recognised as a world-class research facility, which has facilitated several scientific breakthroughs, as well as providing economic, political, educational and social benefits (OECD, 2014).

A survey by the European Commission (EC) and European Science Foundation (ESF) in 2006–2007 suggested the success of CERN has translated into a clear definition, widespread recognition, and use of research infrastructure in physics (ESF, 2007). In contrast, the concept of research infrastructure was considered relatively new in the Biomedical and Life Sciences, and in the Humanities and Social Sciences (ESF, 2007). This promoted a series of initiatives from European bodies to support the further development of infrastructure in a range of research areas. The ESF; the European Heads of Research Councils (EUROHORCs); European Research Area (ERA); EC Innovation Union; Horizon 2020; European Strategy Forum for Research Infrastructure (ESFRI); and the introduction of European Research Infrastructure Consortium (ERIC) status, have all been central to obtaining Member State support and progressing European Union (EU) research infrastructure, across scientific fields from physics to nanotechnology (ESF/EUROHORCs, 2008). Despite these initiatives, in recent years there has been a particular focus on the lack of research infrastructure available to assist with the study of food and health. This is illustrated by the EC supported commissioning of the Food and Health Research in Europe (FAHRE) project; the theme of the recent Expo Milano 2015: feeding the planet, energy for life; and the establishment of both the ESFRI food and health working group and the Joint Programming Initiative - healthy diet for a healthy life (JPI-HDHL).

The above emphasised a requirement for research infrastructure to answer complex, broad, multi-faceted research questions specific to food and health (FAHRE, 2010; EXPO Milano 2015; JPI, 2012). Food remains central to protecting and promoting inter/national public health. Two thirds of global deaths have been attributed to non-communicable diseases, with diet considered an influential modifiable lifestyle factor in chronic disease aetiology and pathology (together with physical activity, tobacco avoidance and responsible alcohol use; Jamison et al., 2013; WHO, 2012). The range of challenges related to food and health are shown below:

- Combating the burden of rising public health, well-being and economic costs associated with non-communicable diseases and associated conditions (e.g., obesity, cardiovascular disease, hypertension, stroke, type II diabetes mellitus, musculoskeletal disorders, certain cancers or mental health conditions (WHO, 2012).
- Minimising malnutrition and dietary or nutrient related infectious diseases e.g., iodine deficiency, stunting, iron deficiency (FAO/WHO, 2014)
- Developing sustainable food consumption and production to manage natural resources/water and protect biodiversity and ecosystems (SCAR, 2011)
- Ensuring the success of the European food-related economy and innovative business community (EC, 2012).

These challenges illustrate the multi-disciplinary nature of food and health research, which frequently aligns with and cuts across a range of disciplines (e.g., social and natural sciences including economics, policy, sociology, psychology, environmental, nutrition, biochemistry, medicine, genetics etc.); and levels of analysis (e.g., molecule, cell, organ, body, individual, community, country, region). Research infrastructure can provide the opportunity to assemble inter-/cross-/multi-disciplinary research teams. This would enable the large scale and innovative research required to help overcome the public health challenges of today and those of the future. What is less than clear however, is how these aspirations might be realised.

This commentary paper provides a starting point for identifying which fragmented facilities, resources and services could potentially be unified to achieve an international food and health research infrastructure in Europe. First, working definitions of research infrastructure and the food and health research area will be presented using documentation from the ESFRI and the Mapping of the European Research Infrastructure Landscape project (MERIL), as well as the EuroDISH model of food and health research areas (for a detailed description of the EuroDISH project, please see www.eurodish.eu; Snoek H et al. unpublished). Second, examples of the types of food and health research facilities, resources and services in Europe identified by EuroDISH will be provided. This will be followed by insights from the EuroDISH project on the challenge of identifying and classifying research infrastructure, as well as suggestions for the future direction of food and health research infrastructure in Europe.

2. Working definitions of research infrastructure and food and health research

2.1. Research infrastructure

Research infrastructure can be described by its activities or by its legal status. The ESFRI definition presented below is primarily related to the former. This definition covers a range of elements, including tangible or hard research infrastructure (e.g., the laboratory of CERN), as well as supporting research infrastructure (e.g., related to Information Communications Technology, ICT), and less tangible or soft research infrastructure (e.g., training, networks or standard operating procedures, SOP).

"The term 'research infrastructures' refers to facilities, resources or services of a unique nature that have been identified by European research communities to conduct top-level activities in all fields. This definition of Research Infrastructures, including the associated human resources, covers major equipment or sets of instruments, in addition to knowledge-containing resources such as collections, archives and data banks. Research Infrastructures may be "single-sited", distributed", or "virtual" (the service being provided electronically). They often require structured information systems related to data management, enabling information and communication. These include technology based infrastructures such as Grid, computing, software and middleware." (ESFRI, 2010).

This ESFRI definition is in line with that used by the ESF in their 2006–2007 survey, as well as the 2010–2012 follow-up survey that was conducted by MERIL. The findings of MERIL were used to create an inventory of European research infrastructures. This inventory continues to be updated and is free to access or search via an online portal (http://portal.meril.eu/converis-esf/publicweb/startpage?lang=1). In order to decide which infrastructures to include on the MERIL inventory, the term research infrastructure has been operationalised by employing a set of in/exclusion criteria. These criteria include:

1) Quality. This primarily relates to a research infrastructure being of greater than national relevance; thus, infrastructures that