Impact case study (REF3)

Institution: Ulster University

Unit of Assessment: Allied Health Professions, Dentistry, Nursing and Pharmacy (3)

Title of case study: ICS-2 Improving vitamin D intake and status in populations worldwide

Period when the underpinning research was undertaken: 2000 - 2020

Details of staff conducting the underpinning research from the submitting unit:

<table>
<thead>
<tr>
<th>Name(s):</th>
<th>Role(s) (e.g. job title):</th>
<th>Period(s) employed by submitting HEI:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor JJ Strain</td>
<td>Professor of Human Nutrition</td>
<td>1981-present</td>
</tr>
<tr>
<td>Dr Emeir McSorley (née Duffy)</td>
<td>Senior Lecturer in Human Nutrition</td>
<td>2002-present</td>
</tr>
<tr>
<td>Professor Helene McNulty</td>
<td>Professor of Nutritional Science</td>
<td>1992-present</td>
</tr>
<tr>
<td>Professor Mary Ward</td>
<td>Professor of Nutrition and Dietetics</td>
<td>1998-present</td>
</tr>
<tr>
<td>Dr Maria Mulhern (née Barnes)</td>
<td>Lecturer in Food Science</td>
<td>2006-present</td>
</tr>
<tr>
<td>Dr Kirsty Pourshahidi (née Forsythe)</td>
<td>Teaching Fellow in Food Science and Technology</td>
<td>2011-present</td>
</tr>
<tr>
<td>Dr Pamela Magee</td>
<td>Senior Lecturer in Human Nutrition</td>
<td>2001-present</td>
</tr>
<tr>
<td>Professor Sumantra Ray</td>
<td>Professor of Global Nutrition, Health and Disease</td>
<td>2019-present</td>
</tr>
</tbody>
</table>

Period when the claimed impact occurred: 2014 – 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact
Vitamin D is essential for health. Setting dietary recommendations enables intake and status to be monitored and improved in populations.

Impact 1: Our research is used by policymakers and risk managers in setting current dietary vitamin D requirements in the USA, Canada, UK, and the EU member states.

Impact 2: These guidelines are used globally by health professionals and food manufacturers to improve vitamin D status.

The significance of the impact can be appreciated in that optimising vitamin D status is crucial for preventing vitamin D deficiency and associated chronic diseases and health conditions, with resultant health and economic benefits worldwide.

2. Underpinning research

Low vitamin D status
Low vitamin D status is linked to osteoporosis and chronic diseases throughout the world, and optimising vitamin D intake can therefore have important consequences in reducing the risk of such conditions. Nutrition and health professionals (e.g. medical doctors, dietitians, sport...
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nutritionists) as well as food manufacturers rely on evidence-based dietary vitamin D requirements, not only to prevent vitamin D deficiency diseases (e.g. rickets and osteomalacia), but also to improve the overall health of populations worldwide.

**Optimising vitamin D dietary intake to improve status**

In 2006, Professors Wallace (deceased) and Strain at Ulster secured funding from the UK Food Standards Agency (FSA), in collaboration with University College Cork, to investigate the relative contribution of dietary intake and sunlight to vitamin D status in young adults and older individuals. This collaboration produced several high impact papers (e.g. R1, R2). The randomised controlled trial outputs from this research (R1, R2) have had considerable impact during this current REF timeframe in informing policymakers when they were devising dietary guidelines for vitamin D. In 2008, additional funding from the UK FSA, also in collaboration with University College Cork, enabled the Ulster team to assess potential benefits of vitamin D supplementation on bone health, immune function and cardiovascular risk markers.

This research built upon a previous collaborative project with University College Cork, also led by Professors Wallace and Strain and which identified the prevalence of vitamin D deficiency in the Northern Ireland Young Hearts Project. This investigation was the first to highlight low vitamin D status among 12- and 15-year olds, particularly in girls, in a representative sample of adolescents in Northern Ireland (R3). This finding was of concern, as low vitamin D status was also associated with low bone mineral density in these adolescents. Our prior research in this age group showed low vitamin D status among young adults in wintertime but established that 8 weeks’ supplementation in our randomised controlled trial was effective at improving status (R4).

**Vitamin D status in elite sports**

Research led by Dr Magee and funded by the Irish Rugby Football Union, Cricket Ireland, and the Irish Amateur Boxing Association demonstrated deficiency of vitamin D in elite athletes and Paralympians in Ireland (not cited here). As a result, Sport Ireland has revised its vitamin D supplementation policy and research at Ulster has subsequently demonstrated improved status in athletes some 4-5 years after the revision of Sport Ireland’s vitamin D supplementation policy (R5).

**Vitamin D status in the COVID-19 pandemic**

Significant research funding was awarded in 2009 by the Department for Employment and Learning for a cross-border Irish Universities Nutrition Alliance collaboration, led by Professors McNulty and Strain, to set up a ‘Centre of Excellence in Nutrition and Ageing’ (CENA). Research emanating from CENA (not cited here) supports a role for adequate vitamin D status for optimal immune function, particularly within the older adult population (≥60yrs). The importance of optimal vitamin D status for immune function during the COVID-19 pandemic is highlighted in a recent (2020) review (R6) with invited co-authors from Ulster. The review highlights the importance of vitamin D for immune health and recommends vitamin D supplementation according to country-specific government guidelines (which in turn utilised data from R1, R2) with emphasis on those self-isolating with limited access to sun exposure.

3. References to the research

The following outputs are published in leading peer-reviewed journals and are reviewed by internationally based editorial boards.


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Key research grants:

- Wallace JMW, Strain JJ, Robson PJ, Boreham C and Dubitsky W. Evaluation of the prevalence of vitamin D deficiency in a representative sample of adolescents from Northern Ireland and its implications for bone health (in collaboration with University College Cork). Funded by the Higher Education Authority of Ireland, 2003-2006; GBP72,816.
- Wallace JMW, Bonham MP, Duffy EM, Magee PJ, Campbell DJ and Strain JJ. Vitamin D status and associated health outcomes: Towards an evidence basis for defining vitamin D status sufficient to reduce risk of chronic disease (in collaboration with University College Cork). Funded by UK Food Standards Agency, 2008-2010; GBP161,958.

4. Details of the impact

Impact 1: Setting current vitamin D requirements for populations by policymakers and risk managers

- The EU: In 2016, our studies (R1, R2, R4) were critical to the European Food Safety Authority’s (EFSA) approach (meta-regression) to assess intake-status for deriving dietary reference values (DRVs) for vitamin D for adults under conditions of minimal vitamin D synthesis from sunlight [C1].
- The UK: The Scientific Advisory Committee on Nutrition (SACN, 2016) used our data (R1-R3) as underpinning evidence [C2] to revise the DRVs for vitamin D for the UK population aged 4 years and over. The UK government cascaded this information to all health professionals for dissemination to the public in the UK [C2].
- The German-speaking countries: The German-speaking countries (D-A-C-H, 2015) used our data to set a DRV for vitamin D in adults aged <60 years (R1) and for older adults aged >60 years (R2) [C3].
- The Nordic countries: The Nordic Council of Ministers (2014) considered a meta-regression analysis of supplementation studies (including R1, R4) in setting requirements for adults aged <60 years and supplementation studies (including R2) for adults aged >60 years [C4].

Impact 2: Use of dietary recommendations by health professionals and food manufacturers
**Global reach**: The current global reach of the impact is clear in that end users (e.g. health professionals and food manufacturers) of the recommendations based on Ulster’s underpinning research (R1-R4) reside in more than 35 territories, including the UK, the 27 EU countries, the USA, Canada, Norway and Switzerland [C1-C4]. This impact includes prevailing recommendations set by the The Institute of Medicine (for the USA and Canada) and The Health Council of the Netherlands using our research (R1, R2). The significance and reach of the impact relating to our research is that dietary recommendations are crucial from a public health perspective for the prevention of vitamin D deficiency and low status, with benefits to populations worldwide. The recommendations are essential public health policy instruments developed with the evidence base and data available at that time (including R1-R4).

**COVID-19**: The current COVID-19 pandemic caused the National Institute for Health and Care Excellence (NICE) in June 2020 to produce a rapid evidence summary, informed by the recent review (R6), recommending all people to follow Government recommendations (based on data from R1-R3) on vitamin D [C5]. NICE also published a medicines evidence commentary on vitamin D supplementation for preventing intensive care admission in people with COVID-19 [C5]. The UK National Health Service (NHS), Public Health England (PHE), the British Dietetics Association (BDA) and the Need for Nutrition Education/Innovation Programme (NNEdPro) Global Taskforce for COVID-19 have recently (April-June 2020) emphasised the importance of vitamin D supplementation in advice for the general public [C5]. A particular emphasis is given to the importance of following vitamin D dietary recommendations (based on data from R1-R3) for those with increased time spent indoors during lockdown, shielding/cocooning and in self-isolation during the COVID-19 pandemic [C5].

**Food fortification**: As a consequence of the revised dietary recommendations (R1-R4), nationally implemented voluntary food fortification programmes have demonstrated vitamin D status improvements in populations, e.g. the Finnish policy has doubled the vitamin D status of the general population with deficiency rates <1% [C6]. Similarly, in response to the revised dietary recommendations (based on data from R1-R4), vitamin D food fortification has been introduced or revised in countries such as India (vitamin D fortified milk and edible oils, 2014), the USA (doubling of vitamin D fortification in milk, 2016) and Sweden (dairy products and margarine spreads, 2018), [C6].

**Food industry**: Industry now uses these dietary guidelines on packaging and in promotional literature [C7] in response to the revised recommendations as underpinned by Ulster’s research (based on data from R1-R4). These industry initiatives have economic benefits in line with addressing global nutritional needs. Revisions to the vitamin D dietary recommendations automatically impact the entire food industry in that every product with a claim relating to vitamin D will always comply with the applicable dietary recommendations (based on data from R1-R4) [C1-C4] as set by the authorities in the relevant country or region.

**Elite athletes**: Sport Ireland has revised its policy so that the vitamin D status of all athletes is now routinely monitored, with vitamin D supplementation implemented (if necessary) using protocols designed by Sport Ireland [C8]. The Sport Ireland Institute, using resources based on our research, now educates athletes on their vitamin D requirements which has improved their status (R5).

### Sources to corroborate the impact


C7: Examples: Glanbia: (i) Benefits of Vitamin D; and, (ii) Vitamin D and Immunity. Kellogg: Kellogg ramps up Vitamin D to Address Health Needs.

C8: Testimonial and information leaflet from Head of Performance Nutrition, Sports Ireland Institute.