Analysing dietary patterns, preferences and knowledge using social media.
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Project Overview

Traditional methods for nutritional surveys are well validated and predominately use interview-led data collection methods and paper food diaries to produce good quality data about population dietary patterns or nutrient intakes. While these data are useful in describing dietary differences between various age and socioeconomic groups, they are labour-intensive, costly and rarely collect data about the level of nutrition knowledge or food preferences; two factors shown to be related to better dietary patterns[1]. There is political and societal impetus in the UK to improve the population's diet in order to prevent obesity-related health problems; particularly among women of childbearing age whose diet influences the short and long-term health of their children[2]. Identifying alternative datasets that could be used to complement traditional nutritional surveys may help to design targeted interventions to improve dietary behaviours. Social media could provide a potential new dataset for tracking dietary patterns, dietary preferences, and nutrition knowledge; with 61% of adults using social networking of some kind, and 79% of those using it daily[3]. This study aimed to i) understand how social media has been used to describe patterns of health behaviour and ii) test whether an online application can be used to measure dietary patterns, food preferences and nutrition knowledge from social media profiles. We have commenced a systematic literature review to achieve the first aim, and have developed a research tool to test the second aim.

Aim 1: Literature Review

Social media is often naïvely assumed to provide a strong positive effect in many areas, for example in marketing where frequently its value is misunderstood[4]. We therefore commenced a systematic review of the literature to assess how social media has been used in nutrition research studies and whether it has been used to measure nutrition knowledge, food preferences and dietary patterns. The initial search strategy was developed with a specialised academic librarian from health sciences and medicine. Seven major databases were searched in spring 2016: Medline, Embase, CINAHL, Cochrane, PsycINFO, Web of Science and Scopus. This selection was informed by previous reviews in similar areas to ensure the key databases were not missed. Both free text and MeSH terms were applied including crowdsourcing, food habits, and social media (MeSH). Initial search results returned 9379 articles. After removing duplicates, and screening all titles and abstracts 76 original research articles and 7 reviews that met the inclusion criteria were identified. The inclusion criteria included: studies that assessed online social media as the delivery method (rather than web-based or 'app' dietary assessment tools), measured dietary patterns, dietary preferences or nutrition knowledge (not intervention studies aiming to improve diet), studies from high-income countries involving adults (18+ years) and articles available in English. Detailed data extraction of the identified articles continues, however qualitative analysis of the articles to date has identified three key themes which are summarised below.

Social Media for Recruitment

Online social networks have been shown to be an effective method for recruiting participants into nutrition research studies. For example Facebook and Twitter can be used, not only to reach specific groups of individuals required for studies, but have also allowed the use of a snowballing method to encourage participants to share details about studies with their friendship groups thus further increasing the recruitment rates for studies[5]. Compared to Facebook, Twitter has been shown to be less effective at recruiting participants to studies[6] because users need to retweet the recruitment message and the vast number of tweets means the message must be re-tweeted many times to be widely received. On the other hand, Facebook advertisements can be targeted to specific audiences which increase the likelihood of them being seen by the population group being studied[7]. Recruitment from online social networks has been shown to reduce costs associated with traditional recruitment methods[8].

Social Media for Data Collection

In previous food and nutritional research, Twitter has been shown to be useful for data collection, particularly for identifying specific dietary behaviours. Previous studies have used content analysis to

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search tweets and assess what people are eating, with whom and where. However such information may be biased as many people post about eating situations that are special occasions that do not necessarily form part of their usual routine[9]. Currently, assessment of nutritional knowledge using online social networks to profile users is limited. Online nutrition education tools have used online social networks to engage participants by using interactive quizzes that provides feedback as scores or encourage competition between friends but these tools have not aimed to measure nutrition knowledge[10].

Social Media for Nutrition Profiling

Analysis of the literature has identified that few studies have used online social networks to assess dietary patterns, food preferences and nutrition knowledge. One study from the US used twitter to identify geographical patterning of dietary behaviours. Tweets containing terms that represented healthy and unhealthy foods (namely fruits and vegetables and fast food chains respectively) were identified and geo-located. The results showed that regions identified as having poorer food environments (i.e. limited access to healthy food outlets) were associated with greater number of tweets about unhealthy food and fewer tweets about healthy foods[11].

Aim 2: Research Tool Development

The literature review identified that social media can be both a cost-effective method of recruitment[12,13] and as a source of data. However, the use of social media profiles to measure food preferences, dietary patterns and nutrition knowledge is yet to be explored. Prior research used participant's Facebook profiles to identify whether posting about alcohol was associated with drinking problems according to the Alcohol Use Disorder Identification Test (AUDIT)[14]. The research identified a positive association whereby individual's that posted about drinking alcohol on the Facebook page had higher drinking problem scores. This suggests that data from individuals' Facebook accounts could be useful to classify health behaviours.

In order to achieve the second aim of our project, we have developed a research tool to assess whether there are correlations between individual's Facebook profiles and their nutrition knowledge, food preferences and dietary patterns (all assessed using published scales). To partake in the study participants log-in using their Facebook account and authorise access to data from their Facebook profile. Currently this authorisation provides access to the pages each participant 'Likes'. These pages may include the profiles of celebrity chefs, food companies or products, and food-related magazines

Figure 1 - Classifying images in our research tool

or pages such as BBC recipes, as well as other non-food related pages. Upon commencement of the study, participants complete a short demographic questionnaire, and then a short 20-item Food Frequency Questionnaire (details below) which can be used to create a dietary quality score for each participant. The next section asks participants to specify what they believe is the salt, saturated fat and sugar content of 20 frequently consumed food products that were identified from the National Diet and Nutrition Survey. Images of the products are shown randomly, along with one of the three nutritional components, and the participant uses a traffic-light scale to state whether they think that product contains high, medium or low levels of the nutrient (Figure 1). Finally participants are asked to rate on a similar scale how much they like each of the 20 products (like, don't like or haven't tasted it)[15].
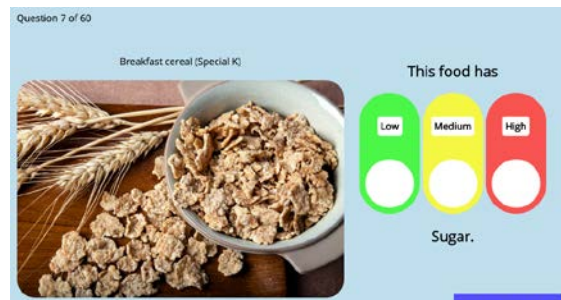
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Food Frequency Questionnaire

The Food Frequency Questionnaire (FFQ) used to assess participants' dietary patterns was developed and validated by the MRC Lifecourse Epidemiology Unit, to specifically assess the diets of women of childbearing age (18-45). The FFQ contains 20 items (developed from a larger 100-item FFQ using principal components analysis) and asks participants to rate how often (on a six point scale from never to more than once a day) they have eaten food from each item over the past month[16]. A standardised dietary quality score can be calculated for each participant and will be used to assess the correlation between participants'
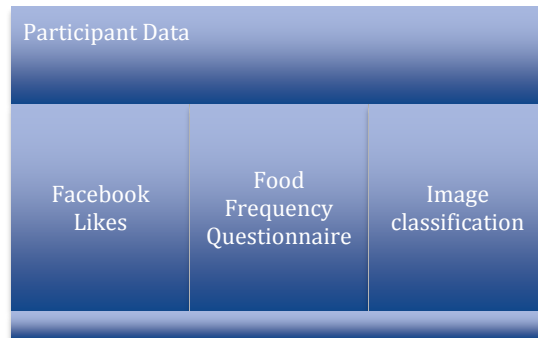

Figure 2 – Research tool study components

overall dietary quality and their food-related social media profile (from their Facebook Likes). We will categorise likes accordingly to their relative healthfulness and create a score for each participant. Due to the importance of the diets of women of childbearing age and the fact that 50% of women aged 25-34 are overweight or obese in England[2], it was decided to revise the initial plan of a broad population approach to instead focus this important subgroup. However we continued with our original aim of assessing individual differences for the possibility of developing targeted interventions in the future.

Outcomes, Funding Streams and External Collaborators

In order to fully understand the role social media has played in previous dietary studies, a significant amount of time and the study budget was spent on reviewing the literature to identify an appropriate gap that this study will fill. Thorough systematic reviews require an in-depth analysis of the current evidence and we anticipate that the results from this work will be written up and submitted to a peer-reviewed health journal in the autumn 2016. This review will highlight the current research gaps and indicate how social media could be used to complement current data sources which may assist in the development of targeted dietary recommendations that can be delivered to large numbers of people.

A second output from this study is the design and implementation of the research tool that will be used to categorise Facebook profiles according to nutrition knowledge, food preferences and dietary patterns. The pilot phase to test the research tool has been delayed due to issues getting a University-based server prepared for running the study and the need to submit an amendment to our ethical application to reflect changes in our methodological plan (particularly around focusing on females aged 18-45). We shall continue this work after the funding period ends and will extend the pilot to involve up to 100 participants. This pilot will enable us to test the research tool and begin to understand the relationship between social media profiles and dietary patterns, food preference and nutrition knowledge.

Publication Plans

As discussed above, we aim to submit the systematic review to a health journal in autumn 2016. In addition, we will write up the results of the pilot study and plan to submit a paper to an interdisciplinary Web Science conference such as ICWSM-17 or WebSci'17. This paper will outline our methodological approach of using Facebook-based login for online survey research and present our initial results.

Future Funding and Collaboration

Our approach has already gained attention from other researchers within the University of Southampton, namely the Faculty of Medicine Public Health Department. The study team is currently drafting an application for an MRC Discovery Award which provides seed funding for interdisciplinary projects up to £10,000. The next phase of the project will involve investigating what additional data can be extracted from Facebook profiles, and exploring whether social activity or profile categorisation is associated with health outcomes, specifically maternity medical records including data about the mother, birth and baby.

Should the pilot be successful, we have identified the EU H2020 SFS-39-2017 topic as a potential avenue to extend our investigations from observational to intervention research. The call focuses on initiatives to tackle the European-wide childhood obesity epidemic, which is highly relevant to our project. Our bid would include using social media to trial a targeted nutrition education intervention based on the social media profile categories we develop. The target population would be women of childbearing age or may specifically target pregnant women whose dietary habits influence the weight status and health of their children.

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