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Report on gaps and needs - WP6

Report on the potentials and limitations for the use of user-generated domestic food preparation data to answer questions regarding determinants of nutrition and eating

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SUMMARY

The overarching aim of RICHFIELD's Phase 1 is to explore the available consumer-related data on food purchase, preparation and consumption, in terms of its type and quality. This Phase consists of three Workpackages (WP5-7) which study food purchase (WP5), preparation (WP6) and consumption (WP7). This report aims to identify the potential and limitation of present and future data to answer key question on the determinants of domestic food preparation.

An inventory of types of domestic food preparation data and data collection methodologies was conducted. A scoping exercise was performed with the aim of identifying the range of available domestic food preparation applications (apps) that collected user-generated data. The results of this exercise were evaluated and from this, 54 prototypical examples of domestic food preparation apps were identified and classified. For 48 (89%) of the apps, the motivation for use was classified as 'Knowledge and Understanding' with 33 (61%) allowing the user to 'Search for information', and 15 (28%) for the user to 'Share knowledge and experience'. A further 53 (98%) were classified as having the 'Planning and organisation' as their primary motivation for use, of these 18 (33%) allowed the user to perform 'Recipe management', ten (18%), to perform 'Meal/menu planning' and 25 (46%) to carry out 'Documenting/recording of food'. A further 18 (33%) apps fell into the category of 'Meal preparation and cooking', within this classification, nine (17%) apps were classified as 'Interacting with sensors', and nine (17%) apps 'classified as using apps as cooking aids.'

Users' primary motivation for using domestic food preparation apps is to develop personal food knowledge, skills and/or abilities. This opens up the potential to answer research questions relating to Individual Psychological determinants, such as food beliefs, habits and self-regulation in relation to food. However, the limited availability of contextual data, such as that at the 'Individual/Situation', and 'Interpersonal/Social' levels, means that much of this data is detached from the user. Researchers intending to use this data will have to carefully consider the degree to which additional contextual information is required to draw conclusions. The interconnectedness of the apps presents new opportunities to further enrich the collected data from external sources. There is the potential to create 'links' between multiple app usages from a single user. For example, it may be useful to gain domestic food preparation specific information from dedicated apps, and enrich this with demographic, situational and social context data collected through apps such as Facebook, Twitter and Instagram. However, the degree to which users would find this interlinkage acceptable still needs to be investigated.

A further point to consider with user-generated domestic food preparation data, is the degree to which it can act as a 'proxy' for intake. The data collected via app usage reflects the motivation to gain knowledge and to develop skills. The degree to which this is translated into intake cannot be directly drawn from the data in its current form. At best, it describes an 'intention' to intake certain foods and/or meals. Again, it is possible to link data from the consumption apps identified in WP7 and map food choice and eating behaviour from preparation through to consumption. Although, a protocol for performing such exercises still needs to be developed. Finally, the availability and accessibility of the user-generated data for use in the RICHFIELDS RI still needs to be established. It is essential that legal and technical experts work with the RI to ensure easy and cost effective access to multiple big-data sets for the RICHFIELD end user.

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CONTENTS

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1. INTRODUCTION

The vision of RICHFIELDS is to design a world class Research Infrastructure (RI) that will serve as a platform to collect, align and share innovative and existing data relating to food and health so as to enable policymakers and other stakeholders to develop evaluate and implement effective food and health strategies. The RICHFIELDS RI will allow researchers to explore connections between real-time and in-situ consumer data, with business and research-generated consumer data from industry, other relevant RI's and from virtual laboratories and facilities. It is proposed that the RICHFIELDS RI will host a linked data platform that will provide an unprecedented opportunity to address the determinants of consumer behaviour relevant to food and health across three distinct instances of behaviour that are uniquely relevant and necessary components of food intake: purchase, preparation and consumption.

Phase 1 of the RICHFIELDS project sought to identify food-related data consumers generate through everyday food- related activities, either actively or passively, through the use of tools such as apps and sensors, "outside the research environment". The large-scale generation of such data has the potential to be able to provide data for use in research thus providing insights regarding food choice or determinants thereof. Food choice operates at physical, biological, psychological, and sociocultural levels (Sobal, 1991), all which operate simultaneously and interact (Sobal et al., 2014) and include the acquisition, preparation, serving, eating, storage, giving away of and cleaning up of food (Sobal and Bisogni, 2009). Whilst food choice behaviour is seemingly simple, it is in fact very complicated behaviour that is influenced by many interacting factors that each belong to the traditional domains of one of a large diversity of scientific disciplines and as a result each of these disciplines claims to have at least a partial answer to the central question in food choice research: ''Why does who eat what, when, and where?" (Köster, 2009).

2. METHODS

The overarching aim of Phase 1 is to explore the available consumer-related data on food purchase, preparation and consumption, in terms of its type and quality. This Phase is compiled of three Workpackages which study food purchase (WP5), food preparation (WP6) and food consumption (WP7). The specific aim of this Deliverable (D6.5) is to report on the work conducted for Task 6.5. This report aims to identify the potential and limitation of present and future data to answer key question on the determinants of domestic food preparation.

An inventory was conducted to identify the range of available domestic food preparation applications (apps) that collect user-generated data and characterise the available domestic food preparation applications according to key research questions (i.e., What/Who/Why/How/Where). The characterisation of the apps utilized a framework of quality criteria that consisted of descriptive, scientific, legal and technical characteristics as detailed in Deliverable D6.3. The evaluation also included an evaluation of characteristics relevant for data management practices (e.g. data access, data integration) as this information is key as data processing strategies are reliant on the availability of effective and reliable data exchange protocols. Data characteristics associated with legal and ethical governance were also considered, i.e. the rights, obligations, and expectations regarding data usage.

The objective of Workpackge 6 is to establish the breadth of in-situ and real-time consumer generated data on domestic food preparation behaviour. To this end, an inventory of types of domestic food preparation data and data collection methodologies was conducted to fulfil the requirements of Task 6.1. A scoping exercise was performed with the aim of identifying the range of

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available domestic food preparation applications (apps) that collected user-generated data. The results of this exercise were evaluated and from this, 54 prototypical examples of domestic food preparation apps were identified and included into the RICHFIELDS Inventory Management System (RIMS). A report on Task 6.1 can be read in Deliverable 6.1. For the apps included in RIMS, a framework of Quality Criteria – developed for Task 5.3 – were applied. These Quality Criteria covered the four core areas; Descriptive Criteria, Scientific Criteria, Legal Criteria and Technical Criteria. A full list of the Quality Criteria can be found in Deliverable 6.3. The application of these criteria will be further discussed below in relation to the potentials and limitations of present and future data to answer key question on the determinants of domestic food preparation.

3. A TYPOLOGY OF DOMESTIC FOOD PREPARATION APPS

A typology of domestic food preparation apps was constructed based the definition of domestic food preparation (as set down in Deliverable 6.1) and as a result of the Scoping Exercise of domestic food preparation apps conducted as part of Task 6.1. The resulting typology can be seen in Figure 1.

The focus of the research was on domestic food preparation, i.e. food prepared for one's own consumption, or that of close others (e.g., family members), in the home or another non-commercial environment. Domestic food preparation encompasses a wide range of skills needed to feed people and includes specific elements of meal preparation (e.g. chopping, mixing, heating ingredients, understanding the language and terminology of recipes, following recipes, understanding measurements and cooking techniques) as well as knowledge of how to plan and budget for food and organise and plan meals that are acceptable to other household members (Stead et al., 2004) and be separated into two core skill sets; 'food skills' and 'cooking skills'.

Food skills can be defined in terms of two behavioural components, the precursors to the mechanical preparation and/or cooking of foods, namely 'planning and organisation' and 'food knowledge and understanding' (Fordyce-Voorham, 2009). 'Planning and organisation' are the skills are reflective of the decision-making process involved in domestic food preparation (McGowan et al., 2015), e.g. documenting and recording food, meal and/or menu planning, recipe management.

Food 'knowledge and understanding' includes the skills reflecting a person's need for information relevant to intended preparation behaviour or the reflection on a previously carried out behaviour (Stead et al., 2004), e.g. sharing knowledge and experience, searching for information. 'Cooking skills' can be described as a set of mechanical and/or physical skills used in the preparation of foods, such as chopping, mixing and heating; and encompass perceptual and conceptual skills, such as understanding how a food will react when heated (Short, 2003). The underlying goal or motivation of this behaviour is the actual preparation of foods for consumption.

The Level 1 of this typology reflects the specific domain of interest, that is, domestic food preparation. The second level classifies the domain into three constructs; planning and organisation (food skills), knowledge and understanding (food skills), and meal preparation/cooking (cooking skills). These constructs are said to be the 'antecedents' preceding the act of using an app. The results of the Scoping Exercise suggested that the primary motivation for using domestic food preparation apps was to develop one's food knowledge, skills and abilities.

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Level 1: What is the activity domain?	Domestic food preparation						
Level 2: What is the user aiming to do?	Planning and organisation (food skills)			Knowledge and understanding (food skills)		Meal preparation / cooking (cooking skills)	
Level 3: What is the user doing?	Documenting/ recording food	Meal/menu planning	Recipe management	Sharing knowledge and experience	Searching for information	Using apps as cooking aids	Interacting with sensors
Level 4: What is the recordable user activity?	e.g. shopping lists, pantry lists, fridge contents lists, expiration dates	e.g. meal plans (including daily, weekly, monthly plans); meal choices	e.g. recipe collections; user inputted recipes	e.g. 'favouriting'; bookmarking; reviews; ratings; sharing via social media	e.g. free search of recipe database, ingredient database; glossary terms; filtered searches (inc. meal types, special diet)	e.g. setting timers, measures and conversions	e.g. 'smart' kitchen equipment and appliances

Figure 1. *Typology of domestic food preparation.*

The 54 prototypical apps included into RIMS were classified according to this typology, these classifications can be seen in Table 1. For 48 (89%) of the apps, the motivation for use was classified as 'Knowledge and understanding' with 33 (61%) allowing the user to 'search for information', and 15 (28%) for the user to 'share knowledge and experience'. A further 53 (98%) were classified as having the 'Planning and organisation' as their primary motivation for use, of these 18 (33%) allowed the user to perform 'Recipe management', ten (18%), to perform 'Meal/menu planning' and 25 (46%) to carry out 'Documenting/recording of food'. A further 18 (33%) apps fell into the category of 'Meal preparation and cooking', within this classification, nine (17%) apps were classified as 'Interacting with Sensors', and nine (17%) apps 'classified as using apps as cooking aids.'

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Table 1. *The classification of domestic food preparation apps by motivation and behaviour.*

Tool name	Knowledge and understanding (food skills)		Meal preparation and cooking (food skills)		Planning and organisation (cooking skills)		
	Searching for information	Sharing knowledge and experience	Interacting with sensors	Using apps as cooking aids	Recipe management	Meal/ menu planning	Documenting/ recording food
8500 Drink and Cocktail Recipes	X				X		
Allrecipes Dinner Spinner		X					X
AnyList		X			X		X
Avocado Meal Planner		X			X	X	
BBC Good Food	X			X	X	X	X
BigOven 350,000+ Recipes and Grocery List	X				X	X	X
Change4Life Smart Recipes	X	X			X		X
Cocktail Making	x	x					
Cook With MandS	X	X			X		
Chronometer							X
Culinary Fundamentals – Cooking School	X						
Culinary Herbs and Spices	X	X			X		
Drinks and Cocktails	X	X					
Drop Recipes	X		X				
Epicurious	X			X			X
Escali SmartConnect			X				
Fat Flush Diet Plan and Meal Tracker	X						X
Fit Men Cook – Healthy Recipes	X					X	X

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Tool name	Knowledge and understanding (food skills)		Meal preparation and cooking (food skills)		Planning and organisation (cooking skills)		
	Searching for information	Sharing knowledge and experience	Interacting with sensors	Using apps as cooking aids	Recipe management	Meal/ menu planning	Documenting/ recording food
Food Science 101	X						
Food Intolerances	X						
Forage – free food from the wild	X		X				X
FridgePal			X				X
Glossary of Food Science Terms	X						
Grocery List						x	
HelloFresh	X	X				X	X
Jamie's Recipes	X				X		X
Kitchen Calculator PRO	X			X			
Kitchen Units: Unit conversion calculator				X			
KitchenPad Timer				X			
Let's Cook – Meal Preparation Timer				X			
LG Smart Range	X		X				
Lose It!	X	X				X	X
MealBoard Meal and Grocery Planner					X	X	X
Meal Planner Pal						X	
My Recipe Book	X	X			X		X
Oh She Glows	X				X		X
Paleo Food List	X						

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Tool name	Knowledge and understanding (food skills)		Meal preparation and cooking (food skills)		Planning and organisation (cooking skills)		
	Searching for information	Sharing knowledge and experience	Interacting with sensors	Using apps as cooking aids	Recipe management	Meal/ menu planning	Documenting/ recording food
Pantelligent			X				
Paprika Recipe Manager	X				X	X	X
Prep Pad for iPhone	X	X	X	X	X		
Recipe, Menu and Cooking Planner		X			X	X	
SITU Scale							X
Smart Diet Scale							X
Substitutions	X	X					
Tesco Groceries	X						
The Monash University Low FODMAP Diet	X						X
The Perfect Boiled Egg		X					
The perfect egg timer			X	X			
Time to Roast				X			
Top Chef University	X						
Vitamins Glossary	X	X			X		X
What's In My Fridge							X
Whole Foods Market	X				X		X
Yummly Recipes	X				X		X

Apps in in the category 'Meal preparation and cooking' represented by far the smallest proportion of apps currently available in the market place. Although, it is worth bearing in mind that the aim of the task was to identify the range – or variance – of apps currently available within this domain, rather than the depth of apps available in any one category. However, in contrast to the two food skills categories ('Knowledge and understanding' and 'Meal preparation and cooking'), the motivation for using 'Meal preparation and cooking' apps was to assist directly with the cooking – or physical food

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preparation – process. As such, this category includes apps, such as timers and also 'Smart' technologies found in the connection home. There are several possible explanations for this underrepresentation. One is that the partner technology – such as connected fridges or scales – is in its infancy, and so many people do not own or have access to these technology – thus they do not require an app. A further explanation is that many apps identified in this category do not collect user-generated data. That is, users are making use of these apps to assist with their cooking skills, such as an egg timer or temperature conversion app, but the apps themselves are not directly collecting any user-generated information and thus were excluded under the parameters of RICHFIELDS. In short, the user is using these apps in a similar way to a traditional stopwatch or book. Finally, users may simply just be motivated primarily to use apps in the pre-preparation process, rather than for the actual preparation of food stuffs.

The user-generated data is represented in the typology at Level 3. Analysis of the content of the apps has allowed for the identification of seven behavioural constructs. For example, a person's motivation may be to develop their planning and organisational skills, the app allows them to achieve this by providing a function for documenting and/or recording foods. This may be in the form of writing a grocery list of foods to purchase, or recoding expiration dates of foods already purchased. The resulting user-generated activity or 'data', is therefore a list of food items. This is conceptualised in Level 4 of the typology.

4. USER-GENERATED FOOD PREPARATION DATA AS DETERMINANTS OF FOOD BEHAVIOUR

Food choice and eating behaviour is complex and multifaceted, thus understanding the factors influencing our behaviour in relation to food presents a significant challenge for researchers. Given the importance placed on dietary change for population health it is essential that we better understand the determinants that affect food choice. We are hungry and so we eat. However, food choice and eating behaviours are unlikely to be simply explained by a simple biological factor. Rather there is a complex interplay of biological, psychological, social and economic drivers. For example, not all food choices lead directly to consumption. Decisions relating to the 'who', 'what', 'why', 'where', 'how' also need to be made. The Quality Criteria set down in Deliverable 6.3 therefore sought to evaluate the extent to which user-generated domestic food preparation data answers these basic scientific questions.

In their paper, Sobal and Bisogni (2009) propose a staged model of the processes involved in food decision-making. They put forward the stages as the 'acquisition', 'preparation', 'serving', and 'eating' of food stuffs. They further suggest that additional decisions need to be made surrounding the storage, giving away and throwing away of food. However, food decisions are not simply related to 'food stuffs' and in this respect they reflect the work of Bisogni et al., (2007) who advocate that food decision are dependent on a range of situational factors, such as location, social interactions, time of day and other actions. The decision is therefore not just 'what' am I going to eat, but with 'whom', 'where', 'how' and 'why'.

To add a further level of complexity, these drivers are unlikely to be static, rather they are driving choice and behaviour only at the current moment. Recently, an adept at the creation of a dynamic and interactive framework of determinants of nutrition and eating has been made. The DONE (Determinants Of Nutrition and Eating) framework has arisen out of work carried out by the DEterminants of Diet and Physical Activity (DEDIPAC) knowledge hub (Stok et al., 2017). The DONE framework identify determinants as falling into four broad categories, Individual, Interpersonal,

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Environmental, and Policy (Stok et al., 2017). Each of these categories have multiple sub-levels. Table 2 details our attempt to overlay user-generated domestic food preparation data types onto the DONE framework, so as to identify the potential and limitation of these data types for answering questions relating to determinants of nutrition and eating.

Table 2. *User-generated domestic food preparation data types categorised by the DONE Framework of determinants of nutrition and eating.*

Broad categories of derminants	Sub-categories of derminants	User-generated Data Types
Individual	Biological	Exercise [2]; IBS symptoms [1]; Body measurement [1]; weight goals [1]; body weight [1]; BMI [1]; Body composition [1]; Biometrics [1].
	Demographic	Email address [12]; Home address [8]; Name [7]; Phone number [7]; Financial information [6]; username and/or password [6]; photo/self-select image [2]; Date of birth [2]; Gender [2]; Postcode [2]; Delivery Address [2]; Location [2]; personal video [2]; social network handle [1]; online interactions [1]; IP address [9]; Device location [1].
	Psychological	Notifications [4]; Reminders [1]; cooking advice and instructions [7]; Database search [25]; shopping list [19]; favourite recipes [14]; Favourite food item [3]; filtered search terms [14]; eating patterns [3]; cooking technique/skills [1]; recipe directions [21]; food preferences [7]; Diet plans [2]; personal notes [5]; Meal Planning [8]; Recipe Management [8]; import recipes [5]; list of fridge items [3]; create pantry list [1]; saved Searches [1]; list of expire dates [1].
	Situational	
Interpersonal	Social	Social media network [10]; social media shares/emails [12]; Food Photo [2]; Posts [4]; Comments [4]; Recipe reviews [2]; Share experience via social media [2].
	Cultural	Cuisine [5]; Dish [2]; Occasion [44].
Interpersonal	Product	Ingredients [19]; product weight [5]; product volume [4]; visual properties [3]; brand name [3]; energy content [2]; food [2]; special diet [2]; allergy information [2]; availability [1]; storage conditions [2]; price [1]; food group [1]; vitamins [1]; Food description [4]; cooking temperature [4]; unit of measurement [2]; macro nutrient [2]; micro nutrient [2]; Enter food/ingredient characteristics [6].
	Micro	Geo Coordinates [1]; physical environment (other)[1]; Domestic Kitchen [1]; smart scales [5]; stored in fridge [1]; smart oven [1], Smart refrigerator [1]; GPS data [3]; Select Oven type [3]; Set timer [2].
	Meso/macro	Physical environment [1]; venue name [1]; Altitude [1].
Policy	Industry	
	Government	

Numbers in [ ] represent the number of apps capturing that user-generated data type.

The typology of domestic food preparation apps suggests that the primary motivator to engage with an app is to develop food knowledge, skills and/or abilities. The DONE framework (Stok et al., 2017) places these determinants at the level of 'Individual' and 'Psychological', thus the majority of user-generated domestic food preparation data types collect data at this level. Some examples of data types collected at this level include; 'meal-planning', 'recipe management', 'shopping lists' and 'databases searches'. Further examples of user-generated data collected at the 'Individual' are those categorised as 'Demographic' data types. Such data types include, 'email addresses', 'home

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addresses', 'data of birth, gender'. Individual Biological level data is also generated through app use, this increase details about 'body weight', 'BMI', 'Body composition', but also general health conditions, such as IBS. It should be noted that the recording of personal biological characteristics moves away from the primary motivation for using these apps – to develop food knowledge, skills and/or abilities. However, this 'gap' in user-generated individual and biological level data may be filled by information derived from the consumption apps studied in Workpackage 7. Here, the primary motivation for using an app is to record food intake. There is the potential for researchers to user-generated data from multiple app sources to create a picture of consumer food choice and eating behaviour.

Of the 54 prototypical app examples for domestic food preparation, not one generated user data relating to an individual's situation. As defined in the DONE framework (Stok et al., 2017), the determinants that would fall under the category 'Individual/Situational' relate to factors that impose constraints on an individual's consumption (e.g., access of a car, workload) and also wider health behaviours relating to eating. It is a key limitation of user-generated data, that it potentially tells you little about the individual's situation. It may be possible to derive inferences as to an individual's situation through the analysis of other information. For example, their meal plans may give you some indication as to their ability to access food, or the time they have available for food preparation. However, these are merely guesses on the part of the researcher. Again, as this classification relates largely to consumption, it may be that user-documented food consumption data (see Maringer et al., 2018) would give a better indication of an individual's personal situation.

There is a similar issue for user generated 'Interpersonal' data. Specifically, data at the 'Interpersonal/Social' level. The prototypical apps collect data related to social media use and an individual's interaction in an online environment (e.g., social media network, social media shares/emails, posts, comments, reviews). However, no information is collected as to an individual's family structure, or the socio-economic status of a household. Again, analysis of certain aspects of the user-generated data – such as meal plans – may reveal information relating to the make-up of a household or its socio-economic status. The apps do however collect some user-generated data potentially relating to cultural food customs. For example, data is collected on the type of cuisine, the dish and occasion – that is, whether the food is being prepared for an event such as Christmas, Easter, a birthday, or a drinks party.

The Environmental category at the product level is well represented. For example, user-generated data is collected about ingredients, product weight, product volume, nutritional value. However, again data relating directly to the micro environment – home environment – is limited. The DONE framework (Stok et al., 2017) would suggest that determinants in this area relate to the availability and accessibility of food in the home, the meal environment and portion size. It is possible that some of this information may be derived from the analysis of other data. Also, this data may be present in the apps sourced in Workpackages 5 and 7. Nevertheless, it remains a gap in the data that researchers may need to consider alternative sources of information to complement the existing data.

None of the apps analysed collect policy data, whether in relation to industry or government. This may limit researchers in drawing conclusions as to the influence of regulation on food choice and eating behaviour.

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5. AVAILABILITY AND ACCESSIBILITY OF INFORMATION

The quality criteria set down in Deliverable 6.3 were applied to each app in RIMS. The entered responses were derived from publically available information about the app. In most instances this was the companion website to the app, although information was also sought from the app store's metadata, terms and conditions documents and privacy statements. It was considered an important constituent of the exercise to discover the extent to which information about the apps could be derived from publically available sources and thus in instances where the quality criteria could not effectively be answered it was decided not to seek additional information directly from the company or app developer. In short, the public availability of the information is in and of itself an important quality criteria. However, only 32 (64%) of apps were found to have a companion homepage/website. Of those that did have a homepage/website, contact information was provided for 23 (71%) of the apps. For those apps that did have a website, 18 (56%) provided 'terms of use' documentation and 23 (71%) provided a 'privacy policy'. Of those apps that provided details regarding terms of use, nine (50%) indicated that the data was owned by the vendor and three (16%) by the users.

There are further gaps in the availability and accessibility of information. For example, for on four (8%) of apps was data collected by the app directly accessible via the apps existing infrastructure. For 11 (22%) the data was not accessibility, but for the majority of apps, 35 (70%), no information was publically available regarding the accessibility of the data.

6. CONCLUSION

The current growth in the use of mobile technology and specifically app use, makes this an important and interesting time in terms of the potential for this data. If researchers are able to again access to user-generated Big Data sets through infrastructures such as the RICHFIELDS RI, it emanates many of the problems traditionally associated with research. However, with it comes a new set of problems that have to be considered.

The primary motivation for using domestic food preparation apps is to develop personal food knowledge, skills and/or abilities. This opens up the potential to answer questions relating to Individual Psychological determinants, such as food beliefs, habits and self-regulation in relation to food. However, the limited availability of contextual data, such as that at the 'Individual/Situation', and 'Interpersonal/Social' levels, means that much of this data is detached from the user. Researchers intending to use this data will have to carefully consider the degree to which additional contextual information is required to draw conclusions. The interconnectedness of the apps presents new opportunities to further enrich the collected data from external sources. There is the potential to create 'links' between multiple app usages from a single user. For example, it may be useful to gain domestic food preparation specific information from dedicated apps, and enrich this with demographic, situational and social context data collected through apps such as Facebook, Twitter and Instagram. However, the degree to which users would find this interlinkage acceptable still needs to be investigated. It should be noted that to date this type of data has been used to study food consumption patterns, e.g. Twitter (Abbar et al.2014; Fried et al., 2014) and Instagram (Mejova et al., 2015; Sharma and De Choudhury, 2015).

A further point to consider with user-generated domestic food preparation data, is the degree to which it can act as a 'proxy' for intake. The data collected via app usage reflects the motivation to gain knowledge and to develop skills. The degree to which this is translated into intake cannot be directly drawn from the data in its current form. At best, it describes an 'intention' to intake certain

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foods and/or meals. Again, it is possible to link data from the consumption apps identified in WP7 and map food choice and eating behaviour from preparation through to consumption. Although, a protocol for performing such exercises still needs to be developed.

Finally, the availability and accessibility of the user-generated data for use in the RICHFIELDS RI still needs to be established. It is essential that legal and technical experts work with the RI to ensure easy and cost effective access to multiple big-data sets for the RICHFIELD end user.

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