

FOOD AND SOCIETY **PROCEEDINGS**

CARDIFF 27 - 28TH JUNE 2019



11th International Conference on Culinary Arts and Sciences

EDITED BY

Adriana Snae, Claire Haven-Tang, Darryl Gibbs & Caroline Ritchie

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PREFACE

The concept of an International Conference on Culinary Arts and Sciences (ICCAS) was initiated in 1993 when the Worshipful Company of Cooks of London established a Centre for Culinary Research at Bournemouth University as a forum for culinary artists and scientists from academia and industry to present their work and share ideas.

The first ICCAS was held at Bournemouth University in 1996 since when a total of ten ICCAS conferences have been held around the world in countries which include England, Egypt, Sweden, Norway, Portugal, the USA and Denmark. It remains the only international conference whose key aim is to bring together the two sides of the international food industry; food sciences and food services.

This, the 11th ICCAS, is being hosted by Cardiff Metropolitan University, specifically the Welsh Centre for Tourism Research (WCTR) in conjunction with the ZERO2FIVE Food Industry Centre. WCTR has expertise in the areas of hospitality and frontline food service sector operations whilst ZERO2FIVE specialises in food manufacture, new product development, food safety and food science.

The conference theme, *Food and Society*, reflects the key role the food and drink industries play in society. In Wales, for example, the 2017 Welsh Government economic action plan, *Prosperity for All*, is based on four foundational sectors, two of which are food and tourism. These are recognised as being crucial to the lives of people and communities across Wales and are instrumental in creating long-term sustainable local economies and a more hospitable society.

Reflecting the theme of food and society our Keynote speakers are *Chris Moore*, Chief Executive of The Clink Charity, and *Lynne Regent*, Chief Executive Officer of the Anaphylaxis Campaign. The Clink Charity's sole aim is to reduce the reoffending rates of ex-offenders by training prisoners and placing graduates into employment in the hospitality and horticulture industries upon release; whilst the Anaphylaxis Campaign, the only UK-wide charity focused on supporting those at risk of severe allergies, aims to create a safe environment for all people with allergies by working with and educating the food industry, schools, pre-schools, colleges, health professionals and other key audiences. We will also hear from *Katie Palmer*, Programme Manager for Food Sense Wales.

As is usual with ICCAS conferences we work hard to ensure that all the conference proceedings are available to delegates at the time of the conference. We know that this does mean very tight deadlines for all of the authors and we would like to thank you all for your co-operation in submitting your full papers, abstracts and poster abstracts. We hope that many of these submissions will form the basis of papers which will be published at a future date in academic journals. We would also like to thank all those who have sponsored this conference, particularly the *Worshipful Company of Cooks of London* and *Make UK* (formerly known as EEF: Engineering Employers Federation).

However, a conference such as ICCAS does not happen without a lot of hard work being undertaken by many whose help is not obvious. We would like to thank Adriana Snae, without whose administrative skills as conference secretariat, this event would not have been possible; along with Ed Gilbert, whose marketing and technical prowess have been second to none! Andrew Thomas is another valued Cardiff Metropolitan University colleague who has been

unwavering in his support for ICCAS 2019. In addition, we'd also like to thank Cardiff Metropolitan University for hosting ICCAS 2019, the Welsh Government, Lesley Griffiths AM, in particular for hosting the Welcome reception in The Senedd and the tourism team at Meet in Cardiff.

Last, but not least, we'd like to extend thanks to our former colleagues, Caroline Ritchie and Andy Roberts, without whom ICCAS would have never found its way to Cardiff and neither would you! Enjoy the conference and the delights of the National Capital City of Wales!!

Claire Haven-Tang
Welsh Centre for Tourism Research
Cardiff Metropolitan University

CONFERENCE CHAIR

Dr Claire Haven-Tang
Welsh Centre for Tourism Research, Cardiff Metropolitan University

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We would like to thank the members of the International Scientific Committee for their hard work in assisting the local Organising Committee in reviewing all the conference submissions and for participating in the judging of the best full paper and best poster awards.

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FOREWORD



The Worshipful Company of Cooks of London is one of the older London Livery companies tracing its origins back to the 12th century. It was founded from two guilds of Cooks in mediaeval London, the cooks of Eastcheap and the cooks of Bread Street. Their first charter was issued in 1482.

Initially the Company was responsible for controlling all the catering trade within the 'Square Mile' but today the Company is no longer an association of tradesmen in its original controlling sense. Our present membership continues to include craft tradesmen, while the Company engages actively with a broad range of organisations and charities associated with cooking. Thus, the Company's purpose in contemporary times has come to rest in a public search for the common good, to contribute as affectively as it can, to the pursuit of a good society - to be socially useful. This we have done and will continue to do by awarding charitable grants and engaging in other activities in the pursuance of cookery and catering in their widest contexts.

We have been associated, through sponsorship, with The International Conference on Culinary Arts and Sciences from its inception and we are once again pleased to be able to sponsor this 11th conference. Earlier this year I attended the City Food Lecture – *Trust & Tech – the future of food* and the City University Food Symposium – *How to develop and deliver a national food policy; a global perspective*. I am particularly looking forwards this conference – *Food and Society*. I am sure it will stimulate some interesting debate when perhaps viewed against the trends of grazing and eating on the move, rather than sitting down around a table and perhaps sharing concerns or celebrating success!

We would like to thank Cardiff Metropolitan University and the conference organisers for taking on this task but also the Delegates for their wide range of thought and contribution without which none of this would happen.

As Master of The Worshipful Company of Cooks, I am delighted and honoured to be included in your conference. I wish you all an enjoyable and successful time and I look forward to meeting as many of you as possible over the next few days

Marcus R Appleton FIH
Master
The Worshipful Company of Cooks of London

SPONSORS & EXHIBITORS



Supporting people at risk of severe allergies



KEYNOTE SPEAKERS

Chris Moore

Chief Executive of The Clink Charity

Today's challenge is that there are 84,000 adults in prison in the England and Wales; 80,000 men and 4,000 women. Sadly, 48% of prisoners released reoffend within the first year of release and if their sentence is less than 12 months this figure rises to 66%. Reoffending sadly costs circa £15bn a year. The hospitality industry is the third largest employer in the UK and it makes up 9% of all UK jobs and there is currently a huge skills shortage. By training and equipping serving prisoners with key skills and qualifications in hospitality or horticulture The Clink Charity has been able to achieve one of the lowest reoffending rates in Europe and provide a credible solution to the skills shortage. By transforming the lives of prisoners (Clink graduates) it not only benefits them but also their families and victims of crime and society as a whole by reducing crime rates and encouraging meaningful employment. We are proud that alongside our partner, Her Majesty's Prison and Probation Service, we continue to achieve extraordinary outcomes, meeting our key objective of reducing reoffending. We do this in an economical way, while delivering our core values of compassion, professionalism and integrity, in an environment that can sometimes seems bleak, with so many daily challenges. The Clink changes attitudes, transforms lives and creates second chances and we have demonstrated what can be achieved when society collectively engages to help those who want and deserve a second chance.

Chris Moore has over 25 years' experience in the hospitality industry and focuses on increasing awareness of the work and skills being developed at The Clink Restaurant as well as securing support from the industry and finding the necessary funds for expansion. Chris also sources knowledge and industry skills that can be passed on and shared with the trainees.

Katie Palmer

Food Sense Wales

Peas Please is a UK collaboration between Food Foundation, Food Sense Wales (Food Cardiff), Nourish Scotland and WWF. The Peas Please initiative aims to make it easier for everyone in the UK to eat more veg by working with actors from across the food system. Taking a food system approach means working at every step of the food chain, from production to consumption. For veg, this means looking across from production (growers) to retailers, manufacturers, food service outlets, caterers, government, local authorities and more. Reducing waste in the system is also an important part of helping everyone in the UK eat more veg. Of all the veg purchased, 40% is wasted through the household and an additional 10% is wasted in the supply chain (WRAP 2018).

Lynne Regent

Chief Executive Officer of the Anaphylaxis Campaign

Living at risk of a severe allergic reaction has practical, emotional and physical implications. The food industry, the health service and wider society can all help to ease the burden with the right education and awareness. The Anaphylaxis Campaigns brings together all these sectors to bridge the knowledge gaps with the aim of creating a safe environment for those with severe allergies.

Lynne Regent joined the Anaphylaxis Campaign as Chief Executive Officer in 2008 after nearly 30 years working in the NHS, ultimately as Chief Executive of Crawley Primary Care Trust. As CEO, Lynne ensures the Anaphylaxis Campaign achieves its objective to support people at risk of severe allergies. She is also involved with several organisations; acting as Co-chair of the National Allergy Strategy Group (NASG), committee member of the Patient Organising Committee for the European Association of Allergy and Clinical Immunology (EAACI) and committee member of the International Food Allergy and Anaphylaxis Association (IFAAA). During 2013-2017 Lynne led the UK patient group involvement in iFAAM – the largest ever European-wide study of the severely allergic population, examining an integrated approach to food allergens and risk management.

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The reporting of food fraud by daily printed media: the Portuguese case study

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Keywords: Daily newspaper; food fraud; food safety; Portugal

Introduction

At the very least, it is obvious that media coverage of risk is selective: not all risks can be in the news all of the time. Ideally, the media plays the role of intermediary, facilitating communication among various societal stakeholders and providing counter viewpoints from different sides of a debate. Likewise, it can be viewed as a vehicle for informing the public on scientific nuances and complexities of the food safety system. However, journalists and press editors adjust the story frame to their ideology, professional and knowledge limitations, as well as to time and space constraints¹. Likewise, through framing, media highlight certain points of view and marginalize or ignore others, defining occurrences and explaining how they are to be understood². Writing about science and technology can thus emphasize scientific facts, their socio-political implications, environmental risks, and human health concerns³. Likewise, food fraud may be under the attention of the media because the food fraud phenomenon is growing as the food chains become more diverse and more global to meet the demands of growing urban populations⁴.

Food fraud is a broader term that encompasses the deliberate and intentional substitution, addition, tampering or misrepresentation of food, food ingredients or food packaging; or false or misleading statements made about a product, by food producers, to retailers, passing through processors and distributors, all this for economic and financial gain⁵. Although the scale of the food fraud phenomenon is not clearly known, it is estimated to have an associated global economic cost of €44,690 million per year⁶. In the Europe Union (EU) according to the EUROPOL 2013 report on The EU Serious and Organised Crime Threat Assessment (SOCTA), there are 3,600 groups of organized crime assets that have particular interests in the food area⁷. Although the cause or motivation is economic or financial, food fraud may lead to serious public health risks, since the types of contaminants used by the criminals are unconventional and may only become known once encountered⁵. Moreover, standard food safety and food quality assurance systems are generally not developed to detect new adulterants, representing the mitigation of this phenomenon a challenge for the food industry and regulators⁸.

In the EU context, there is not an exact definition of “food fraud”⁹. For each EU Member State, there are national laws that provide various definitions for these evidences that represent a certain type of violation of statutory agri-food chain requirements¹⁰. Following the EU statement, in Portugal, food fraud or deceptive practices and the adulteration of food by economic motivation fall within the scope of article 8 of Regulation (EC) 178/2002 of 28/01¹¹, referred to as “General Food Law”. In this context, it is understood as fraudulent practice the fraud on goods namely the intention of deceiving the business relationships by those who produce, import, export, has on deposit or exposed for sale, sell or put into circulation counterfeit foodstuffs, making them pass as authentic, different in nature or quality and quantity lower than that affirmed, or appear to possess¹⁰. It is understood as the adulteration of food: the

existence of cases of abnormality, susceptible or not to create danger to life or health and physical integrity when they are concerned counterfeit foodstuffs, through addition, subtraction or replacement, partial or total, of substances or ingredients, provided by economic motivation and specific legislation concerning certain foodstuffs (Table 1). The aim of this exploratory study was to characterize the nature of the reporting of food fraud in news from the major daily Portuguese newspapers.

Table 1. The Food Fraud Framework

Type	Definition	Example
Adulteration	Adding to a foodstuff a substance/ingredient from such a food constituent without altering the characteristics of the food	Honey adulterated with sucrose
Falsification	Intentional substitution or addition of a substance in a product for the purpose of increasing the apparent value of the product or reducing the cost of its production	Addition of colza oil in olive oil
Mislabeling or misrepresentation	Misrepresenting country of origin, ingredients, so on	Undeclared allergens
Food counterfeiting	Illegally exploits reputation, quality or other characteristics associated with certain trademarks, otherwise protected trade names and geographical indications (PDO, PIG, organic, craft)	Cheese marketed as PDO, not being produced in the region and/or without the proper certification
Clandestine slaughter	Slaughter not authorized	Slaughter of animals in plant without licensing and/or without official sanitary inspection

Adapted from: European Union¹¹; Portuguese Ministries of Justice, Health, Agriculture, Forests and Food, Trade and Tourism¹²

Methods

Two daily newspapers were selected from the Portuguese press: *Jornal de Notícias* (JN) and *Diário de Notícias* (DN). Both newspapers, from the same group – the Global Média Group¹³, have national coverage with transversal contents for the entire population but having the North (for JN) and the South (for DN) of the country as their main region of influence. Their selection was based on the following criteria: i) the profile of the readers, in order to assure that readership would represent Portuguese society; ii) the daily sales so that the requirement of a wide readership would be fulfilled – JN and DN are two of the four daily newspapers of generic scope with the highest circulation (compound average circulation of over 100,000 units per day)-; and iii) the accessibility of their databases during the specified research time. The present study refers to the newspapers published from 1 January 2002 to 30 September 2017, as the Global Media Group database has been available since 2002. The search for food fraud news on the Global Media Group database was made using specific keywords according to the literature review and the most recent trends in food fraud in order to avoid possible mistakes and omissions¹³: “food fraud”; “foodstuff fraud”; “contaminated food”; “food contamination”; “ASAE food” (ASAE- Economic and Food Safety Authority); “fake food”; “counterfeit food”; “adulterate food”; “fraudulent practices”; “mislabeling and consumer deception”; “illegal

labelling”; falsification of PDO certificates; “illegal use of PDO brand”; “Portuguese Economic and Food Safety Authority and food fraud”; “Portuguese Economic and Food Safety Authority seizes fake foodstuff; “ASAE seize meat”; “ASAE seize fish and fish products”; “ASAE seize olive oil”; “ASAE seize wine”; “clandestine slaughter”; “horse meat”; “nitrofurans”; “illegal wine”; “contaminated eggs”.

Subsequently, the articles referring directly to food fraud were isolated and content analysis was conducted¹⁴ as a way to identify the same categories from the different news. Table 2 describes the methodological framework used in the content analysis, following Rowe, Frewer and Sjoberg¹⁵ approach. The type of food fraud and the food hazards were codified by the authors’ triangulation, using this framework.

Table 2. The Content-Analysis Framework used for assessing the Newspaper Reports on Food Fraud

Categories	Description
Newspaper name	i) Jornal de Notícias; ii) Diário de Notícias
Article code	Code given to the article
Article heading	Heading of the article
Article writer	Name of the journalist(s)
Date of publication	Year, month, day
Page number	Page in which the article was referred:
Number of words (article size)	i) Small (1-300 words); ii) medium (301-600 words); iii) large (601-900 words); and iv) extensive (900+ words)
Resources	Presence of complementary information to the written text in the news: i) Photo; ii) Image; iii) Graphic; iv) Table; v) Scheme
Potential hazard	i) Biological; ii) Chemical; iii) Technological
Food category	Food categories mentioned in the articles related to food fraud
Country	Countries mentioned in the articles
Type o food fraud	Table 1
Content of the article	i) Reassuring (reassuring statements); ii) Alarming (alarming statements); iii) Informational (informational statements); iv) Uncertainty (statements described as unknown)

Adapted from: Kehagia and Chrysochou¹⁶; Rowe, Frewer and Sjoberg¹⁵

The results of the content analysis were illustrated in a Microsoft Office Excel® matrix, which was filled in for each article separately and answered in such a way that would offer information ready for processing. For the analysis of results, descriptive statistics were applied, using frequency tables and different graphical representations, seeking a systematization and adequate synthesis for the results.

Results

The nature of food fraud reported

The analysis of the news of these two newspapers revealed a total of 108 articles related exclusively to food fraud during the period from January 1, 2002, to September 30, 2017. Annual frequencies of such news, during the fifteen-year period, were distributed without sharp variations. However, food fraud news drew more attention during the years of 2003 and 2013, corresponding to the nitrofurans in Portuguese poultry and the horsemeat crisis, respectively. Additionally, other food fraud news peaks were observed, more specifically for the years 2006, 2007, 2008, and 2015.

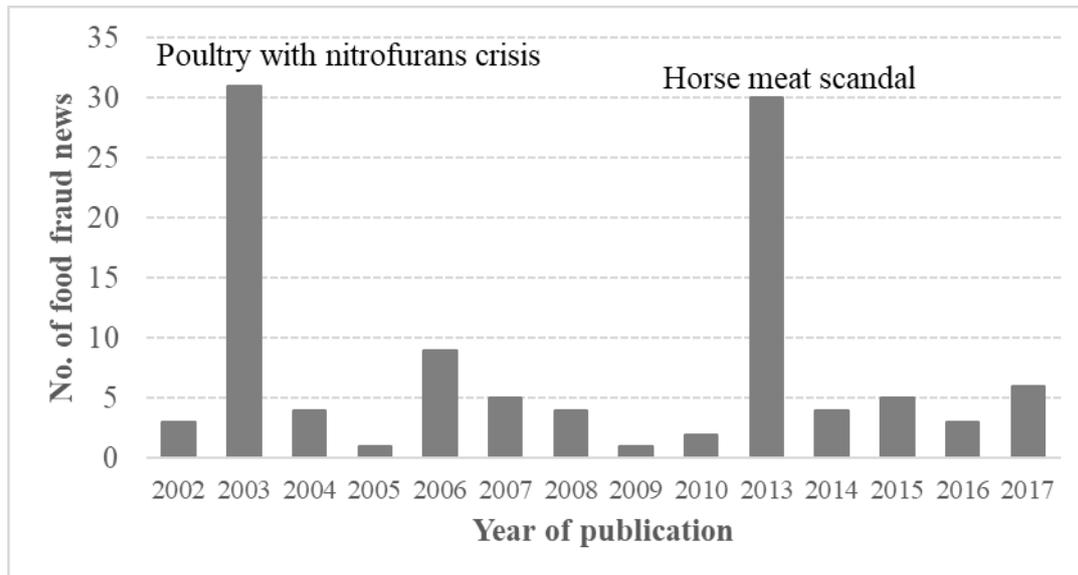


Figure 1. Annual frequency of food fraud related news at JN and DN newspapers, from 2002 to 2017

The food fraud news peaks observed for the period 2006-2007 may be explained by the fact that ASAE (the Portuguese Economic and Food Safety Authority) was created in 2005¹⁷ and these news peaks may be related to the inspections carried out by this public organism. The 2008 peak is related to the melamine addition (a chemical intermediate used in the manufacture of amino resins and plastics used as a monomer and as an additive for plastics) to infant milk and other dairy products, in China in the summer of 2008, to artificially increase apparent protein contents¹⁸. The more recent peak, observed in 2017, is associated with the coverage of the illegal use of fipronil in poultry farms resulting in contamination of eggs and poultry meat¹⁹ (Figure 1). As a result, meat, more precisely, poultry, pig, beef, and horsemeat were the food products more covered on the selected news (Figure 2).

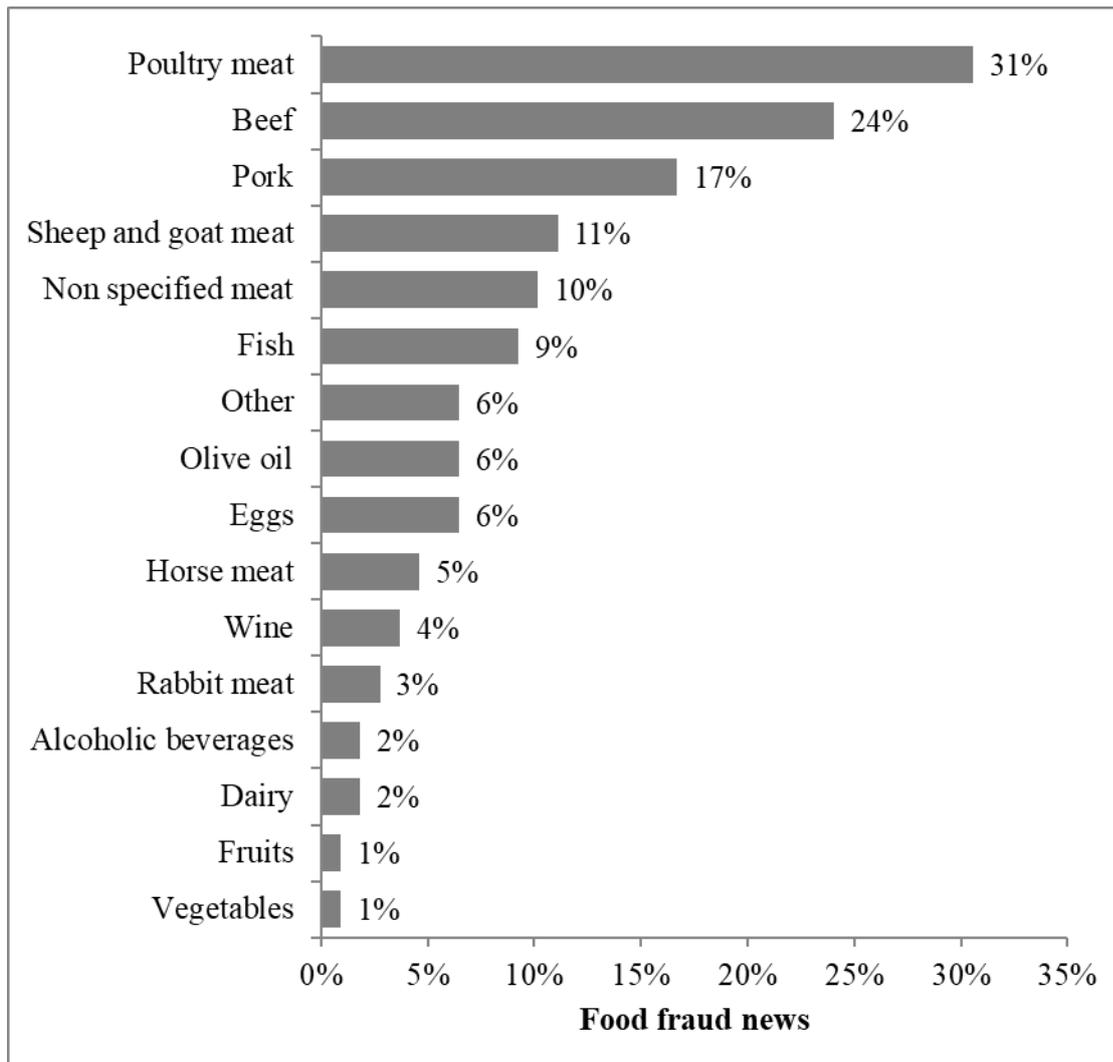


Figure 2. Frequency of news reporting food products associated with food fraud from identified and reviewed articles (n=108)

In the same way, the more extensive food fraud type was related to falsification, followed by clandestine slaughter for public consumption (Figure 3). This could be explained by the fact that these two food fraud types are related to the meat product category, like the intentional addition of sulphites to meat poultry to give the appealing red meat colour (Figure 4). On the other hand, wine is more related to false claims and non-declarations, and fish with adulteration (for instance, over treating frozen fish with ice).

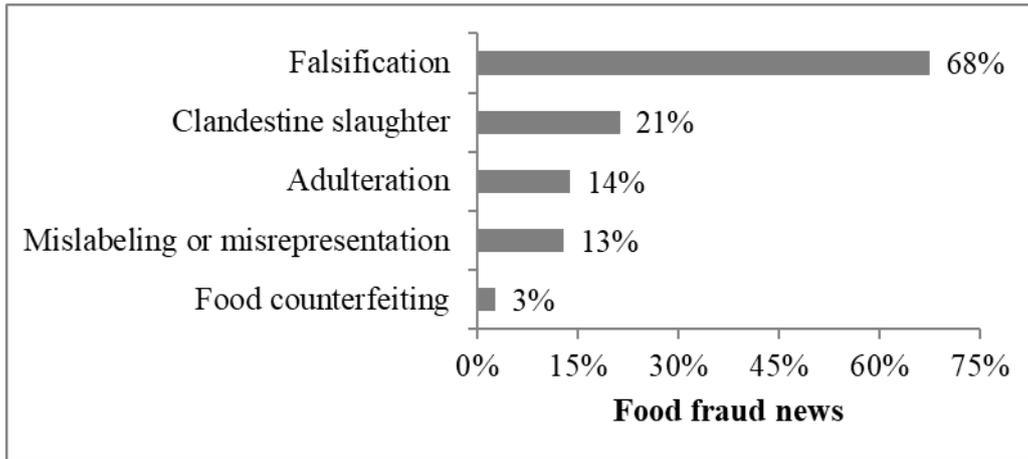


Figure 3. Food fraud type associated with food fraud covered in the news for the period 2002-2017 (n=108)

Additionally, chemical hazards (e.g. sulphites, nitrofurans, phenylbutazone) were most widely covered food hazard related to food fraud with a total percentage of 44%, followed by technological hazards (e.g. fraudulent food labelling wine, the horsemeat in ground beef or add refined oil to extra virgin olive oil) and biological (e.g. lack of safe raw food handling practices or clandestine slaughter for public consumption).

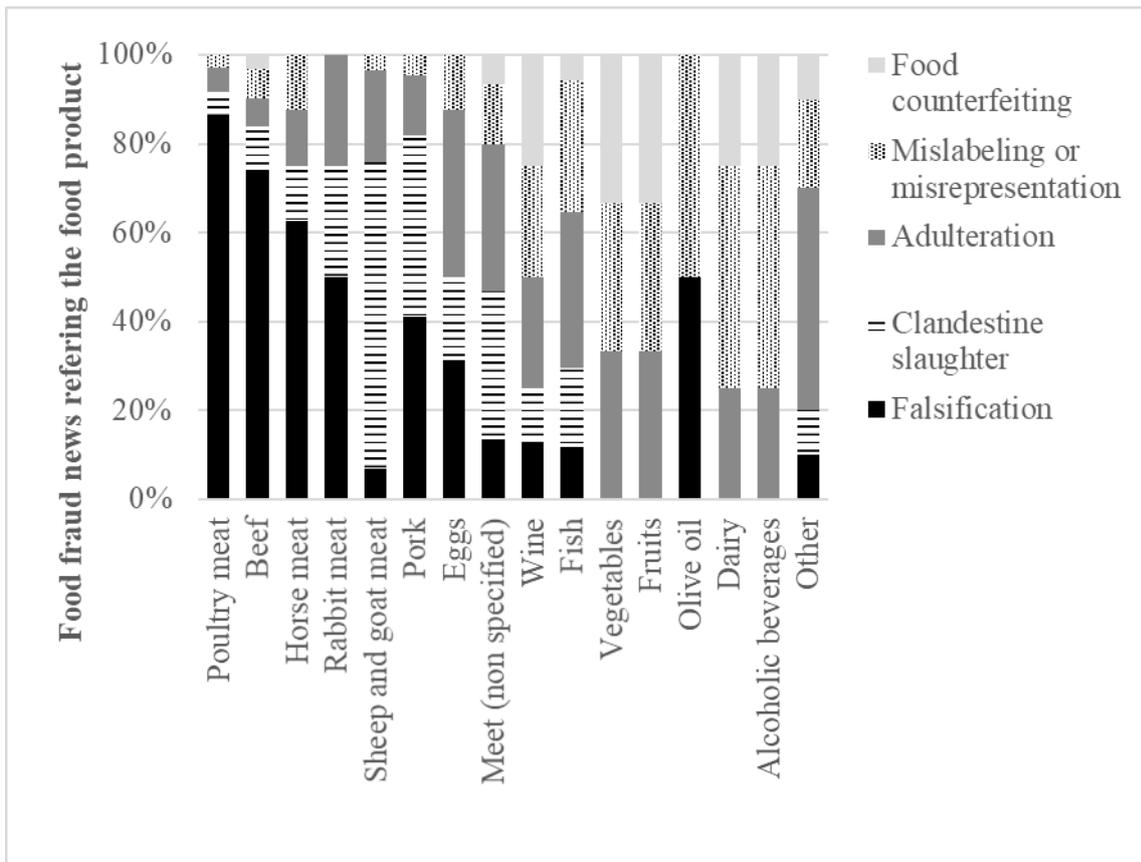


Figure 4. Food fraud type according to the food product category

Quantity and location within the newspaper

Regarding the articles' size, most were of medium or small size (Figure 5). Among the newspapers, DN articles were more extensive compared to the JN newspaper, whereas 29% and 37% of the articles were classified as medium and large size compared to 36% and 51% of the JN articles classified as small and medium-size respectively. Moreover, they were not placed in prominent positions (cover and first pages) within the newspapers: only 6.8% of the JN covers were related to food fraud and none of the food fraud news of the DN newspaper were positioned on the front page. Greatest coverage was in the home-news pages: first pages for the JN newspaper and intermediate pages for the DN newspaper. This may be in accordance with the JN newspaper editorial in the sense that it is a more “popular” newspaper compared to DN, which qualifies as a “quality” paper²⁰.

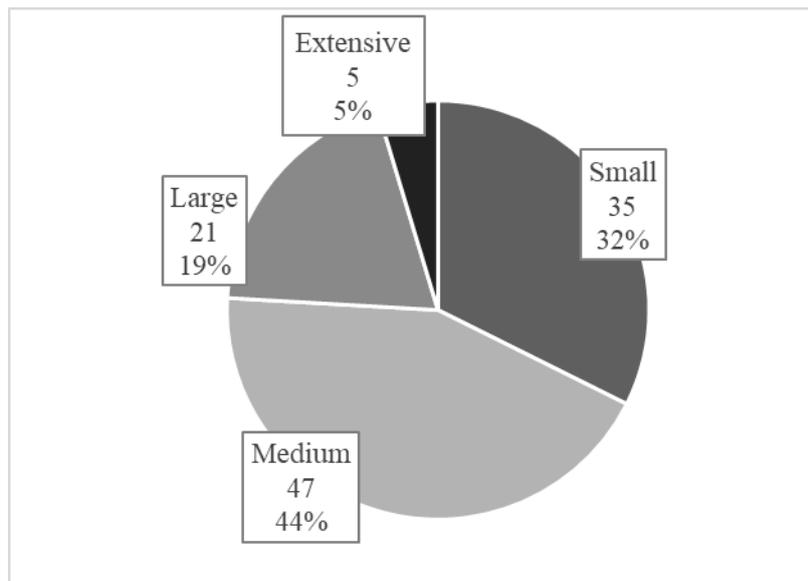


Figure 5. Size of articles reporting food fraud (n=108)

Nevertheless, food fraud news were accompanied with other visual elements, like photos and images (of food products related to food fraud or of the food fraud agent), tables, and schemes in order to keep the attention of the audience and offer additional information (Figure 6). More than 80% of food fraud news of our sample use these visual elements. Regarding their content, all the articles had some form of informative content, while 56% aimed to alarm the public about the food fraud problem in the food chain. Uncertainty statements made up around 27%, while reassuring ones 23%. Among the countries mentioned in the articles as the geographical location of food fraud, Portugal came first (64.5%), followed by Europe (16.5%) and other or non-identified countries (19 %).

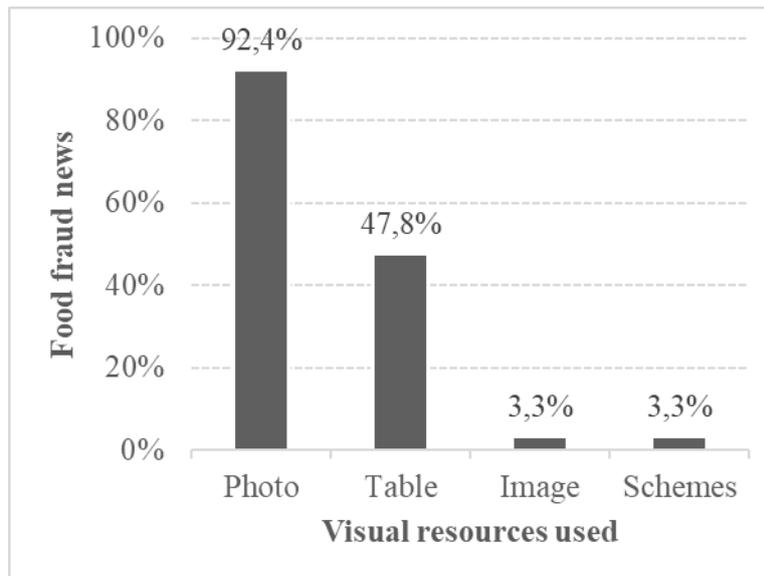


Figure 6. Presence of visual resources in food fraud news (n=108)

Discussion

From the present analysis, it is clear that food fraud can be considered to have been sufficiently covered by the Portuguese newspapers. Even though food fraud news were covered during the fifteen-year with periodic coverage, they had lower frequencies than other news. Nevertheless, two peaks were also observed for the period 2002-2017: the nitrofurans in Portuguese poultry (in 2003) and the horsemeat crises (in 2013), reinforcing the effect of acute and brief media on the coverage of food fraud²¹.

In fact, during 2002–2003, nitrofurans residues were detected in Portugal in poultry meat, despite nitrofurans, a veterinary drug used in the poultry industry for their broad antimicrobial activity, were banned from use in food animal production in the EU area, in 1993, due to its genotoxic and carcinogenic properties²². This crisis created a serious economic impact with a reduction of 30% of the production of the poultry industry²³, whereas 1.5 million birds were destroyed and over 250 tons of poultry meat was removed from the market²², with a huge impact on the newspaper coverage.

Moreover, the discovery of products across Europe, such as burgers and lasagne, labelled as containing beef and found to contain 80% 100% horsemeat, by substituting one product for another, triggered another food crisis: the horsemeat scandal. It was a viral social subject for the media²⁴ and led to different opinions in point of technical approach and scientific information access²⁵. Although the horsemeat incident involved a fraudulent labelling and ultimately did not affect food safety or public health consequences, initial concerns about potential health risks due to phenylbutazone - a veterinary medicinal product whose use in food-producing animals (including horses) is illegal, resulted in a substantial expenditure of public resources over the course of the investigation²⁶. Such cases erode consumer confidence and may cause other concerns for a variety of societal or cultural reasons²⁷. In fact, the European Commission (DG Santé), since July 2013, and after the horsemeat crisis, created the European Food Fraud Network for food fraud suspicion, to facilitate exchanges of information between Member States²⁸.

As a result, the more extensive food product covered in the news for the period in analysis, as well as the food fraud type (falsification is very demarcated) and risk hazard (chemical and

technological hazards) announced on the selected news were related to these food fraud peaks: nitrofurans in poultry and the horsemeat scandal. The interest for these issues becoming part of the media agenda can be explained by the fact that they have all the elements to make a good story²⁹: they revealed illegal facts and exposed agents (fraudsters) that deliberately deceive the consumers for an economic gain⁵. Moreover, consumers feel that they cannot protect themselves, and the act/hazard itself is perceived to be under societal, rather than individual, control³⁰. This may explain the nature of the article content used for the food fraud stories: informing about the incident and the potential risk for the public health and sometimes simultaneously alarming the audience.

Moreover, it was also shown that the use of other visual elements, especially photos were widely used in the two newspapers of the study, probably in an attempt to catch the public attention and emphasize the relevance of these news. The use of these artefacts makes food fraud information more noticeable, enhancing the probability that the audience will perceive that information, discern its meaning and store it in memory²⁹.

Reference to food fraud was not limited to national geographical boundaries and the EU and other countries were also referring, despite the number of articles referring to Portugal were higher. This reinforces the fact that food fraud is a global phenomenon. Within a more interconnected world, food fraud can occur at any point from the production process to the import/export process, to the purchase point⁵. Nevertheless, the vast majority of the food fraud news dealt with food fraud conducted in Portugal. This could be explained by the fact that the audience is generally more interested in events that are relevant to the community in terms of geographical and/or cultural proximity³¹. Taking into account the results of this research, the next step is to analyze in-depth the article contents, in order to identify the dominant meaning of the messages.

Acknowledgements

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Meeting the Challenges of Care Home Catering for People Living with Dementia: The Sex 'n' Drugs and Rock 'n' Roll Generation

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Introduction

I hope I die before I get old! There is no doubt that many Baby-Boomers will be pleased not to have fulfilled "The Who's" death wish just yet. This might have been a familiar cry in years gone by but now, with the rapidly increasing life expectancy of the Baby-Boomer generation and their greater demands and expectations, the ageing population of a far more rebellious, active and demanding cohort of men and women have more to look forward to. They have paid their dues and taxes and will in future expect the levels of service they have become accustomed to as they enter the later stages of life, perhaps ending their years in residential care homes or a long term care home for the Elderly and Mentally Impaired (EMI), in other words, those living with the "bastard disease", otherwise known as dementia and Alzheimer's Disease.

The first waves of the Baby-Boomer generation are already in their mid-sixties to seventies² and it should be recognised that many of the current, and near future, intake of care home residents will be from the Baby-Boomer generation, rather than the stoic generation who had survived the privations of World War II, rationing and sacrifice. It will probably be no surprise to many that the rock legend Robert Plant is now 70 and Pete Townshend is already 73. The expectations of the coming generation are far higher with an ingrained sense of entitlement, with food being a major component in residents' health and happiness³. This sense of entitlement may well prove to be a major challenge, requiring a significant paradigm shift, to future care home management, staff and caterers⁴. The Baby-Boomers have been the trend-setters, living different lives than their parents. Many embraced drugs, sex, rebellion and thought little of attending drug fuelled rock and roll concerts and music festivals. Does that ring a bell with you?

Within the last decade there have been many reports in the media regarding the often poor standards of food, hydration and service in long term care homes⁵. Many long term care homes are now outsourcing their catering requirements to specialist catering companies. The commercial companies have to make a profit and the not-for-profit or community interest companies have to limit their losses and hopefully return a surplus. There are also many companies now promoting their ranges of ready-made, frozen, ready to heat, convenience foods, some of which, whilst fulfilling a gap in the market, can hardly be considered the production of the finest culinary artists. How can the quality of Food and Beverage (F&B) Services be improved, whilst maintaining a healthy Profit and Loss (P&L) account? Under current market and financial pressures there is little room for manoeuvre in costs and every caterer is under constant threat from competitors eager to take away business⁶. The current research is part of an ongoing study to develop a framework for delivering improved nutrition for long term care home residents through resident centred hospitality and culinary care provided by the catering production and hospitality service delivery staff.

The dietetic and nutritional concerns for the elderly and frail residents of long term care homes have been well-documented and studied for many years, and in significant depth⁷. The various journals related to nursing, dietetics, nutrition, geriatric care and clinical care all have their sections on improving nutrition for people living with dementia. The rôles of the catering

managers, chefs and hospitality food service staff in the care homes, and the contribution they can make to the well-being of care home residents, much less so.

From that dietetic and nutritional research it is abundantly clear that the needs of the residents have been clearly identified but what is under-developed is **how** to meet those nutritional needs within the working environment of care home catering provision. In particular, what the nutritional research has done, especially the latest outcomes⁷ is to identify the key tensions - **getting the food onto the plate and into the resident**. Added to the above, a report in *The Lancet*⁸ suggests that the care home catering services will face increased challenges, stating "*The past 20 years have seen continued gains in life expectancy, but not all of these years have been healthy years. Our study suggests that older people today are spending more of their remaining life with care needs*". Although not directly mentioned in the report the suggestion that demand for care home places will nearly double within the next 20 years will present further challenges for care home owners, managers and their caterers. Approximately 190,000 more people aged 65 years or older will require care by 2035 to cope with the rise in demand. That equates to an increase of some 86%.

Taking an estimated average residential care home capacity of 55 residents, Calculated from a database of 68 care homes throughout the United Kingdom (UK), that increase could lead to a total capacity demand of some 3,450 care homes by 2035. With each of those homes employing an average of 1 head chef or cook, 2 kitchen assistants or apprentices and 3 or 4 hospitality / food service staff, based on an average number of staff employed in the care homes surveyed, that adds up to a significant need for skilled production and service staff in the care home sector. Where will those staff come from? This is a particularly thorny issue, with Brexit on the horizon and care home owners and caterers already struggling to find educated and trained staff. There are also reports that as many as one in six long term care homes are facing financial failure as "*the mixture of rising costs, cuts in funding and an aging population has created a volatile situation, with many companies now showing signs of significant financial stress*"⁹. The situation is further compounded by continued pressure to improve services having failed to get the basics right.

Dementia

Dementia is a catch all term for several degenerative brain conditions including Alzheimer's Disease. The root of dementia is from the Latin: 'de' which means without and 'ment' which means mind, historically described as being 'out of one's mind'. The word dementia describes a set of symptoms that may include memory loss and difficulties with thinking, problem-solving or language¹⁰. The most common form of dementia is Alzheimer's disease – all forms are progressive in nature and lead to functional losses¹¹.

The Alzheimer's Society UK¹² state there are already 850,000 people living with dementia in the UK and suggest that within the next decade, by 2025, there will be one million people living with dementia in the UK. According to the latest report¹², eighty per cent of care home residents have dementia. And one in three care home residents are admitted already suffering from malnutrition¹³. A systematic review¹⁴ noted that 'the quality of current research of the effect of mealtime interventions in dementia was poor' and interventions had a 'moderate' success rate¹⁵.

Taste and texture perception is reduced with older age, and some research indicates that environmental factors also influence the amount of food which dementia patients are able to eat¹⁶. That research, however, did not suggest any changes to food and hydration delivery other

than changing plate and cup colours. An holistic approach using expert knowledge from hospitality, nourishment (gastronomy), and sensory science disciplines will allow the development of the catering and culinary arts professional leadership, competence and forward-thinking which is fulfilling its social and ethical agenda. Although the Care Quality Commission (CQC) report¹⁷ fell short of suggesting the introduction of legislation or regulation, several of these concerns were related to the feeding of residents:

- Staff and managers in some homes: did not always give people a choice of food or support them to make a choice; failed to identify or provide the support that people who were at risk of malnutrition needed; did not ensure that there were enough staff available to support people who needed help to eat and drink:
- 14% of homes failed to have enough staff to meet people's needs.
- Homes caring for people with dementia, including those with a dedicated dementia unit, were less likely to be meeting the standards relating to respect and safeguarding.

What, then, is to be made of this? Are catering services, hospitality management and the culinary arts – cooking, serving and feeding – too commonplace or quotidian to be studied seriously or to be able to contribute to the well-being of people living with dementia?

Dementia and Hospitality Business

'Food is your medicine – hence let your medicine be your food' (Hippocrates, circa 400 BC). Many academic commentators have attempted to define hospitality and the term has been described as both commercial and social activities¹⁸. Within a care home environment there are competing values and priorities. Care home nursing managers may be more concerned about the medical status of their charges, rather than the state of hospitality or their immediate comfort, whereas the catering staff may well place more emphasis on the feeding and hydration routines and creature comforts of their 'guests'.

There is a small, but growing, body of research questioning the philosophy of, and critical studies of, hospitality and the limited interactions between the different academic traditions, with even less interaction between practitioners and academics. In one overlapping area of the hospitality disciplines, care home catering, sometimes referred to as institutional catering, there appears to be even less interaction between the caterers and nursing or medical staff. In this case we could consider the phenomenon of 'hospitality as care'; 'hospitality as medicine'; 'hospitality as ethics' and; 'hospitality as culture'. It could be suggested that the Culinary Arts, in the context of the 'principles of hospitality' demands a sacred obligation not just to accommodate the guest, but to protect the stranger, especially the patient living with dementia who arrived at the door of the care-home.

The constantly evolving understanding of hospitality, including reference to cultural and religious meaning within our history have been followed, and commented on, by historians of hospitality. Within those studies the definitions of hospitality are wide ranging, including comment on the provision of food and drink, the ethics of welcoming strangers and the etiquette expected of societies^{19,20}. Should then, a patient resident within a long term care home be considered as a guest and in receipt of hospitality? Should that hospitality be viewed as far removed from the commercial realities of the hospitality business sector²¹

Who then is the host in the context of long term care home hospitality? Should the host be the Care Home Manager (Registered Manager); the Nutritionist; the Hotel Services Manager, Catering or Hospitality Manager? It must be accepted, however, that a long term care home is not a hotel, where the daily rates fluctuate according to demand. You cannot just log on to Trip-Advisor or Hotels.com to change bookings if you and your family don't like the services

offered or the prices charged. Once in a care home the resident is more or less a hostage to the status quo. From April 2016, all care homes have been expected to display the results of CQC inspection ratings in a prominent position on their premises, much like the 'Scores on the Doors' systems for restaurant food safety.

Just one of the major problems facing those people living with dementia in long term care homes is the reduced intake of nourishment, leading to malnutrition, regardless of the hospitality services. The potentially harmful effects include dysphagia (difficulty or discomfort in swallowing as a symptom of disease), apparent food refusal, stress and panic expressed by the resident when fed^{22,11}. Despite past and current government strategies to improve the nutritional intake for people living with dementia in long term care homes, surprisingly little research has been carried out into the operational, practical and staffing aspects of feeding those people. From a caterer's point of view there has been much advice as to what to feed to the people within their domain^{23,24,25,26}. There has, in fact, been a long history of dietary and nutritional advice most of which seems to be both accurate and well intentioned.

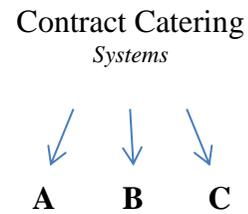
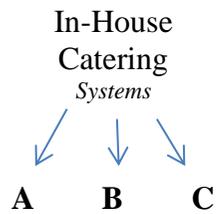
Method and Ethics

The original intention was to develop a single case study based on the catering and hospitality provision at one long term care home where the residents were either totally or predominantly people living with dementia. Following an initial Pilot Study it was decided to extend the study to other long term care homes. The reasons for this change of tack were several:

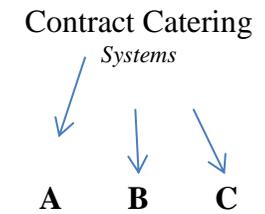
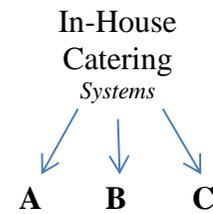
1. it was felt that one care home would not offer sufficient scope to generalise the findings and conclusions;
2. the original care home in the pilot study was relatively small;
3. the care homes which also catered for residents who were not living with dementia tended to be larger and were more representative of the care home sector

As suggested²⁷, the units of analysis for the qualitative study were determined during the design stage. The Sampling Frame shown in Figure 1 describes the type of care home units to be studied. Figure 2, describes the individual units of analysis, the actors involved in delivering F&B services. The sample of care homes used has been randomly generated based on the National Institute for Health Research Enabling Research in Care Homes (ENRICH) programme Data Base of care homes actively willing to take part in research.

Chains



Independents



The Systems chosen

A: Cook - Hold - Serve

B: Cook - Chill / Freeze - Regenerate / Rethermalise - Serve

C: Buy Ready Meals - Regenerate / Rethermalise - Serve (also referred to as "Assembly - Serve")

Figure 1: Sampling Frame

Although other catering / food production and service systems exist, including "Cook Serve" (the most common in traditional restaurants) the three above are most representative of the systems currently in use in care home catering environments. If others are identified during the interviews they will be recorded.

Senior / Regional Management		Dieticians and Nutritionists		Corporate Chefs / Unit Head Chefs		Catering / Care Assistants Customer Facing
<i>Head Office / Regional</i>	<i>Local Home</i>	<i>Head Office / Regional</i>	<i>Local Home</i>	<i>Head Office / Regional</i>	<i>Local Home</i>	<i>Local Home</i>
Face to Face interviews using semi-structured interview questions with responses recorded and transcribed 1 + hours		Face to Face interviews (Possibly via SKYPE) using semi-structured questionnaire questions with responses written in questionnaire form 1 + hours		Face to Face interviews, during observation period, using semi-structured questionnaire questions with responses recorded and transcribed. Observation notes made at time of visit 4 + hours		Observation of work patterns during service of meals 1 to 2 hours followed by structured questionnaires administered by paper, Tablet or internet 20 minutes
<i>Complex questions of both qualitative and quantitative type</i>		<i>Predominantly qualitative type interview questions</i>		<i>Relatively complex questions of both qualitative and quantitative type</i>		<i>Simplified questions using a mix of types</i>

Figure 2: Interview / Questionnaire Scheduling / Observation Type

The intent was to create a map of what is happening NOW in the care homes; to describe the reality of what is going on and identify areas of concern and exemplar units (if any).

Each participant type has separate interview questions / questionnaires as briefly outlined above. Face to Face interviews, although time consuming, have generated more in-depth, data rich, responses. Each participant has been shown a participant information sheet and signed a participant consent form. The on-line survey form also contains that information.

Initial Findings/Results

The questions used in the interviews and questionnaires have been based on the prior literature review and included topics on the following. Some of the preliminary results and observations are shown for each topic with a brief discussion, *in italics*, where regarded as being appropriate.

Size and capacity of the homes;

The homes surveyed have capacities of between 23 to 82 residents. The dining rooms would not normally seat more than 12 residents, though the larger homes did seat more at one time. *Care had been taken in all of the homes to make the dining facilities as comfortable as possible, though one of the older homes was looking decidedly tired and run-down.*

Staffing structures of the group / homes and number of catering staff employed;

Regardless of the size or capacity of the home, each home surveyed employed a minimum of one head chef / cook. None of the homes, even the larger units, employed more than 2 additional kitchen staff. In most of the homes, food service to residents was carried out by Care Assistants; only one home employed dedicated hospitality / food service staff. These were directly responsible for plating the residents' food whilst the nursing and care assistants served the food to the residents. *None of the care home catering staff appeared to be under particularly severe pressure, especially in the smaller homes. Observations of practices revealed that all of the cooks knew what they were doing, having repeated their culinary repertoires many times over, acting almost as if by clockwork.*

Number of dieticians and / or nutritionists employed directly and Relationships between nutritionists, nursing / care staff and catering staff;

None of the surveyed homes directly employed dieticians or nutritionists. A large catering services company employed both dieticians and nutritionists at head office level. Two of the medium sized groups did not see the need, but would instead rely on the community services available or seek advice from the Speech and Language Therapist (SALT) teams at the local hospitals as required. None of the chefs or managers had recently consulted a dietician or nutritionist. None were aware of recent research and guidance in improving nutritional care for people living with dementia in long term care homes.

Educational and training background of staff employed, including catering skills and serving residents living with dementia;

All but one of the head chefs / cooks was educated to Level 2 equivalent City and Guilds (C&G) or National Vocational Qualification (NVQ) in cookery / culinary arts. One was totally self-taught without any formal qualification. None of the chefs had received any certified training in cooking for people living with dementia, though two chefs had received on-line training on nutrition awareness in cooking for elderly residents. None

of the Care Assistants responsible for serving food to residents had received any additional catering training other than food safety Level 1 or 2 or dementia specific training in food service.

Perceptions of professional status of chefs and hospitality staff;

All culinary staff reported not being held in high regard by their colleagues in clinical and care roles.

What catering systems are currently in use in the care home catering environments;

Without exception, all care home chefs were operating a predominantly cook - hold - serve system. Two chefs were using cook - chill - re-thermalise - serve systems for some dishes but this did not extend to production more than one day ahead. None were using a cook - freeze system. *Of considerable concern was the apparent lack of knowledge regarding plating skills and food presentation. No effort was really made to make the food look attractive once on the plate. There is a definite need for presentation and plating skills training.*

What is the availability of food and drink, times and restrictions;

All the homes in the survey operated standard meal times, with only minor differences. All homes made certain foods available throughout the day and sandwiches and other finger foods were generally available 24 hours.

Recognition of changing demographics and their future needs;

None of the care home managers or chefs were really aware of the changing demographics of their future residents and had not made plans in this respect.

Menu and recipe development, cycles, tracking and menu content analysis;

All the chefs interviewed were responsible for creating their own menus with little, if any, input from the managers or nutritionists. Following analysis of the menu cycles obtained during the visits only one showed any sign of culinary creativity with the rest being content to maintain the old staples. This attitude showed a marked resistance to change, with the status quo holding sway. *Content analysis on the menus seen was restricted to the usual texture, colour and taste. No menu analysis software was in use in any of the homes.*

Need for dysphagia foods and fortifications. Bought in or made from scratch;

All chefs reported a need for texture modified meals for some of their residents. All were making their own from scratch rather than buying in ready-made products. There were varying degrees of texture modified foods required from fork mashable to thin purée. Only one chef made any attempt to mould the modified food to make it look as close to the pre-modified food as possible. *None of the respondents were aware of the forthcoming changes to the Texture Modified food descriptors, from the British Dietetic*

Association (BDA) descriptors to the International Dysphagia Diet Standardisation Initiative Descriptors (IDDSI) descriptors due to come into force in April 2019

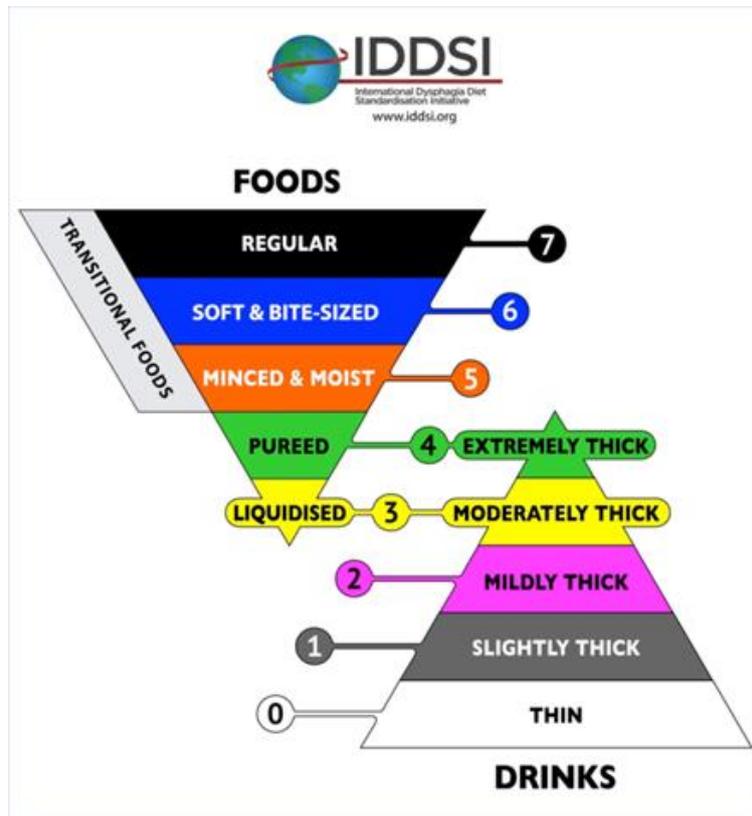


Figure 3. IDDSI Texture Modified Foods Descriptor

Of the foods served and observed it was clear that little or no thought had been given to presentation of Texture Modified foods in an attempt to preserve the resident's dignity.

Average food costs per resident per day;

Often regarded as a contentious issue, all chefs and managers were forthcoming in revealing their daily food cost budgets and actuals. It was not a surprise to note that the high quality homes, where the residents were self-funding, rather than those relying on local council funding, had the highest F&B budgets with one even including an allowance for wine with the meals. The recorded F&B costs were between, £2.15 to £5.50. Disregarding the higher end, the average daily food cost per resident is **£2.44**.

Knowledge and use of new / innovative kitchen equipment

There was a distinct lack of knowledge among the chefs of the advances in time and labour saving kitchen equipment. Items such as vacuum packers, water baths and cVac ovens were unheard of. *There is a need for greater awareness among owners, designers, managers and chefs of the benefits of advances in commercial kitchen technology.*

Knowledge of and application of natural food additives and hydrocolloids;

As above, when questioned on the types of additives and methods available all the chefs were confused about such additives and their potential uses.

Conclusions

This preliminary study has identified significant tensions in what the nutritionists have identified as critical needs for people living with dementia and what the caterers are able to provide. The care home owners and caterers are actively running businesses and **must** return a profit in order to provide a return on investment for their shareholders. We identified that many care home businesses were already going into administration and it does not look too rosy for the immediate future yet the demand is soon to increase significantly. Many of the questions asked during the interviews will be re-visited with the intention of making the future research more focussed on the business aspects. We believe there may well be much to learn from hospital catering services and our future research will reflect that.

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Fridge stories – a story of older adults living at home with Meals on Wheels

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Keywords: Elderly people, Ready-made meals, Protein, Vitamin D, Malnutrition

Introduction

“Better food for more people” was the slogan at the World Food Summit in Copenhagen at the end of August 2018 (3). This includes for elderly people, the focus of this paper, and especially elderly living at home whose main source of food is meal deliveries to their homes. In this paper, the word *elderly* refers to older adults. According to the World Health Organization (WHO), “older” refers to those over 65, with those over 75 years old being referred to as “old” and over 85 years old as “very old” (4). The number of elderly people (>67 years) is growing (5) in all welfare states, and the risk of malnutrition increases with ageing. Elderly people can develop a number of eating difficulties that can influence their food intake. Eating difficulties can be based on diseases, such as Parkinson’s disease, dysphagia, and preoral, oral, and motoric eating challenges. Malnutrition occurs in 10% to 60% of patients in hospitals and nursing homes (6) in the Norwegian context. Undernutrition increases this rate up to 70% (7). Many patients are already experiencing malnutrition when they arrive at hospital or nursing homes.

Theoretical approach

Several academic articles focus on the fact that many older adults who come to nursing homes and hospitals suffer from malnutrition at the time of admission. Therefore, it is important to develop a better understanding of older adults’ relationship with food in terms of what they buy and what they have in the fridge, what is delivered by ready-made meal suppliers, and what they may eat outside the domestic sphere. Meals on Wheels (MOW)(8, 9) is a program used in many countries, including Norway (9), to transport food to older adults living at home. Many different companies produce and deliver food via MOW and have different distribution processes which vary among cities.

The proportion of older adults in Norway in need of nursing homes was estimated to be approximately 70000 in 2018. As approximately 40000 nursing homes exist (10), given the increasing proportion of older adults, by 2040, there will be a high demand for nursing homes. According to the Norwegian government, there are no plans for a large expansion of more facilities. Therefore, it is reasonable to assume that many older people will soon be without a nursing home. Another possibility is that older people live at home for as long as possible, which can postpone nursing home needs in the future (11).

The older adult population is a complex group. Reduction in muscle mass within this population is not uncommon, because energy requirements are closely related to activity

levels. As one's age increases, muscle mass decreases (12). It is possible to slow down muscle mass loss by maintaining moderate physical activity. Older people who have on average a lower energy intake also eat fewer meals during the day (13), yet the need for vitamins and minerals continues and even increases among older adults (14, 15). The intake of vitamin D, which helps calcium be absorbed in the intestine, thereby strengthening bones and preventing osteoporosis (2), is often limited in many people, especially during winter months. Sunlight is another important source of vitamin D, but access to sunshine is impaired when little time is spent outdoors (16). Older people who sit inside a lot during winter or have some kind of movement problems are particularly vulnerable to low levels of vitamin D.

Older adults living at home are a scarcely researched population. In 2016, one study examined different types of elderly connected to different meals experiences (17). Another study focused on healthy elderly above 60 years old who were living at home, exploring their motivation, behaviours, knowledge, and futures (18, 19). This paper examines the elderly living at home who receive meals delivered to them once a week; it studies the content of their refrigerators in their daily lives.

Methodology

Two to five photos of the contents of each refrigerator were taken once a week for four consecutive weeks, resulting in 119 photos. A Canon single-lens reflex camera (SLR) was used to take all the pictures. The pictures were automatically numbered by the camera's automatic numbering system. All images were saved to separate memory areas for each week and were then encoded with a unique number for each person who participated in the survey. This code is unique and not traceable to the participants.

Data collection

The initial data collection point was applying for ethical permission to conduct the research as planned. The Norwegian Centre for Research Data (NSD) approved the project (No. 60998). A collaborative effort was established between the researcher and an institution that distributes ready-made meals (dinner) to those who subscribe. The institution wanted more knowledge about the subscribers' experience related to the ordering and delivery of ready-made meals and the meals themselves. The institution only delivers meals once a week, from one to seven dinners per person. The dinners have a good shelf life when stored in a refrigerator and according to rules of treatment. The dinner is to be heated in the microwave, as instructed by information provided on the web and on the food's packaging.

The researcher applied for and received NSD approval to conduct the investigation. All subscribers were then contacted with a request for participation in the refrigerator project. This pilot project received nine participants who agreed to open their refrigerators for the research project. The collection of images was carried out by a trusted employee who

supplied food to all home residents. One day a week, the employee visited the individual participants and took from two to five pictures of the contents of each refrigerator. The photographs were not taken the same day as the delivery of the ready-made meals. The same procedure was followed over four consecutive weeks. The collection of photos started in mid-September and ended in the end of November.

Ethical considerations

The research proposal was submitted for research approval to the Norwegian Centre for Research Data (NSD) and was approved (No. 60998/3/EPA) on 3 July 2018.

Financing

This study was funded through the public policy system, VRI (policy instrument for regional innovation and development in Norway).

Results

This section details the results of the photographs of the contents of older adults' own refrigerators, which were taken in the fall of 2018. The same procedure for collecting the photographs of the contents of the refrigerators was followed every week. A trusted project employee was hired by the institution to take the pictures in the various homes. In August 2018, written consent was received from the various participants regarding participation in the project based on the information they had received in advance. All participants in the project subscribe to a ready-made meal service delivered by the institution involved. Each image was manually analysed and counted. The various results provide an overview of both ready-made meals and other food in the participants' refrigerators.

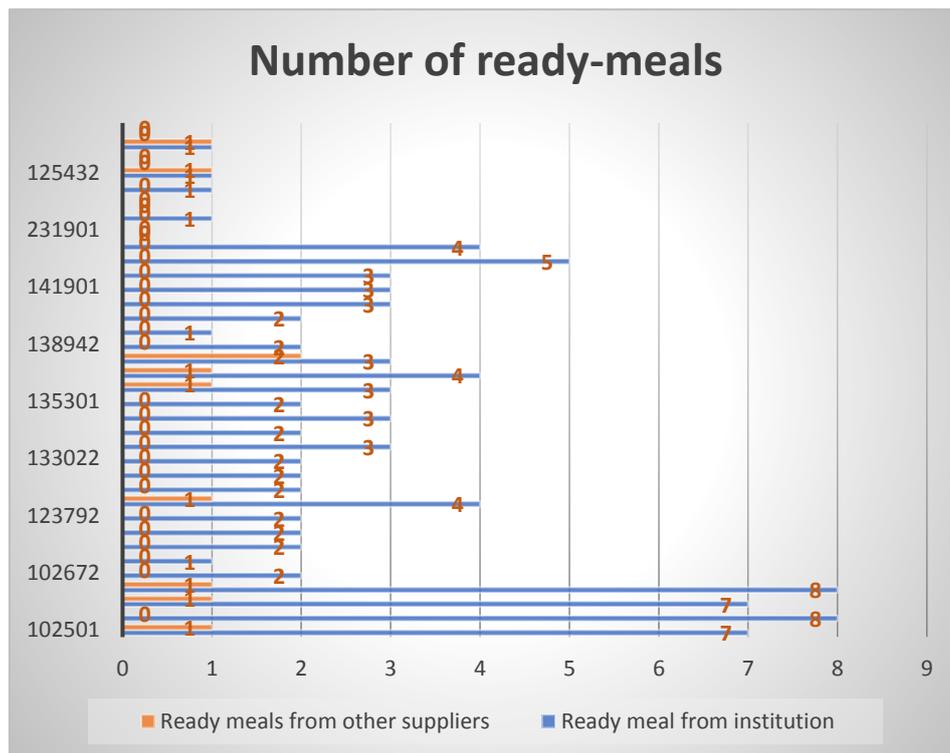


Table 1 shows how many pre-cooked meals the elderly received at home from the subscription and other suppliers each week.

Although there are many different types of older adults, they share some common characteristics in terms of food and eating. One such area is that older people should focus on good protein intake. They have an increased need for protein because muscle loss is a natural part of the ageing process. Protein needs increase even further when individuals have a disease and/or more diagnoses. When protein content drops too low, it can lead to impaired general condition among the elderly, which can be evidenced by a poorer appetite among the elderly due to their limited strength and, thus, reduced energy.

It is important to increase protein intake by the age of 50 and whenever physical activity increases due to strength training as such activities help individuals increase or maintain muscle mass. The use of protein-rich food is an important option for the elderly. In Norway, most people meet their protein needs through the dinner meal, which often consists of meat or fish. Those who need more protein should include proteins in other meals as well. A regular diet can include several sources of protein at breakfast, lunch, and dinner as well as between meals. Mapping out the contents of the refrigerator, as done in this article, can help individuals meet their protein requirements.

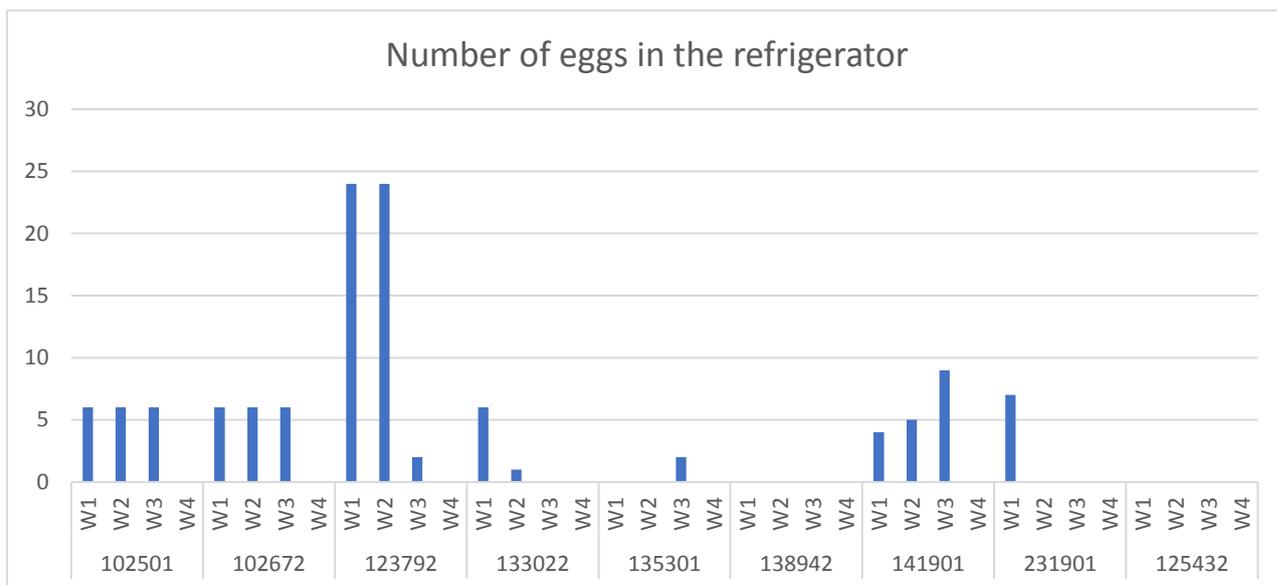


Table 2 Overview of how many eggs the elderly living at home had stored in their refrigerators

Eggs are an important source of protein. The number of eggs consumed during the four weeks was very stable; it is reasonable to assume that the intake of proteins is low when the number of eggs varies over time. Other products that are good sources of protein include dairy products (e.g., cheese, shun, quark, sour cream, Greek yoghurt) and light foods (i.e., milk products with a low fat content). These were used by most participants (approximately 77%).

Vitamin D. The elderly needs extra vitamin D in their diets. Some products, such as “Tine’s Strength” (milk) include added vitamin D. The study results indicated that only 22% of the participants had this product in their refrigerators. Other important sources of vitamin D are sunshine, cod liver oil, fatty fish, and roe/caviar. Some dairy products, like milk and cheese, also include added vitamin D (2, 20). Cheese can be a source of vitamin D, but only white or brown cheese.

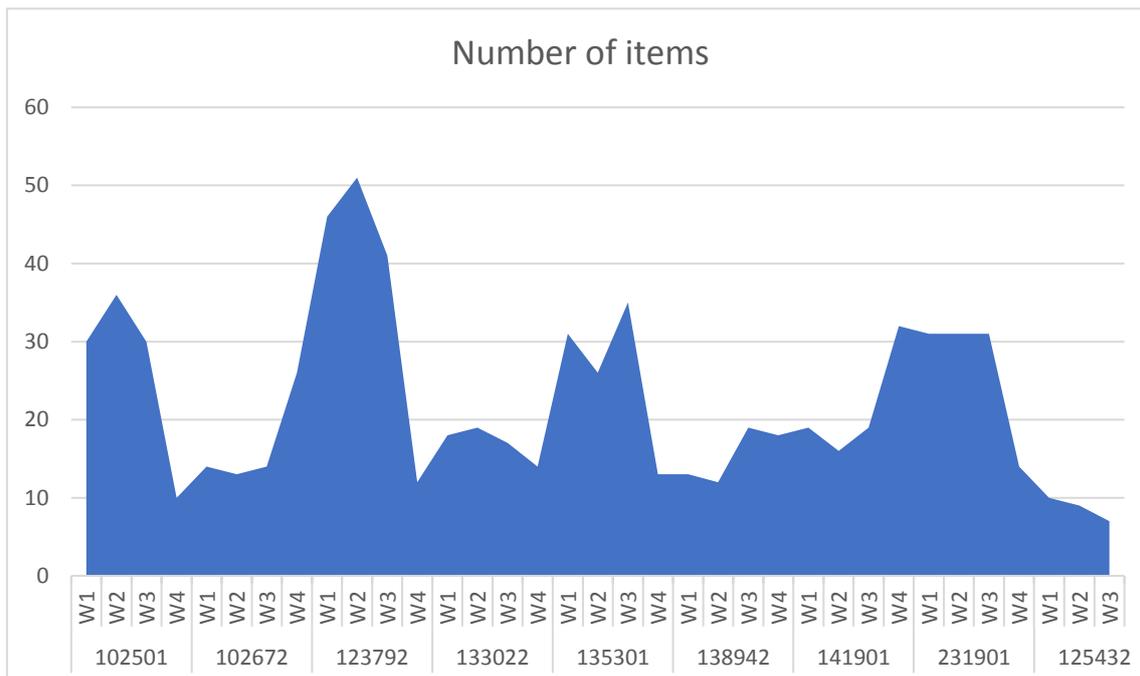


Table 3 Number of food items in refrigerators.

Table 3 details the variation in the number of food items in refrigerators, which ranged from 7 to 51. Many older adults had a low number of products, including only a few protein sources and energy sources, which is concerning. Some of the ready-made meals had been opened and wrapped in plastic. According to the participants, the portions are sometimes too large. This is not surprising as older adults' appetites often decrease as their age increases.

Discussion

The starting point for the discussion is the findings related to the contents of participants' refrigerators. It was no surprise that all participants had ready-made meals in their fridges. There was a greater variation in the number of ready-made meals among the participants. One possibility is that not everyone orders for the whole week (i.e., seven days) because they have other meal supplements. In addition, they might split the dish into several servings because they have less appetite or forget to eat sometimes. However, this can cause malnutrition over time.

The ready-made meal menus include a balance of meat and fish dinners. Therefore, it is reasonable to assume that the participants received a normal protein supplement through the dinner meals. Examples of protein-rich foods are pure meat and fish as well as a variety of alternative foods that can be eaten for breakfast or lunch as well as between meals (15). As people grow older, their need for protein increases. The need for protein is further increased by disease, and many older people often have various diagnoses. A normal person needs about 1 gram of protein per kilogram of body weight per the Norwegian Directorate of Health in Norway (12); after 65 years of age, this amount

increases to 1.1 to 1.2 grams of protein per kilogram of body weight. Ultimately, 15% to 20% of the energy intake should be protein (15). Low protein intake over time causes weak muscles and impaired general condition as well as other ailments and diseases.

In a previous study of older adults, an information office for food was sought for older adults. This need can be further emphasized in this context as older adults living at home can become sicker when they move from the home to a nursing home (19). The number of older adults with dementia in Norway is expected to double, from approximately 70000 people, by 2040 (11). Thus, older adults living in their own homes need to have a well-balanced diet which provides enough protein, energy, and the required vitamins, adapted to their age and any diagnoses they might have. The older adults who participated in this study showed a limited protein supplement, despite receiving protein in their ready-made meals. Only one participant received hot meals for the whole week (see Figure 1).

Another cause for concern is that several participants had few products in their refrigerators, including only a few protein sources. Although most had eggs, consumption over time did not seem to be high. It is reasonable to assume that the delivered ready-made is evenly distributed between meat and fish dishes. Important protein sources are meat, poultry, and seafood, with eggs being the least expensive (2). In Norway, both pure meat and fish are expensive for consumers.

The storage of ready-made meals is clearly communicated to the older adults who subscribe to the food service. The delivery institution and manufacturer of the ready-made meals recommend storing them in a refrigerator for up to 14 days and heating them in a microwave oven. However, the pictures showed that a few participants stored the food in the freezer, which can reduce the quality of some foods containing potatoes.

Limitations

This article has some limitations. The number of participants in the survey was low, but pictures of the contents of the refrigerator must be regarded as an intimate form of information gathering. The number can therefore be considered satisfactory. Another limitation may be that not all products are visible, although the pictures provide a good overview of the most important energy and protein sources.

Conclusion

This article presented results from the investigations into elderly participants' refrigerators. A large variation occurred in the number of ready-made meals participants had delivered. Several participants indicated that they do not eat dinner every day—at least, not meals delivered from the institution—which is concerning. One possibility is that some participants split the dinners over two or more days, which decreases their daily protein intake. If dinner is a major part of their daily protein intake, it is critical to eat dinner every day. The fact that many older people have few products in their fridges

means variations in dinner and other meals are reduced. In addition, the older adults might be using the contents of the refrigerator to meet their dietary needs (e.g., protein).

Some of the ready-made meals delivered were photographed as being opened and wrapped in new plastic, suggesting that portion sizes are too large, but participants have no other size choices from the delivery company. Future research should conduct a longer study adjusted to each individual and measure food intake using well-known nutritional screening tools. Another area to investigate is the packaging of ready-made meals as well as the menus and portion sizes.

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The Breakfast Club – Hospitable meal practices as rehabilitation strategies and practices in nursing homes

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Keywords: dynamic hospitality, institutional meals, nursing homes, breakfast club

Introduction: The rationale behind the project

This paper presents the outlines of a three-year research project, named The Breakfast Club. The primary rationale behind the project is based on an increased elderly population in Denmark and hence, an increased pressure on public welfare benefits and financial resources. This challenge has been accommodated by deploying new welfare technology solutions, these include rehabilitation strategies in order to increase functional ability and quality of life among the elderly populations and hence to decrease pressure on welfare resources (1). In the Danish Health Care legislation, it is even highlighted for municipalities to actively involve elderly citizens, this include nursing home residents, in rehabilitating strategies (2). Terms like “co-creation” has been enrolled as key rehabilitation words to underpin the importance of putting citizens before the system and thereby allowing the individual to define their way to maintain or improve their functional ability and quality of life. In this context, it has been suggested to consider institutional meals and meals in nursing homes as an arena for rehabilitation (3). However, so far the scientific literature on meal involvement in nursing homes is sparse (4,5) even though studies find rehabilitative nutritional interventions either cost neutral or even cost effective (6). On the contrary, institutional meals have been characterized as an activity where residents passively take part in everyday meals that are planned, produced and served at specific times in beforehand by someone else without any or little influence or involvement (7). In best case, residents are invited to lay a table or to choose specific dishes or meal components. This makes the power relations between residents, health care professionals and the nursing homes as organizations asymmetrical. In worse case, institutional meals can even be comparable to E. Goffman’s concept of institutionalization described in *Asylum* (8).

It could be argued, that nursing home residents are vulnerable citizens who are challenged by decreased cognitive or social and food-related physical functionality, and consequently, has little or no ability to be involved in their daily meals. However, in a previous study (The Breakfast Club) residents with Alzheimer's were involved in a breakfast club and it was found that their cognitive, social and food-related functionality significantly increased (9). However, the study did not provide an ability for residents to become part in meal planning processes as a strategy to involve residents actively, and neither did the study consider health care professionals’ ability to support this. However,

the study can serve as inspiration and as a learning space for how to involve residents actively in meal preparations.

The second rationale behind this project is based upon a hospitality thinking. A theoretical position that can contribute to answer the question: How can residents be involved actively in every day meals? It takes a point of departure in the increased academic knowledge on hospitality as an everyday institutional meal practice and in particular in the conceptual model: The Hospitable Meal Model (10,11). The model frames an ontological position in terms of dynamic hospitality that considers meal experiences as dynamically, relationally and culturally constructed and supports the idea that meal experiences create different values and can be unpredictable (12,13). The Hospitable Meal Model has its theoretical background in Critical Hospitality Studies (14,15), and is inspired by Jacques Derrida and Immanuel Kant's way of engaging with the notion of hospitality (16–18). A dynamic hospitality thinking will support active involvement through shifting host-guest relations allowing the residents temporally to become hosts (11). The Hospitable Meal Model, include the term of co-creation, which underpin the dynamic element of a meal by supporting a more open-ended approach towards meal experiences (10). The notion of co-creation can be described as “*a profound democratization and decentralization of value creation, moving it from concentration inside an organization to interactions with its customers, customer communities, suppliers, partners, and employees, and interactions among individuals*” (19). Co-creation has its origin in marketing research and has gradually been transferred into the field of health care services (20,21). The idea behind co-creation is to transcend a traditional separation of production and consumption in which the guest is perceived as a passive recipient of products or services (22). Instead, the idea of co-creation can be seen as a facilitation of a multi actor oriented value-creation processes (23), similar to Derrida's description of host-guest relations (24). Being each other's constitutive conditions allows as such the residents temporary to become host and health care professionals temporary to become guest (11).

The third rationale behind the project focuses on healthcare professionals and respective nursing home management's capability to becoming involved in dynamic hospitality meal practices allowing residents to become hosts temporarily. In addition, this requires a preparedness to name, reflect and respond to the situation, and to draw on existent normative cultural and social value of a meal (21). Few studies have considered health care professionals and meal practices, but it has been found that health care professionals are bound to hospitality practices that represent static and asymmetric guest-host relations, bound in routines and undeclared culturally learned pre-understandings of how to perform hospitality in connections to meals. (4,11,25). Furthermore, it can be argued that existent meal practices in Danish elderly institutions are based on theories and models like The Five Aspect Meal Model (FAMM) and The Making Most of Mealtime Model (M3 Model) (26,27). Although, the FAMM model is inspired by Michelin restaurants the

model can be criticized for representing a static model for experiences that take place in a certain time and place, leaving out any possibility to consider aspects outside the physical surroundings and the physical time as part of an experience (28). It also leaves meal experiences as beforehand staged and designed, neglecting the fact that they can be co-created and unpredictable. In contrast to the FAMM model, the M3 model reflects meal experiences as dependent on much broader elements placed outside the eating events and the physical settings.

However, despite the model's ability to reflect the complexity of institutional meals in nursing homes, the M3 model can be criticized for being statically constructed as the model considers both individuals, the surroundings and nursing home organizations as static elements. The M3 model does as such support an already predetermined idea of the right meal and right value of a meal articulated as increased food intake (8). New learning activities for health care professionals has as such been sought (11). It could be considered whether a dynamic hospitality thinking based on The Hospitable Meal Model in combination with the established Breakfast Club for nursing home residents can support residents' food-related functional ability and quality of life. In addition, this innovation can become a learning space for health care professionals that can subsequently be transferred into everyday dynamic hospitable meal practices.

The objective and research questions

The objective of the project: The Breakfast Club is therefore to contribute to the scientific body of knowledge on how to design and implement dynamic hospitable meal practices in a nursing home as an everyday meal activity, through the development and introduction of a breakfast club as a learning space. Secondly, it creates an opportunity for new educational activities targeting health care professionals.

This leads to the following research questions:

How can a dynamic hospitality approach towards institutional meals be utilized:

- 1) as a rehabilitative strategy and contribute to residents' food-related functionality and quality of life, and*
- 2) to develop dynamic hospitality competencies, and as the basis for new educational activities targeting health care professionals?*

Project design

Based on the research questions, the project is designed as a complex intervention study that includes an action research strategy (29). In addition, the research activities will be accommodated by initiating educational activities targeting health care professionals in general. The project is structured through four phases (see figure 1).

The methods applied in the project will both include quantitative as well as qualitative methods. This include surveys in combination with observations as impact measurements to explore residents' food-related functionality and quality of life. Qualitative visual

photographic observation and interview methods will be applied in the study of hospitality practices and health care professionals' ability to adopt dynamic hospitable meal competencies in the breakfast club and subsequently as everyday meal practices (29,30). Furthermore, visual photographic methods will also be used continuously as a learning platform for health care professionals.

The project is carried out at Kastanjehavens nursing home. The nursing home is situated in the Copenhagen metropolitan area. Currently, 68 residents are living at Kastanjehaven supported by 60 staff members out of which 30 of them have a professional health care background. Kastanjehaven is characterized by working purposefully with rehabilitative efforts, with particular focus on the individual resident's competencies, skills, wishes and needs. This includes meals as a platform for rehabilitation. Here a breakfast club will be developed and implemented, and held once a week over a period of nine months. A minimum of 16-18 elderly residents is expected to be involved in the breakfast club; however, weekly, only four to six residents will participate in the club each time. The inclusion criteria for participating will be social competencies and the ability to express themselves verbally. Excluded from the project are terminal residents and residents with special diets. Six to 10 health care professionals will be enrolled in the breakfast club as well. Selection of these will be based on ability and willingness to be change agents as "training of trainers".

Each week a resident is appointed as host and has to plan the upcoming breakfast event. This includes considerations of theme, content and form, and will be carried out together with a health care professional. To support each resident in planning their breakfast event as well as to support health care professionals' adapting dynamic hospitality competencies, two learning tools named; "Breakfast Toolbox" and "Conversation Cards" will be introduced. The "Hospitable Toolbox", is a physical box with artifacts, such as tablecloths, cookbooks, etc. The other learning tool is "Conversation Cards", with small linguistic statements, questions related to breakfast food-cultural items. The idea behind the Breakfast Toolbox and the Conversation Cards is derived from a "probes" and narrative mapping thinking and serves as a creative process that supports dynamic hospitality through co-operative actions and increases the readiness to name, reflect and respond to a situation based on the cultural and social norms of meals (31,32).

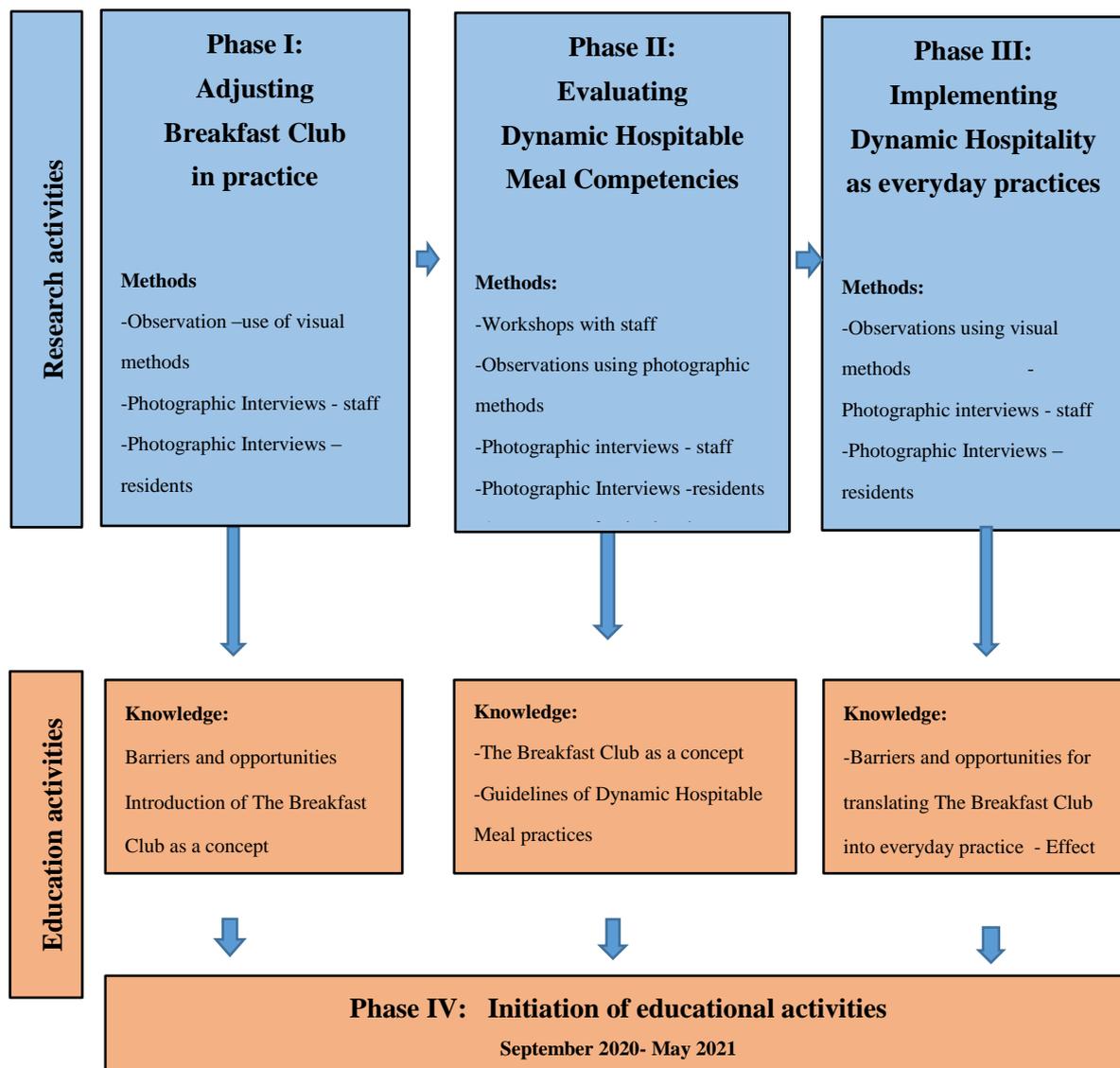


Figure 1. Presentation of the research design, content, structure, methods and timeframe of: The Breakfast Club.

Project activities

Phase I: Adjusting the breakfast club in practice – a feasibility study

Phase I is designed as a feasibility study (30) and aims at preparing the following intervention study, describing the concept of the breakfast club as well as exploring and evaluating existent hospitality meal practices by focusing on barriers and opportunities for implementing a breakfast club at Kastanjehaven. This include considering the breakfast club as a learning space for developing hospitable meal competencies, and the development of the Breakfast Toolbox. Photographic observations and interviews with residents as well as health care professionals will be conducted with inspiration from practices theory (34–36).

Phase II: Evaluation dynamic hospitable meal competencies – intervention study

Phase II, is designed as a complex intervention study where approximately 30 breakfast club events are to be held (29). Baseline data will be gathered and assessed. These will be based on existing and validated questionnaires related to food-related functionality and quality of life (31–33). Thirty to forty residents will be enrolled, these include the 16 participants of the breakfast club. Furthermore, activities in phase II involves workshops with health care professionals, photographic observations of the breakfast club in combination with interviews with residents. It also include photographic interviews with health care professionals. Based on these data, the breakfast club as a concept will be evaluated and presented and guidelines for dynamic hospitality meal practices as learning tools for future educational activities will be developed. Health care professionals' competencies related to dynamic hospitable meal practices will be evaluated using action competences as analytical frame (37). At the end of phase II, measurement in terms of food-related functionality and quality of life will be collected among breakfast participants and assessed.

Phase III: Implementing dynamic hospitality as everyday practices - action research

The purpose of phase III is to study and evaluate dynamic hospitable meal competencies among health care professionals as everyday meal practices outside and after the breakfast club. An action research approach (39) will be applied involving health care professionals and residents in determining the actions that needs to be taken in order to implement dynamic hospitality as everyday meal practices. As part of a reflexively engagement with the nursing home, collaborative photographic observations- and interview methods with residents and health care professionals and if possible relatives as well will be undertaken. Furthermore, food related functionality and quality of life will be measured, in order to consider whether the implementation of a breakfast club and hospitality competencies among health care professionals, has influenced residents' food-related functionality and quality of life at the nursing home.

Phase IV: Initiating of educational activities - webinars

The purpose of phase IV is to initiate new educational activities based on dynamic hospitality with a breakfast club as a learning space for health care professionals in general and based on knowledge gained from phase I to phase III. The new educational activities will be carried out as webinars (Web Based Seminars), which is a virtual learning platform. The educational activities will be targeting health care professionals in general.

Conclusion

The project has just been initiated and the first five breakfast clubs have been carried out (December 2018). However, at the ICCAS conference in June 2019 it would be possible to present the initial results from phase I and phase II. As such, the presentation will address the following topic:

- 1) Results from the feasibility study: Barriers and opportunities for implementing a breakfast club.
- 2) Initial results from the intervention study in terms for residents' food-related functionality and quality of life.
- 3) Presentation of first draft of developed guidelines for dynamic hospitable meal practices.

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Simulated Environments for Food Packaging Design Assessment

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Keywords: Simulated Environments, Product Testing, Packaging

Introduction

Using applied retail research, the purpose of this study is to evaluate the viability of using a simulated environment to conduct packaging design validation tests in order to gain deep insights into the ways in which purchasers make buying decisions. The resultant knowledge will provide empirical data on packaging design for Welsh food Small to Medium Enterprises (SMEs). Packaged food products are increasing rapidly in choice, and competition is ever more intense¹. More than 70% of consumers make decisions on daily necessities in store, 85% of goods are purchased without picking up an alternative option, and 90% are purchased after examining only the front packaging of a product without having it in their hands. Therefore, it is paramount for companies to ensure that their products are eye catching².

Eye tracking has proved to be a valuable tool in assessing consumer attention, as consumer attention has been shown to be correlated with product³. However, their facilities are highly costly, and their guidelines and results are not available to the public⁴. Large companies such as Pepsico, and Unilever regularly use eye-tracking methods in the development of new packaging and retail strategies, to assess consumer attention in shopping environments.

In the context of the food industry, research suggests that when a shopper does not connect to a shopping context, they will often remove themselves from a shopping mind-set, and instead assume a more aesthetically critical mentality, turning the experiment into a ‘beauty contest’ where the most visually appealing product will win – an irregular occurrence that does not correlate with purchase decisions made at the shelf in real life. A simulated environment can replicate external variables (to some extent) to simulate a real-life context in a laboratory setting. The simulated environment is also customisable, it ensures confidentiality, and enables the easy set-up of an array of data recording devices.

The Perceptual Experience Lab

The Perceptual Experience Lab (PEL) is a synthetic reality space developed to allow for customisable low-cost replications of real environments with controlled and monitored conditions.



FIGURE 1 PARTICIPANT IN SIMULATED SUPERMARKET AISLE IN PEL

Six 4K projectors project onto a custom built 5280px by 1980px, 200° wrap around screen, which covers the participants' full field of vision. The sense of immersion can be adjusted and controlled with the manipulation of surround sound, light and temperature control, air flow, smell diffusion, and the capacity for physical props. State-of-the-art observation software linked to high-resolution cameras, eye-trackers, microphones and heart rate variability monitoring equipment allow detailed monitoring and recording of studies - offering high levels of customisation, flexibility, and a broad spectrum of data collection methods.

Aim

The overall aim of the research is to combine theoretical knowledge of marketing and design, with the practical implications of user testing, to investigate if packaging design can be improved through low-cost simulated environments and increase Welsh food SME sales in the supermarket. As part of this broader area of research, the objective of this experiment is to develop an iterative process to assess one of the packaging designs from the Welsh food company Puffin Produce.

Experiment Set Up

One part of the experiment (condition A) compared the packaging design of Puffin Produce's standard line of potatoes, Blas Y Tir (BYT), with two of Tesco's potato product lines, Tesco Every Day (TE), and Tesco Finest (TF). See Figure 2 below.



FIGURE 2 CONDITION A: ORIGINAL PHOTOGRAPH DISPLAYING ORIGINAL BLAS Y TIR, TESCO EVERY DAY, AND TESCO FINEST PACKAGED POTATOES

The other part of the experiment (condition B) added an alternate packaging design of Puffin Produce's standard line of potatoes, Blas Y Tir (BYT), with the same two Tesco products. See Figures 3 and 4 below. Basic elements of the original packaging design were altered and placed in the original photograph, in condition B, to compare how shoppers react to different stylistic choices, and whether it changes perceptions of the same product, and to determine if it has an effect on decision making.



FIGURE 3 CONDITION B: ALTERNATE DESIGN ADDED INTO PHOTOGRAPH



FIGURE 4 ORIGINAL BYT DESIGN COMPARED TO ALTERNATE DESIGN

30 participants took part in the experiment, with participants varying in occupation, gender, and age, based on a demographic ratio chosen by the marketing team at Puffin Produce, to represent the target sample of supermarket frequenters. See the breakdown in Figure 5 below.

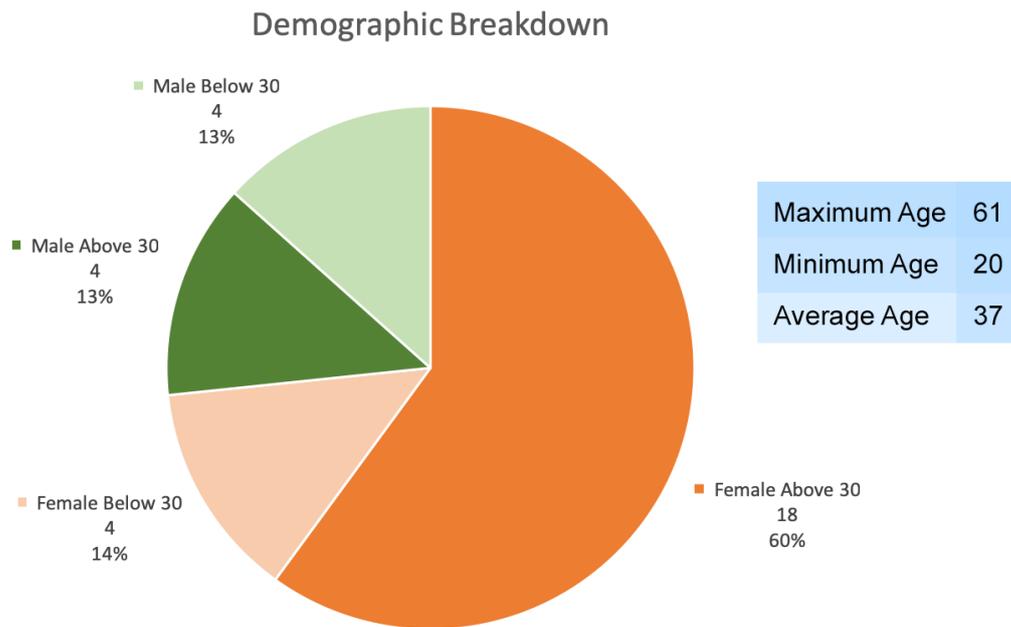


FIGURE 5 IMAGE EXPERIMENT DEMOGRAPHIC BREAKDOWN BY AGE AND GENDER

The 30 participants were split into two groups. Group A viewed conditions in the order of A (original photo) – B (alternate design photo), and Group B viewed conditions in the order of B – A. Participants and conditions were counterbalanced, so the cumulative increase of stimuli did not yield biased results. Counterbalancing is a method of experiment design in which, when applied, the researcher can control order effects when using repeated measures (Field, 2013). Using the counterbalancing technique for this experiment, each participant experiences a different order of conditions, avoiding the ‘summative’ effect on the different sensory input, and allowing for unbiased results.

It is important to test in an immersive and believable supermarket context to keep results as close as possible to real-life purchases. PEL was set up to imitate a supermarket; previous experiments informed the environmental set up of the simulated space. When photographing the supermarket scene, the camera’s focal point centred between BYT and TE to minimise bias. The Cardiff School of Art and Design’s Research Ethics Committee gave ethics approval for the study. All participants gave their informed consent prior to their inclusion in the study.

Methodology

1. Equipped with head-mounted eye trackers, shoppers stand in front of the PEL screen to view the first condition. Eye tracking was used to see what participants fixate on,
2. Gaze data and immediate verbal responses to questions (see below) were recorded in the supermarket scene. Questions were provided by the marketing team at Puffin Produce.

- Which packaging caught your attention first?
 - Which packaging do you like most?
 - Which packaging do you like least?
 - Which packaging feels more Welsh?
 - Which packaging feels more premium?
 - Which packaging feels more modern?
 - Which packaging feels more fresh?
 - Which product would you buy based purely on packaging, regardless of price?
3. Once all verbal responses were recorded, participants were guided to a questionnaire form where they answered the same questions corresponding to their last viewed condition to record quantitative and qualitative answers.
 4. The process was repeated for the second condition

Results

1. Which packaging caught your attention first?

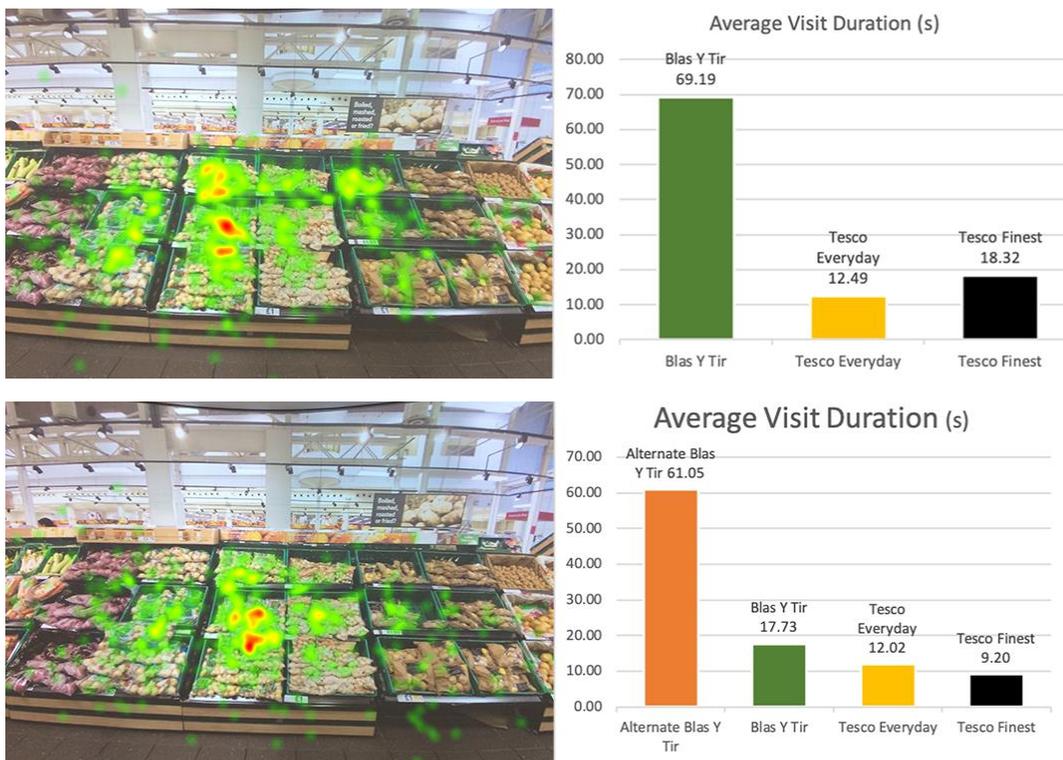


FIGURE 6 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

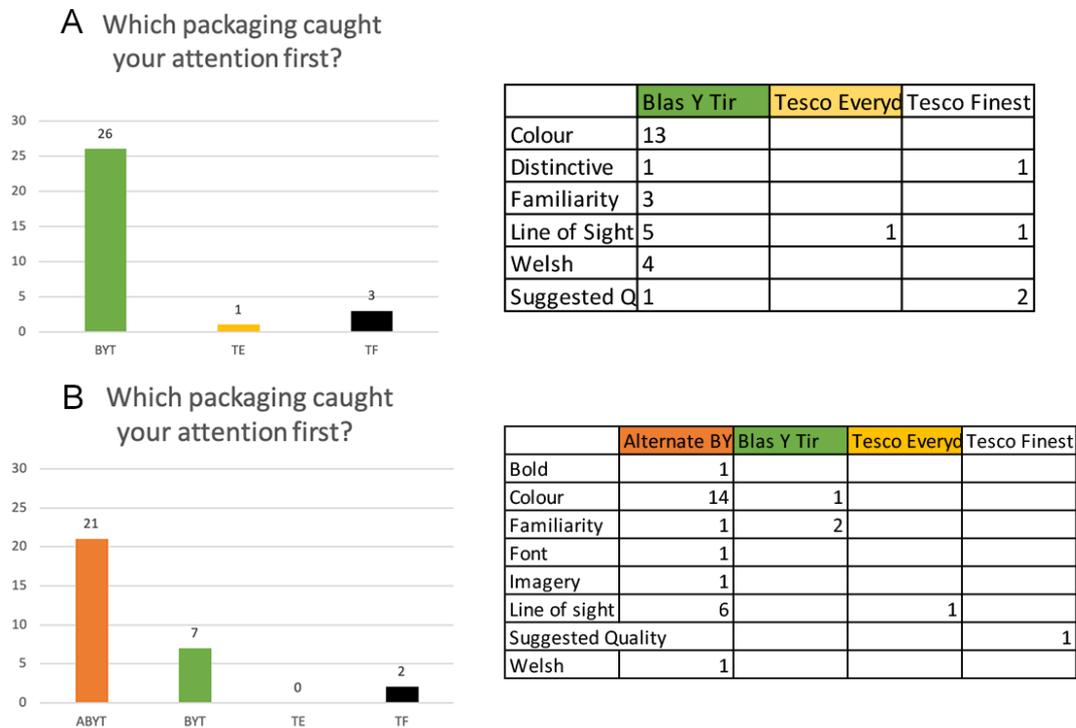


FIGURE 7 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT)
(TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA with a Huynh-Feldt correction showed that BYT packaging differed significantly to TE and TF packaging [$F(1.619, 46.942) = 98.193, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of BYT packaging (0.87) and both TE (0.03) and TF (0.10). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA with a Huynh-Feldt correction showed that ABYT packaging differed significantly to BYT, TE, and TF packaging [$F(2.57, 74.521) = 32.369, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there were significant differences ($p < .05$) between the participants' choice of ABYT packaging (0.70) and BYT (0.23), TE (0.00), and TF (0.07). No other comparisons were significant (all $p > .05$).

2. Which packaging do you like most?

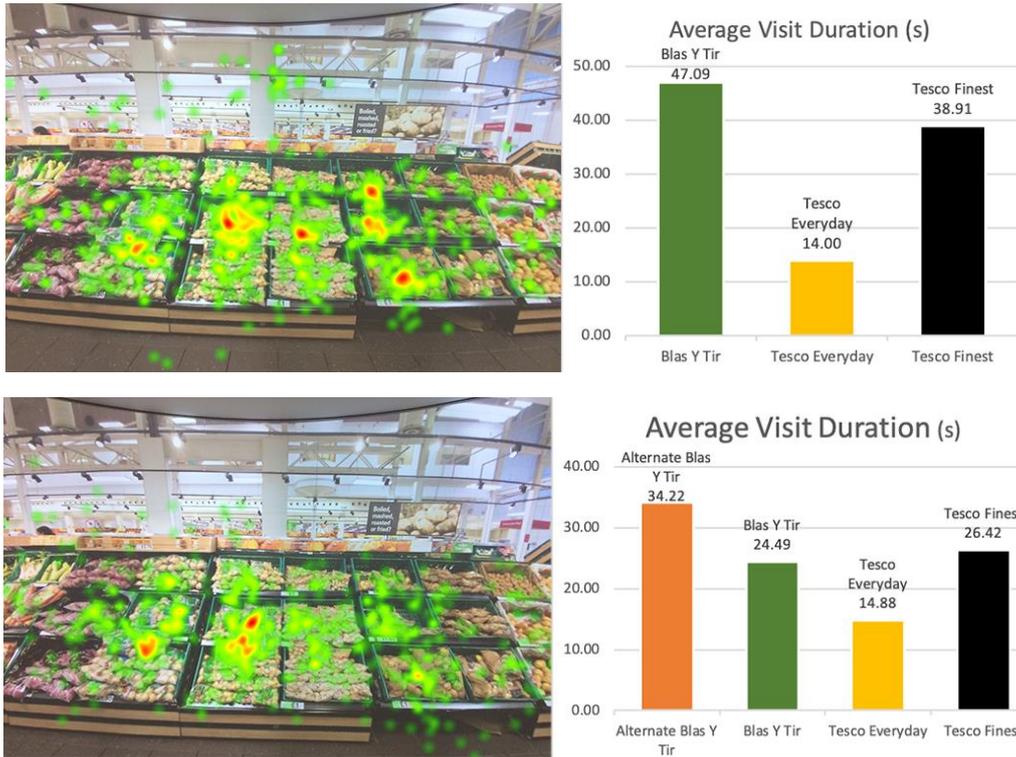


FIGURE 8 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

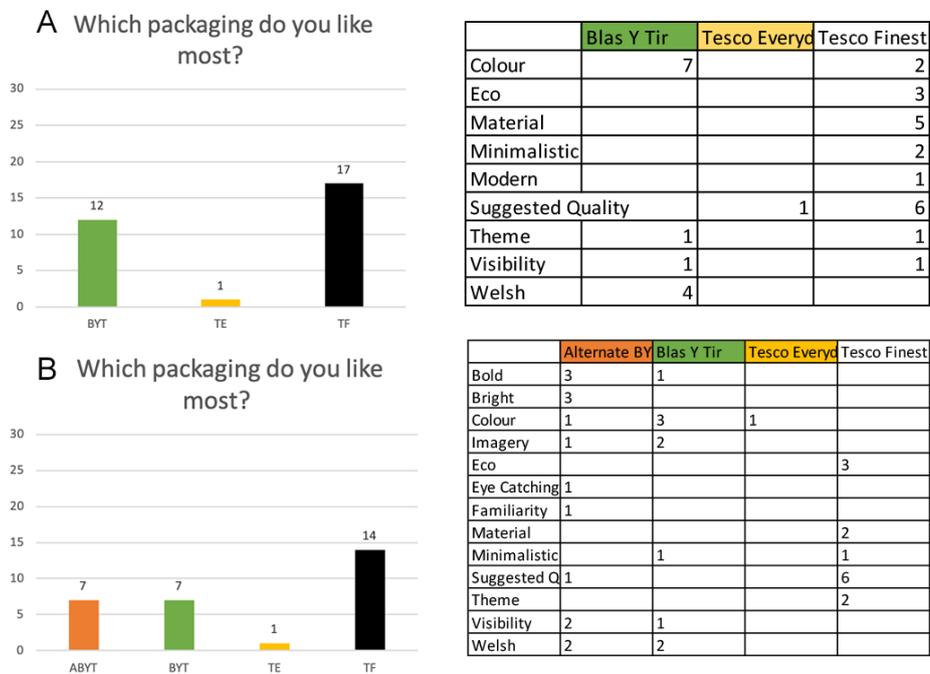


FIGURE 9 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA was conducted, and the Mauchly's Test indicated that the assumption of sphericity had not been violated, $\chi^2(2) = 3.254$, $p = 0.196$. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.03) and both BYT (0.4) and TF (0.57). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TF packaging differed significantly to ABYT, BYT, and TE, [$F(1.985, 57.573) = 11.83$, $p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that was a significant difference ($p < .05$) between the participants' choice of TF packaging (0.47) ABYT (0.23), BYT (0.23) and TE (0.03). No other comparisons were significant (all $p > .05$).

3. Which packaging do you like least?

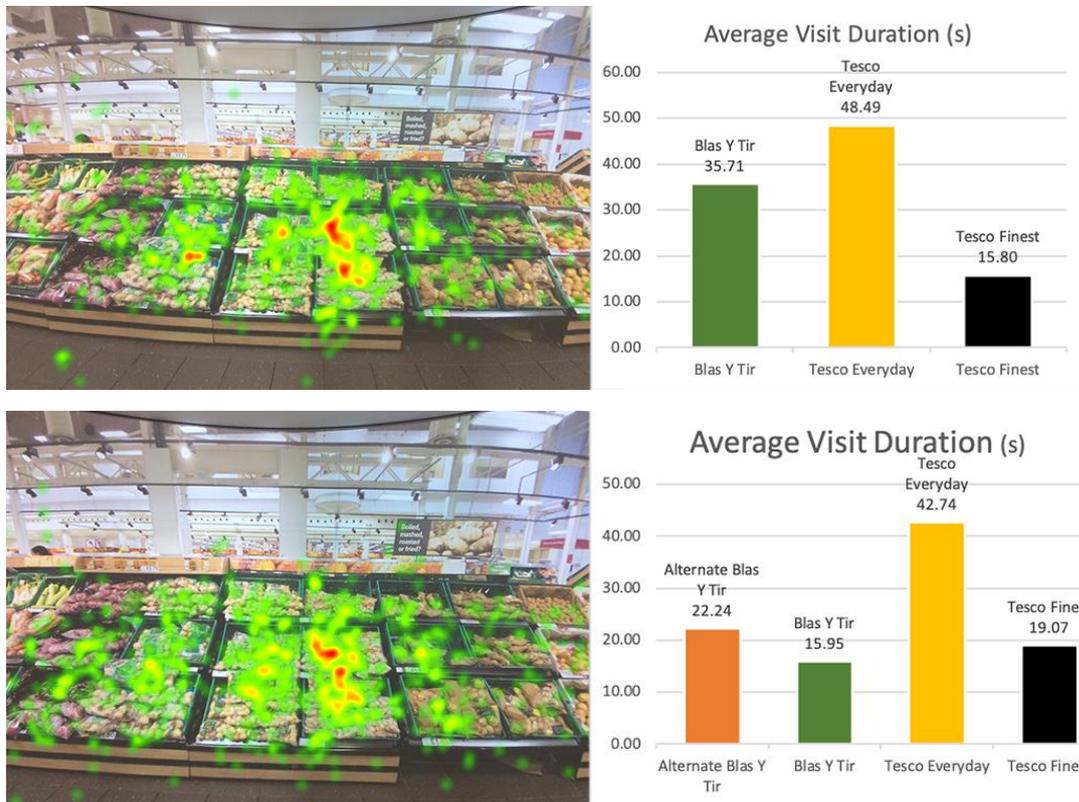


FIGURE 10 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

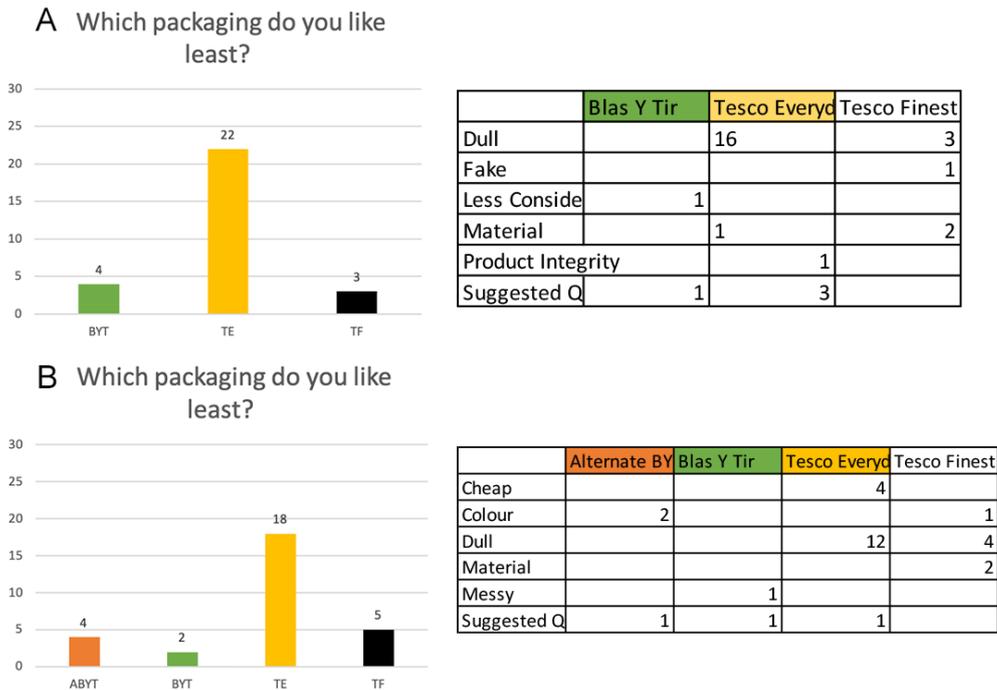


FIGURE 11 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TE packaging differed significantly to BYT and TF packaging [$F(1.209, 35.063) = 43.819, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.73) and both BYT (0.13) and TF (0.10). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TE packaging differed significantly to ABYT, BYT, and TF packaging [$F(1.704, 49.409) = 22.054, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.60) and ABYT (0.13), BYT (0.07), and TF (0.17). No other comparisons were significant (all $p > .05$).

4. Which packaging feels more Welsh?

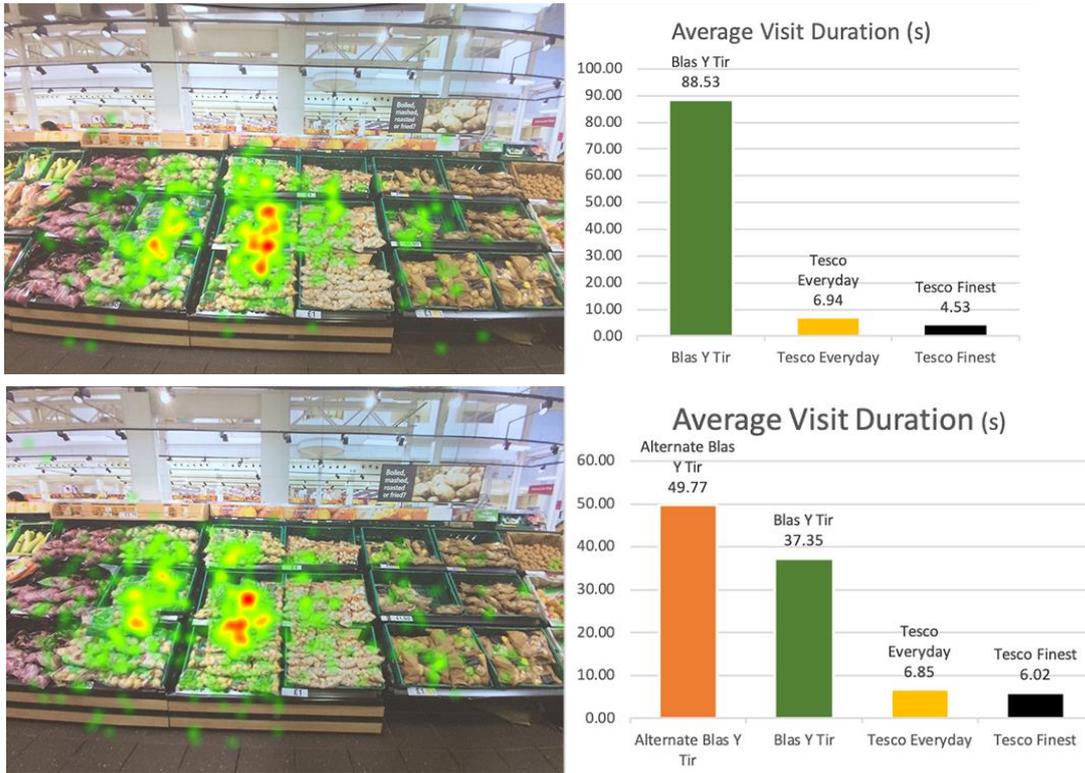


FIGURE 12 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

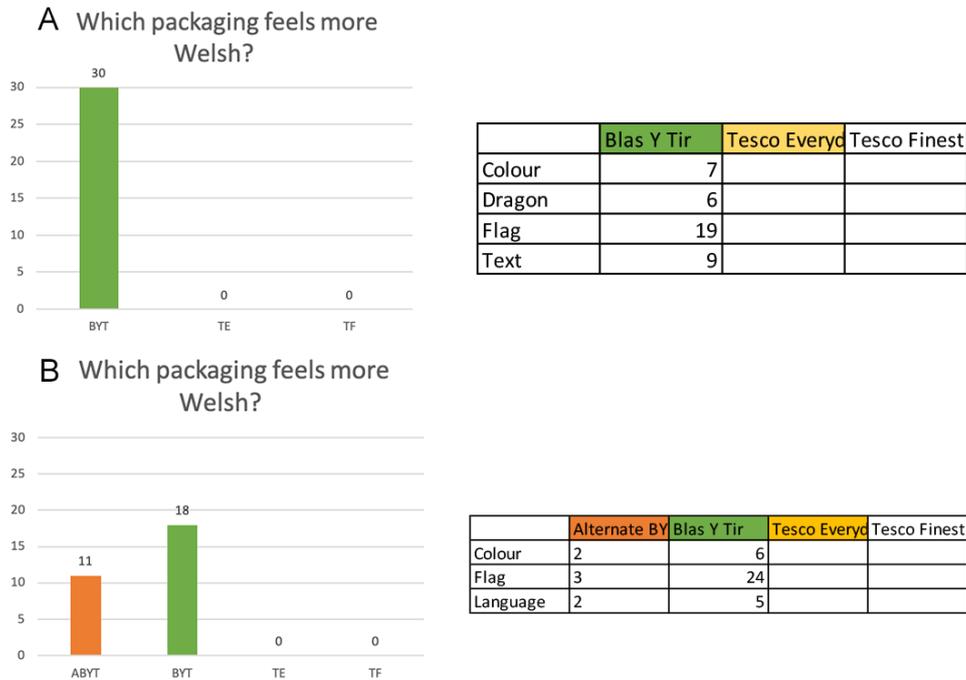


FIGURE 13 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) 100% of participants chose BYT as the packaging that felt most Welsh.

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that BYT packaging differed significantly to ABYT, TE, and TF packaging, and ABYT differed significantly to TE and TF packaging. $[F(1.767, 51.23) = 26.935, p < 0.001]$. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of BYT packaging (0.60) and ABYT (0.37), TE (0.00), and TF (0.00). It also shows a significant difference between ABYT (0.37) and TE (0.00) and TF (0.00). No other comparisons were significant (all $p > .05$).

5. Which packaging feels more premium?

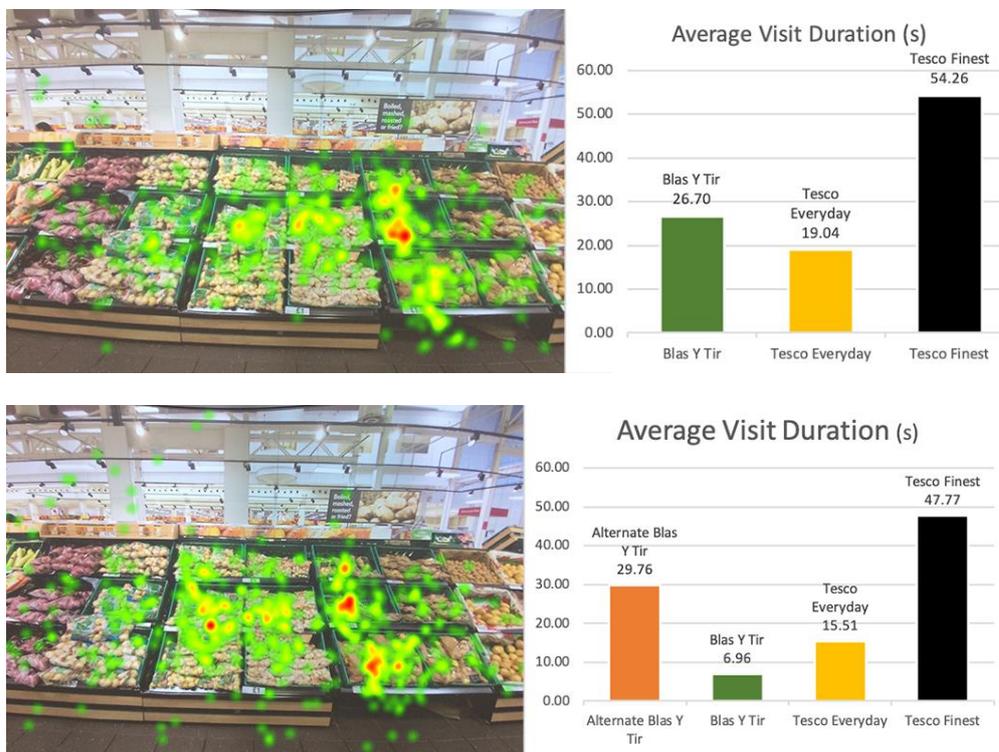


FIGURE 14 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)



FIGURE 15 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TF packaging differed significantly to BYT and TE packaging [$F(1.0, 29.0) = 58.0, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TF packaging (0.80) and both BYT (0.1013) and TE (0.13). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TF packaging differed significantly to ABYT, BYT, and TE packaging [$F(1.606, 46.575) = 66.156, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TF packaging (0.80) and ABYT (0.10), BYT (0.07), and TE (0.03). No other comparisons were significant (all $p > .05$).

6. Which packaging feels more modern?

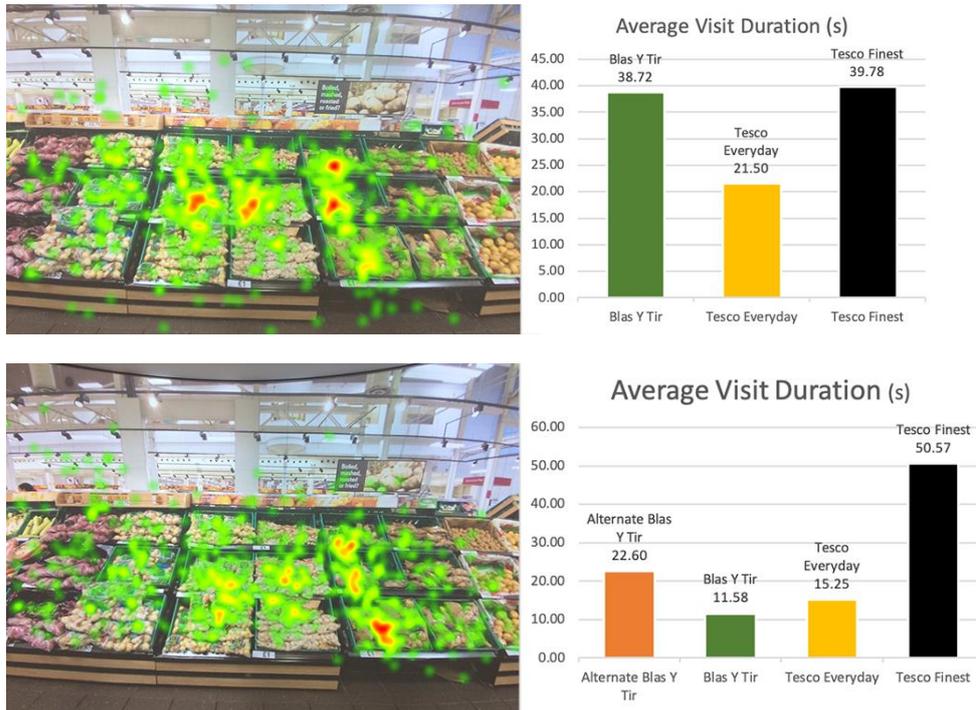


FIGURE 16 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)



FIGURE 17 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TF packaging differed significantly to BYT and TE packaging [$F(1.217, 35.291) = 31.0, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TF packaging (0.77) and both BYT (0.13) and TE (0.10). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TF packaging differed significantly to ABYT, BYT, and TE packaging [$F(1.480, 42.931) = 54.459, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TF packaging (0.77) and ABYT (0.03), BYT (0.10), and TE (0.10). No other comparisons were significant (all $p > .05$).

7. Which packaging feels more fresh?

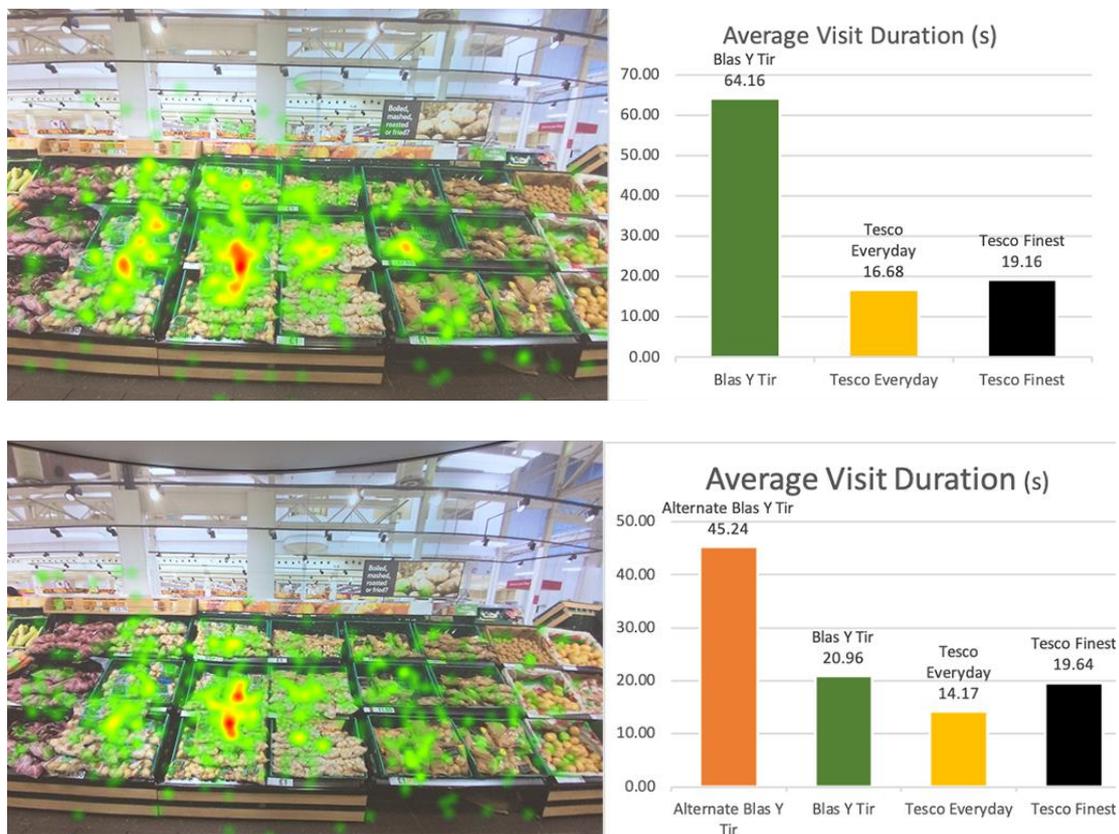


FIGURE 18 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)



FIGURE 19 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA was conducted, and the Mauchly's Test indicated that the assumption of sphericity had not been violated, $\chi^2(2) = 0.094$, $p = 0.954$. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between all participants' choices of packaging, BYT (0.67), TE (0.00) and TF (0.30).

B) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TE packaging differed significantly to ABYT, BYT, and TF packaging [$F(2.967, 61.129) = 12.232$, $p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.00) and ABYT (0.43), BYT (0.27), and TF (0.30). No other comparisons were significant (all $p > .05$).

8. Which product would you buy based purely on packaging, regardless of price?

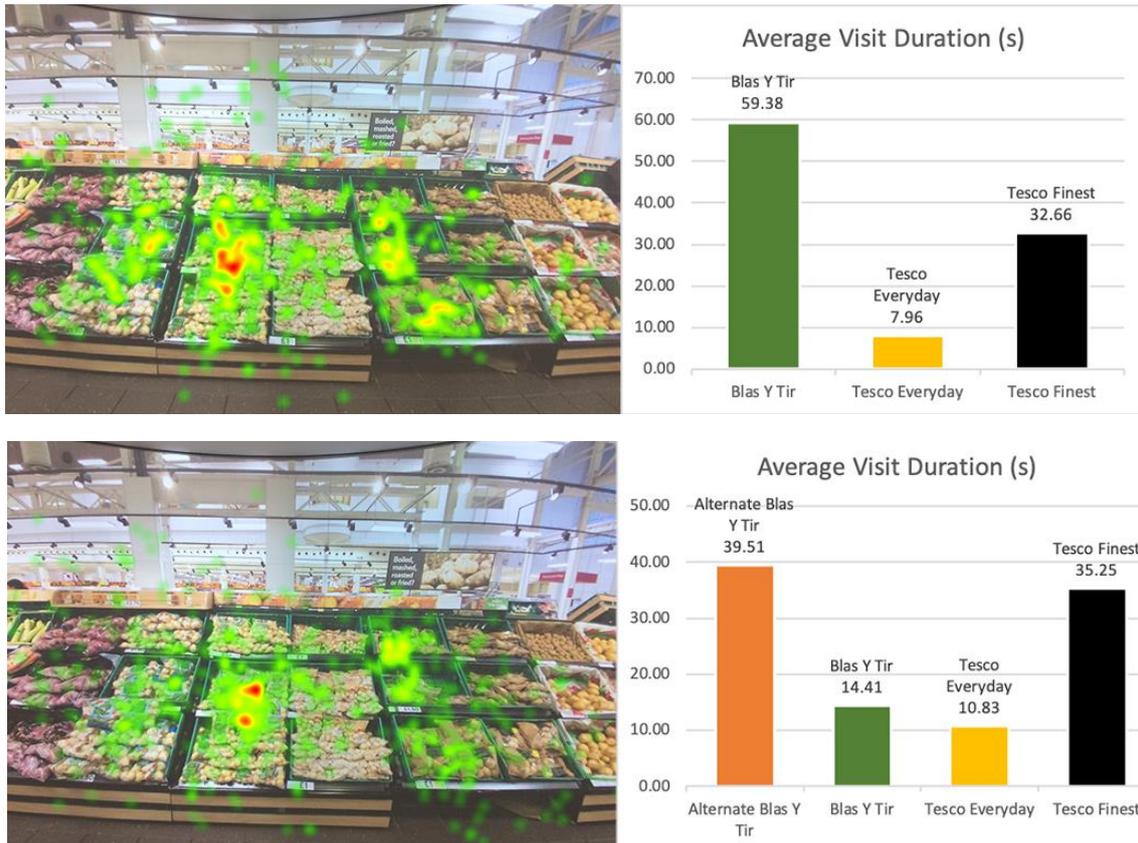


FIGURE 20 EYE TRACKING VISUALISATION AND AVERAGE VISIT DURATION CHART (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)



FIGURE 21 QUANTITATIVE RESULTS (LEFT) AND QUALITATIVE CODING CHART (RIGHT) (TOP ROW: CONDITION A, BOTTOM ROW: CONDITION B)

A) A repeated measures ANOVA with a Greenhouse-Geisser correction showed that TE packaging differed significantly to BYT and TF packaging [$F(1.385, 40.154) = 26.238, p < 0.001$]. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.00) and both BYT (0.53) and TF (0.47). No other comparisons were significant (all $p > .05$).

B) A repeated measures ANOVA was conducted, and the Mauchly's Test indicated that the assumption of sphericity had not been violated, $\chi^2(2) = 10.453, p = 0.064$. Post-hoc tests using the Bonferroni correction revealed that there was a significant difference ($p < .05$) between the participants' choice of TE packaging (0.00) and ABYT (0.30), and TF (0.50). It also showed a significant difference between TF (0.50) and BYT (0.20). No other comparisons were significant (all $p > .05$).

A significant result showed 60% of participants preferred the ABYT packaging design. See Figure 22 below.

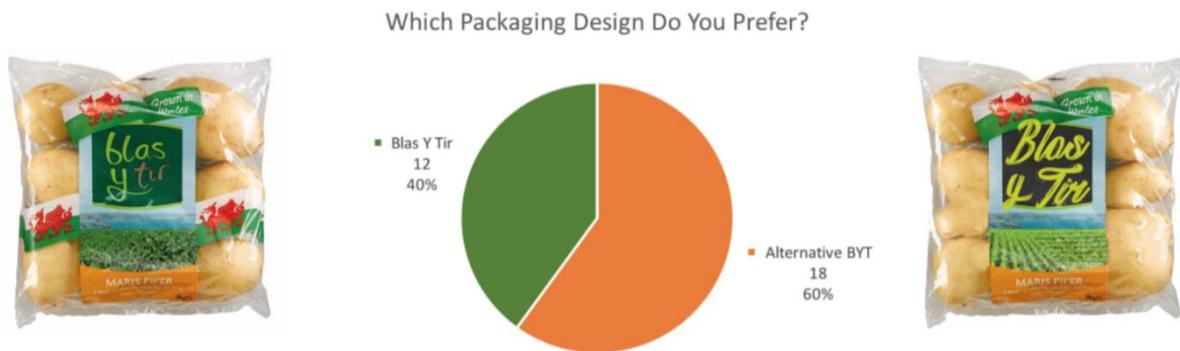


FIGURE 22. SHOWS SHOPPERS' PREFERENCE OF PACKAGING DESIGN
Word clouds were generated by the proportion of reoccurring key themes used to describe each packaging design.



FIGURE 23. KEY DESCRIPTORS OF BYT PACKAGING



FIGURE 24. KEY DESCRIPTORS OF ABYT PACKAGING



FIGURE 25. KEY DESCRIPTORS OF TE PACKAGING

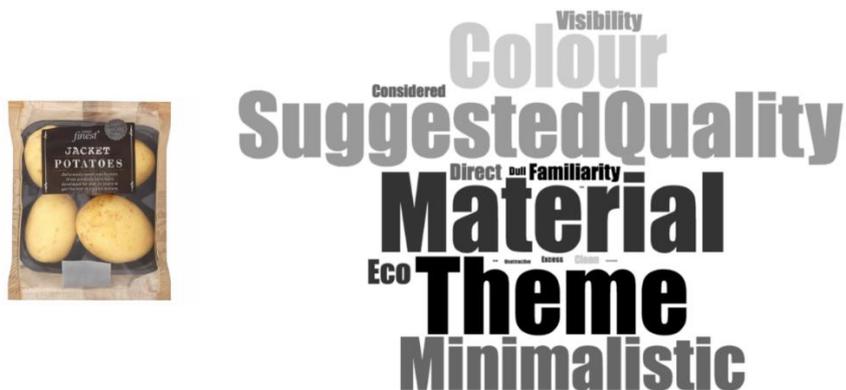


FIGURE 26. KEY DESCRIPTORS OF TF PACKAGING

Discussion

Patterns and keywords that appeared across the qualitative feedback were valued as significant and categorised into themes. This part of experiment was used in tandem with the quantitative data to gain a deeper understanding of shoppers' perceptions rather than confirming or developing theories. Thematic Analysis⁵ was used for its flexibility and accessibility as an inductive approach to analyse the data.

1. Attention

Quantitative results show that in condition A, BYT was chosen significantly more over the other packages and in condition B, ABYT was chosen significantly more. This, can be explained by positioning, coupled with some answers in the qualitative feedback suggests that line of sight may be a factor. However, precautions were taken as mentioned in the Methodology, the camera's focal point when the photograph was taken, was in the middle between BYT/ABYT and TE to minimise bias.

2. Like Most

In qualitative results of both condition A and B, TE scored significantly lower than the other packs, and TF scored highest, though there was no significant difference between TF and BYT/ABYT. In condition B, ABYT and BYT were chosen the same amount of times.

3. Like Least

TE was consistently and significantly chosen as the least liked packaging design in both conditions.

4. More Welsh

In condition A, 100% of participants chose BYT as the packaging that felt more Welsh. In condition B, the quantitative results show again that BYT felt significantly most Welsh. Suggesting that line of sight is not a factor in decision making when asked targeted questions.

5. More Premium

In both conditions, the packaging chosen significantly more frequently when asked 'which feels more premium' was TF, which is appropriate as it is Tesco's premium line.

6. More Modern

In both condition A and B, TF was chosen as the packaging that felt more modern significantly more than the other pack designs.

7. More Fresh

In condition A, the results show that both BYT and TF was chosen significantly than TE, however, BYT is chosen significantly more than TF again. In condition B, although ABYT scored highest, there were no significant differences between ABYT, BYT, or TF. However, they were all chosen significantly more as packaging that felt more fresh than TE.

8. Buy

Shoppers in condition A chose TF and BYT to buy significantly more than TE, however, there is no significant difference between BYT and TF. This is a positive result for Puffin Produce as BYT is their basic line, and it did significantly better than TE, and there was no significant difference between BYT and TF considering TF is the premium line for Tesco. In condition B, TF scored highest, significantly more so than BYT and TE, but not ABYT. TE was chosen the least again, however, there was no significant difference between TE and BYT. Again, a positive result for Puffin Produce as BYT is their basic line, was chosen more than TE, and though ABYT was chosen slightly more than BYT, there was no significant different.

Limitations

As only 30 participants were involved in this study, the results from this experiment cannot be used to represent the decision choices the general population. Although steps were taken to minimise line of sight bias, it is still a factor to consider in future studies (for example, to counter balance shelf location). Ultimately, this experiment was conducted in a simulated environment, so the results cannot be assumed to be the same as if conducted in a real supermarket. Further larger scale studies are required to valid these results.

Conclusion and Future Research

This experiment is a created system in which tests can cheaply, quickly and effectively assess packaging design. The results from the experiment cannot definitively improve packaging design, but rather give guidelines and provide empirical data highlighting perceptions of targeted aspects of design elements. This method can reveal and confirm general perceptions, and which packaging participants are attracted to based on design. Equipped with this data, companies or design agencies can use this knowledge to inform future designs. This study has revealed interesting associations between packaging design elements and its link to the perception of the product. The next step will be to develop a new packaging design based on insights gained from this experiment, and to

test it against its' predecessors to see if there are any significant differences in scores/perception. In the next study, packaging positioning will be counterbalanced to minimise line of sight bias.

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Characterization of food offer at a university cafeteria

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Keywords: University; Availability; Food offer.

Introduction

In European countries, economic development and the increase of consumers' purchasing power led to an increase of food availability, which resulted in deep changes in food consumption (1). Regardless of other risk factors, an unbalanced food consumption pattern, characterized by high consumption of high energetic food, such as sugary drinks, sweets, cakes and fast-food associated with a sedentary lifestyle, has a significant impact on the nutritional status of the population, leading to an increased risk of developing chronic non-communicable diseases (1-5). Cafeterias have been associated with low availability of healthy foods (6-8) and consumption away from home as potential promoters of obesity prevalence has been demonstrated in several studies and assumed by consumers (7, 9-11). The key factor in the decision process of food selection is the food at the work environment (12), which includes complex aspects such as cost, quality, availability and accessibility that can act as incentives or barriers in the selection of healthy options (6, 12-14).

Therefore, it becomes necessary to develop tools that assess food availability of restaurants, allowing consumers to identify units that adopt strategies, which will facilitate the acquisition of healthier eating patterns among the population (7, 13). Cafeterias present a complementary service to the university canteens; they must also observe the principles of a balanced diet and act as health promoter (15). Recently, university and work cafeterias have been recognized as a place of support in the promotion of a healthy diet and are considered as decisive and influential on eating behaviour (16), since students and employees spend most of their break time there (16, 17). By modifying food availability in cafeterias, it may be possible to promote consumption of healthy foods and restrict the marketing of harmful foods, influencing eating habits (18-21).

Objective

To assess the food offer of a university cafeteria and characterize the nutritional adequacy of the food items available and to correlate it with sales and prices.

Materials and Methods

Food groups through direct observation and price list evaluated the availability from the perspective of the variety of food products available for sale. Food products were

classified as desirable (D), acceptable (A) and not desirable (ND). The classification was carried out taking into account the target population and the goals of health promotion and according to the criteria developed by Ferreira et al and by Costa (50, 51) and The Guidelines for school buffets of the Portuguese Ministry of Education and Science - General Direction of Education (MEC - GPI) (52). Availability, sales and cost were evaluated item by item.

Table 1 – Food items classification according to literature

Desirable (D)	Acceptable (A)	Not Desirable (ND)
Milk and dairy products rich in calcium, fruit, dark bread, bread without added fat or very low fat content and without added sugar.	Food products that can function as an alternative and complement of desirable food products. In accordance with the classification developed by Ferreira, A., <i>et al</i> and by Costa, there were considered acceptable foods rich in carbohydrates, with or without added sugar; Examples: chocolate milk, biscuits and <i>Croissants</i> without stuffing, without stuffing, white bread, ham, cheese and nectars.	Food products that have one or more of the following characteristics: are hiper energetic; include stimulants; additives or have high salt content.

Pastry, cakes, fruit nectars and ice cream, due to the lack of discrimination on available data of the type and variety of products offered and sold, were classified as follows: all nectars as A food, and all types of pastries, cakes (with the exception of the slice of cake) and ice cream as ND food. Additionally, since the bread was classified as D food and jam and butter as A food, bread with butter or jam, were classified as A food. Also regarding white bread with D or ND food, was classified as A food. According to Decree Law N°. 50/2013, of April 16, cafeteria (alcoholic) beverages may not be available for sale. So, beer with alcohol and wine, were classified as ND products, considering their alcoholic content. Sales and prices of food items on a cafeteria of private management in the university campus were collected through reports of daily sales. The analysis was carried out between January and June. For qualitative evaluation and study of availability, sales and prices the Microsoft Office Excel® was used.

Results

It was found that 46% of foods available at the cafeteria were not desirable, 29% were desirable and 25% of products were acceptable. In general, consumers choose mostly not desirable food products (44%), followed by acceptable food (34%) and as final option desirable food products (23%). It was found the most available products were drinks with a prevalence of 30%. Fruit and ice cream were the least available products with a prevalence of only 1%. Drinks were sold in a higher percentage, accounting with 32% of the total sales. Ice creams accounted for 1% compared of the total sales. The results for availability of food products as well as the sales were organized by group and by subgroup.

Drinks: In terms of availability, it was found that not desirable drinks predominate (46%), followed by desirable drinks (39%) and finally by acceptable drinks (15%). Although in

terms of availability not desirable food predominate, the desirable products were the most sold (40%), followed by acceptable food (33%) and by not desirable food (26%) (Table 1). In spite of a greater availability of soda/soft drinks (32%), nectars were the most sold drinks (25%).

Homemade cakes and pastries: In this group, only ND (58%) and A (42%) products were available. It was found that ND food products were the most sold accounting for 61% of the total sales (table 3). It was also found that the pastry products showed a high availability (47%) and they were also the most sold (60%) of the group of homemade cakes and pastries.

Sweets: In this group level, all food products were classified as not desirable. The products with the highest sales were the chewing gum and chocolates.

Breads: In this group food products were classified as desirable (72%) or acceptable (28%). It was found that although in terms of availability desirable food products predominate, the acceptable foods were the most sold (66%).

Sandwiches: Food products available were classified only as acceptable (70%) and desirable (30%). Acceptable food products were the most sold (69%).

Snacks: 89% of snacks available were not desirable, followed by acceptable (11%). Not desirable food were the most sold (94%). Food products, as for example quiche, hamburgers, pizza slices and hot dogs in spite of being the most available (39%), were not the most sold, being supplanted by fried potatoes and chips (66%).

Ice Cream: All products were classified as not desirable. This group has only 2 types of food products and for this reason the comparative analysis between the prevalence of availability and sales was not applicable.

Fruit: All products on this group were classified as desirable. In terms of availability this group also features only 2 types of food products and for this reason the comparative analysis between the availability and sales was not applicable.

The average price of products available was 1.02€ and the top selling products were “not desirable products” with an average price of 1.05€. It appears that the “not desirable products” were on average more expensive than the others. The products more available were the most sold (table 2).

Table 2. Prevalence of food availability, sales and cost according to classification of food products

Classification	Average Cost (€)	Availability (%)	Sales (%)
Not desirable	1.05	46.0	43.6
Acceptable	1.05	23.4	33.8
Desirable	0.94	30.7	22.6

Drinks: In this group the “not desirable products” presented an average cost of 0.97€ and were the most available (13.7%). Despite this, the most sold products were desirable products that were the cheaper ones (0.77€) (table 3).

Homemade cakes and pastries: In this group, “not desirable products” are those who were on average more expensive (0.86€), and those who were more available and more sold (table 3).

Sweets, ice cream and fruit: Comparing to ice creams and sweets, fruits were cheaper, and compared with sweets they were less available and less sold (table 3).

Bread: In spite of availability of less healthy options, it appears that healthier options, although more expensive, are the most sold (table 3).

Sandwiches: The average cost of acceptable and desirable sandwiches was very similar, and less healthy options were slightly more expensive. Despite being more expensive, they were the most available and the most sold (table 3).

Snacks: The not desirable snacks available were more expensive than the acceptable ones. Despite this, they were the most available and the most sold (table 3).

Table 3. Prevalence of food availability, sales and cost according to classification of food products and by a subgroup of foods

Group	Classification	Cost (€)	Sales (%)	Availability (%)
Drinks	Not desirable	0.97	8.3	13.7
	Acceptable	0.87	13.6	4.4
	Desirable	0.77	12.9	11.7
Homemade cakes and pastries	Not desirable	0.86	13.4	8.0
	Acceptable	0.83	8.4	5.8
Sweets	Not desirable	0.84	5.4	5.1
Fruit	Desirable	0.75	2.8	1.5
Ice Cream	Not desirable	1.28	1.1	0.7
Bread	Acceptable	0.67	9.2	5.8
	Desirable	0.96	4.8	15.3
Sandwiches	Acceptable	1.89	4.6	5.1
	Desirable	1.88	2.1	2.2
Snacks	Not desirable	1.25	15.4	18.3
	Acceptable	1.05	0.9	2.2

Discussion

“Not desirable food products” should be the least representative; nevertheless, they were the most available at the cafeteria, corresponding to 46% of whole products. These results were in line with findings in a study carried out in the cafeteria at school the School of Tourism and Hospitality of Coimbra (EHTC) (22). Sales data followed the same trend of availability, not desirable food was the most sold, corresponding to 44% of whole sales, while desirable food products were the least sold (23%). Similar results were found in another study conducted in the cafeteria of EHTC, where not desirable dinks

corresponded to 60.9% of sold beverages (23). Most available products were high energy density, rich in saturated fats, low in complex carbohydrates and rich in simple sugars and are low density foods. Our results are in line with other studies on trends of food availability (1, 24). The not desirable products were the most sold. These results are consistent with the results from others studies undertaken in several European countries and in the United States of America (25-28). Availability and sales of ice creams may be underestimated since they are seasonal products and analysis was performed in the period of winter/spring.

It is known that food availability influences food intake, although it is not the only determinant. So, in view of the results obtained in this study, the question arises concerning the relationship between food availability and consumption. Considering the availability of food as a determinant of food habits, we might think that if the availability of desirable food increased in the cafeteria, an increase in consumption should be expected. These results reveal the need for improving nutritional adequacy of the menus, in order to meet recommendations, and promote healthier eating habits by canteen users. The intervention can start by a concerted action between units modifying the offer and increasing desirable products.

Comparative analyses carried out after systematic and continuous interventions reveal positive changes in food provided by school cafeterias. The effectiveness of these interventions is due to the involvement of the various levels of responsibility of the institutions, specialized health professionals and complementary actions of food education together with the agents involved - including employees who prepare meals and consumers - with the aim of promoting acceptance of proposed measures (29).

Conclusion

Generally, food offer is not good. However comparing the price of food available and food sold, seems that the price not to influence the food choice in the population under analysis. Food availability should be changed to shape sales toward the promotion of health, as well as the development of new policies and actions of food education to enable people to make more informed food choices away from home.

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GERVALOR: Valorization of Food Waste in a Hospital Food Service Unit

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Background

In the food sector, waste is a major social, nutritional and environmental issue, affecting the sustainability of the food chain as a whole. In the EU alone, we waste 90 million tons of food every year, i.e. 180 kg per person (1). Moreover, the growing concerns about hunger, preservation of the environment and the economic crisis have raised public awareness of food waste (2, 3). As several authors now assert, there is a need to investigate the social and environmental implications of waste at different stages of the supply chain. Indeed, food waste has an impact on food security, on food quality and safety, on economic development and on the environment (4). Some of the wasted products simply cannot be consumed, as they are not fit for human consumption and thus they must be considered “losses” in all respects. Instead, a part of the wasted products is still suitable for human consumption (5). Halving this edible waste is one of the goals in the Roadmap to a Resource-Efficient Europe, not least because the food value chain in the EU is responsible for 17% of Europe's direct greenhouse gas emissions and 28% of its material resource use (1). In order to prevent and reduce food wastage, the European Parliament declared 2014 the European Year against Food Waste, inspired by Last Minute Market¹ and its campaign “One year against waste”. The literature on food waste has so far focused on the quantification of the total food losses along the supply chain (2, 6, 7) to highlight the negative implications of this phenomenon as well as its impact on the whole food system as a whole (8). However, the retail stage has long been neglected by such studies, although its contribution in limiting the implication of food waste might be consistent and, at the same time, sustainability is becoming an important business issue for retailers, as their practices may influence the whole supply chain process and its economic, environmental and social consequences (9).

Staggering amounts of food waste thus generate enormous energy, chemical and material potentials due to the functionalized molecules stored in them (10). The idea of harvesting high value-added products from food waste streams aligns with the current concept of sustainable development, which aims to achieve food security, environmental protection, and energy efficiency. Collective efforts have been made in the recent years to exploit food waste as a bio resource for our next generation of energy, chemical, pharmaceutical, cosmetic, food and other high value-added products (11). GERTAL is the largest

Portuguese company in the catering sector, serving in Portugal 61.3 million meals in the year 2016. These meals represented a volume of purchases of 40,000 tons of raw material food, which corresponds to a cost of € 60,475,906, which after being introduced into the chain generate approximately 7,854 Ton of food waste in the year 2016.

GERValor project - Valorisation of Organic Food Waste – intends to allow GERTAL, a Portuguese food service company, sign in the objectives of the European Plan for the Circular Economy and fight against food waste. Through this project, GERTAL enables contribute to the development of a pioneering strategy for the recovery of waste and reducing food waste in Portugal, thus encouraging the reduction of barriers to the entry of technologies and business models for the sector.

Objective

To characterize food waste in hospital food unit and identify it possible sub products. Additionally, analysis of environmental impact of meals production, with and without food waste valorisation.

Methods

The evaluation of food waste was conducted in a hospital food unit selected by convenience attending the fact that health sector is the one with great amounts of food waste. The food unit selected serves on average 2.870 meals a day and 1.062.100 meals by year. Food waste produced was evaluated during 14 days, without any connection with the planned menus. Food waste was separated in Cereals and tubers (pasta, rice and potatoes), bread, mixed meals, meat, fish, pimples / bones, soup, fruit and vegetable and milk. Food waste was monitored in cafeterias, during meal preparation, and after service of meals. The quantification of the food waste was carried out by weighing the components of the meal. A calibrated balance (maximum 100 kg, minimum 1Kg and precision of 30g) to weigh the total amount of food produced, plate waste and leftovers. Selective aggregate weighing method was used.

This method involves weighing the aggregate food by type of food. Food remains from ingestion, for all the individuals, are separated into different containers according to the type of food. The average value of the waste, per food item and per meal, is determined by dividing of the overall value of wastage found by the number of subjects who ate the meal (12). To identify possible sub-products of food waste characterized in the unit under analysis, bromatologic analysis was conducted. For this analysis, a sample of food waste before and after food production was selected randomly. Sciantec Analytical Services carried out Bromatological analysis. Environmental impact of meals production was analysed through Life Cycle Analysis.

Results

Food Waste Characterization

During the period under analysis, was observed an average of 22% of food waste by meal produced.

Table 1 – Plate waste according different distribution options by food group

Unit	Kg							L
Food waste	Cereals and Tubers	Bread	Mixed Meals	Meat	Fish	Soup	F&V	Milk
Served in tray	1560.83	153.14	671.34	460.47	311.14	2000.88	1547.39	1716.00
Served in Cafeteria	7.00	0.00	0.00	0.00	0.00	0.00	426.51	0.00
Self-line	0.00	0.00	0.00	135.74	61.21	0.00	478.16	0.00
Total/food group	1567.83	153.14	671.34	596.21	372.34	2000.88	2452.06	1716.00
Total	9530							
N.º of meals produced	42484							
% Food Waste by meal	22%							

Differences in meals components were observed before and after production waste. As shown in table 2 the waste after production is higher than before.

Table 2 – Food waste before and after food production

	Before		After	
	Kg	%	Kg	%
Meat	135.74	20	105.85	16
Fish	61.21	9		
F&V	478.16	71	80.75	12
Carbohydrates Sources	-	-	226.65	34
Soup	-	-	146.7	22
Mixed meals	-	-	105.85	16
Total	675	100	11836	100

Bromatological analysis of food waste

Composition analysis samples is vital to assess their potential valorisation applications. As shown in table 3, food waste samples have high moisture content, moderate levels of sugars and starch, low ash contents and low gross energy values. Differences between composition items under analysis sample before and after food production were observed, being the sample after food production globally richer to valorisation.

Table 3 – Bromatological Analysis of Food Waste

	Before food production	After food production
Total oil (%)	<0.30	0.60
Crude fibre content (%)	0.80	0.90
Ash (%)	0.90	0.70
Protein content (%)	1.20	1.90
Starch content (%)	3.00	0.60
Sugar content (as sucrose) (%)	1.13	4.79
Gross energy (MJ/kg)	1.40	2.24
Calcium (%)	0.04	0.02
Sodium (%)	0.01	0.02
Magnesium (%)	0.02	0.01
Copper (mg/kg)	1.00	1.00
Iron (mg/kg)	5.00	5.00
Manganese (mg/kg)	1.00	3.00
Zinc (mg/kg)	2.00	2.00
Potassium (%)	0.28	0.21
Phosphorous (%)	0.03	0.04
pH	6.20	4.80
Moisture content (%)	91.80	87.40
Gas yield (m³/tonne of fresh matter)	40.60	65.90
Total methane content (%)	53.90	54.10

Possible routes of valorisation

Taking into consideration the composition and properties of food waste sample under analysis, various valorisation routes could be identified. A biorefinery is a facility for the total conversion of biomass material or waste into fuels, power, chemicals, materials, bio-based polymers and fibers. The biorefinery concept takes advantages of biomass components and intermediates to maximise the value derived from these materials. To be economically viable, it is important to produce a range of different products to maximise the value of the biomass feedstock, open new markets and reduce the cost of installation. Food waste under analysis seems to be a suitable feedstock for biorefineries as it can contain considerable amounts of carbohydrates, protein and oil, as shown in table 3. Possible routes of valorisation are presented in table 4.

Table 4 – Possible routes of valorisation of food waste identified

		Potential Usage	Constrains
Applications in the food industry	Animal (livestock and pet) feed	a) Carbohydrates and Proteins from food waste used as ingredient in livestock feed b) Incorporated into pet feed(13)	a) EU legislation(10, 14-16) b) Low starch and protein content c) Variability of food waste d) High moisture content e) Cost of technological process prior to

			incorporation process(17)
	Processing into flour	a) Drying and grinding into a fine powder (“flour”) that can be incorporated as a functional ingredient in a variety of food products(18, 19)	a) Variability of food waste b) High moisture content c) Cost of technological process prior to incorporation process(18)
Anaerobic digestion	Biogas (biomethane)	a) Heat b) Electricity(20)	a) Depends on biomethane potential of food waste samples(21)
	Digestate	a) Fertiliser	
	Volatile fatty acids (VFA)	a) High content in organic matter, carbon and nutrients used in the production of VFA(22, 23)	a) Further studies would be required to determine the most promising conditions to produce VFA(24)
Production of energy and fuels	Production of biohydrogen	a) Produced from waste biomass(25)	a) Uptake of hydrogen fuels cells remains low. b) pH c) Moisture content(26)
	Production of biohythane	a) Sugar content of mixed samples could be promising to usage of food waste to biohythane production.(27)	a) Pre-treatment b) Scale-up(27)
	Production of bioethanol	a) Produced from biomass materials	a) Pre-treatment(24) b) Low content of starch in food waste samples c) Storage processes of food waste
	Production of biobutanol	a) Solvent b) Extraction agent c) Supplement d) Eluent e) Biofuel(24)	a) Low content of starch in food waste samples b) Low yields(28)
	Production of biodiesel	a) Fuel produced from natural biological sources.	a) Variability of food waste(29)

	Pyrolysis and gasification	a) Non-condensables b) Bio-oil c) Bio-char(30)	a) High moisture content
	Combustion	a) Produce energy through biomass(31)	a) High moisture content b) Low calorific value
Extraction of high value products	Bioactive compounds	a) Incorporated as functional ingredients in a variety of industry products(32, 33)	a) Variability of food waste
	Proteins	a) Extract protein as bio component(33)	a) Variability of food waste composition
Production of chemicals and other materials	Bioplastics	a) Polymers production from renewable materials(24, 29)	a) Further studies needed to analyse economic viability of this process(34)
	Succinic acid	a) Interesting applications in food, chemical and pharmaceutical industries	a) Production costs b) Operability for the large-scale fermentation(35)
	Butanediol	a) Chemical component used in a variety of manufacturing industries b) As precursor for the production of various industrially-relevant compounds	a) Pre-treatment for some food products(36)
	Industrial enzymes	a) Biological catalysts that can be used in a variety of manufacturing industries(37)	a) Production cost(37)
Other applications	Composting	a) Compost production(24)	a) Moisture content b) Variability of food waste
	Landspreading	a) Non-chemical fertiliser	a) EU and PT legislation(38)

Limitations of food waste to valorisation

The mixed nature of food waste and variation in sample composition due to foodstuff availability, market trends and demands will have major impact on the potential of the valorisation routes. Additionally, the high moisture content observed in samples may reduce the potential valorisation applications. Furthermore, the high organic matter content of food waste may pose additional challenges in terms of storage and transportation.

Environmental impact of meals production

Meals production have different environmental impact if considering the valorisation of food waste.

Table 5 – Comparison of environmental impacts with and without food waste valorisation

Environmental Impact	Unit	Without Food Waste Valorisation	With Food Waste valorisation
Climate change	Kg CO2 eq	307.9283	123.1114
Ozone depletion	Kg CFC -11 eq	3.19E-07	-3.14E-06
Terrestrial acidification	Kg SO2 eq	0.0421	-6.4782
Freshwater eutrophication	Kg P eq	0.2240	-0.0340
Marine eutrophication	Kg N eq	-0.0017	-0.2837
Human toxicity	Kg 1,4-DB eq	-0.4338	-15.5839
Photochemical oxidant formation	Kg NMVOC	0.2002	-0.0656
Particulate matter formation	Kg PM10 eq	0.1144	-0.7716
Terrestrial ecotoxicity	Kg 1,4-DB eq	-0.1510	-0.1555
Freshwater ecotoxicity	Kg 1,4-DB eq	-0.0362	-6.4545
Marine ecotoxicity	Kg 1,4-DB eq	-0.0143	-5.5042
Ionising radiation	KBq U235 eq	0.5993	1.8037
Agricultural land occupation	m2a	-2.6543	42.5119
Urban land occupation	m2a	-0.0571	-0.4271
Natural land transformation	m2	0.0089	0.0106
Water depletion	m3	0.0051	1.1087
Metal depletion	Kg Fe eq	0.2464	-3.8147
Fossil depletion	Kg oil eq	4.1634	1.2912

Conclusion

This study shown a high level of food waste and demonstrate that valorisation of food waste is possible through some routes and that valorisation have a positive environmental impact. Further studies are needed to understand which is the best model to implement valorisation of food waste in food service unit. The GERValor project is studding valued solution according to Gertal's business model. Defined solutions could be allow a great potential of replicability in other companies that work in the food sector.

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Analyzing a Community-based Local Food Initiative to Improve Food Security among Low-income Older Adults

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Introduction

Aging is often accompanied by a decline in function, cognition, and an increase in malnutrition risk.¹ In the United States (US), older adults beyond the retirement age are also at risk of food insecurity. In addition to declining health, limited economic opportunities negatively impact the possibility to maintain well-being and health.² While this can be a challenge for those in the middle class, it is even greater for low-income populations. Because the cost of healthy foods exceeds the cost of foods with poor nutrient value, low-income populations face challenges obtaining proper nutrients for optimal health.² According to research conducted in the northwestern US, survey respondents who were in the highest income group consumed diets that were higher in nutrient density than the diets of respondents who were in the lowest income group.³

While the US is one of the wealthiest nations in the world, in 2013, food-insecure households reached 14.3% of the population.⁴ Conditions reported by households with low food security include not being able to afford a balanced meal, and having to worry about whether food would run out.⁵ Households with very low food security report skipping meals and eating less than is required.⁵ Food insecurity among low-income seniors is a community health problem in the US that has not received adequate attention. Food insecurity has been associated with increased out-of-pocket medical spending as well as non-adherence to medication, which in turn creates a vicious cycle of increased medical spending yet decreased health.¹ Medical expenditures are also expected to increase as the population ages. By 2030, 25 percent of the population will be made up of older adults.⁶ It is projected that by 2050, adults 65 and over will reach a population of 83.7 million, nearly doubling the population in 2012 at 43.1 million.⁷

Consistent high rates of food insecurity are compounded by more general patterns of poor dietary intake across the US. According to the Centers for Disease Control, as of 2015, only 9% of US adults consumed the recommended daily amount of fruits and vegetables.⁸ More broadly, men, young adults, and adults living in poverty had the lowest levels of produce consumption.⁸ Within that population are low-income older adults. While food insecurity within this demographic could be due to a variety of reasons, in many cases, there is a lack of access to fresh fruits and vegetables due to issues of low income, poor health, disability, among other factors.^{9,10} In recent decades, researchers observing this food insecurity among low-income seniors have conducted a variety of qualitative and quantitative analyses to gain a stronger understanding of the factors surrounding this insecurity. A study using multiple logistic and linear regression analyses concluded that

food insecure seniors' health fared worse than the health of food secure seniors.¹¹ It assessed the degree to which the elderly with food insecurity were likely to have a greater self-reported status of health, to be at a higher risk nutritionally, and to have a lower intake of nutrients.¹¹ Studies have identified causal factors for food insecurity at the individual and interpersonal level, including limited income, restricted mobility, limited education, living alone, and having two or more health problems.^{9,12} However, community-related factors have also been identified.¹⁰ For example, many US urban residents have poor access to fresh fruits and vegetables because they live far from stores that sell fresh produce, or they do not have access to transportation.

Because there are multiple causes of food insecurity for the elderly, interventions to address this problem have to consider the complex interrelationships between multiple barriers at individual, interpersonal and community levels. The Social Ecological Model (SEM) is a framework widely used in public health and nutrition that was designed to aid in the conceptualization of the multiple domains that influence behavior. These levels of influence include: (1) social structure, policy, and systems; (2) community; (3) institutional/ organizational; (4) interpersonal; and (5) individual.¹⁴ Social structure, policy, and systems pertain to local, state, federal policies and laws that regulate or support healthy actions.¹⁴ Community includes places, social networks, norms, or standards.¹⁴ The institutional/organizational level covers institutions, from private businesses to public entities.¹⁴ The interpersonal level pertains to interpersonal processes and primary groups that provide social identity and role definition.¹⁴ Lastly, the individual level refers to personal characteristics that influence behavior such as attitudes, knowledge, beliefs, and personality traits.¹⁴

The social ecological model accounts for causes of food insecurity throughout all five levels of the model, and it is used to model interventions to address food insecurity among low-income seniors.¹³ At the individual level, low-income seniors may not have the physical ability to access fresh fruits and vegetables, potentially due to issues such as a physical disability. In the U.S. alone, there is an estimated 40 million people who have a cognitive, sensory, or ambulatory disability.¹⁵ This can account for many people who may be struggling to acquire adequate healthy food. At the interpersonal level, many low-income seniors live alone, because a large percentage are either single or widowed.¹⁶ At the organizational level, there could be several reasons affecting the ability of low-income seniors to access fresh produce, one being that the stores that are accessible to them do not offer healthy options. From a community level, those same people cannot access the stores with healthy options because they may not have a method of transportation to get there⁹. Many low-income seniors do not own cars or they may live in an area where public transportation is poor, with many choosing to walk when there is no other form of transportation.⁹ Lastly, at the policy level, low-income seniors may be issued government food assistance. However, this often does not help individuals become completely food secure because funding may not last the whole month and because fresh produce tends to

be a more expensive option. Seniors may opt to spend their food stamps on cheap, less nutrient-rich foods to help stretch them to the end of the month.¹⁷

At the policy level, several types of local food initiatives have been promoted to attempt to increase access to fresh fruits and vegetables in communities with limited access. These include initiatives that subsidize fresh fruits and vegetables at corner stores, which usually only sell processed food and snacks. Another type of local food initiative involves encouraging urban gardening in vacant or underutilized spaces. While these types of initiatives may achieve their objectives, older adults with limited mobility may not be able to participate. In contrast, mobile farm stands or markets could transport the produce grown in urban gardens directly to assisted living homes or senior citizen centers. Although research on mobile markets is growing,^{20, 21} few studies have been conducted that specifically focus on low-income older adults as potential patrons at mobile markets.

The aim of this study is to use the SEM to describe and analyze a community-based innovation to improve food security among low-income seniors. The study was conducted in a community in northern NJ, where a coalition of non-profit, municipal and other state organizations have come together to improve local food sustainability. A central feature of this initiative is a community farm that hosts a children's farm camp and community workshops. In an effort to distribute the produce grown at the farm to those most in need in the community, the coalition constructed and staffed a mobile farm stand. This community-based intervention sought to reach a target population of seniors in low-income living facilities, where the produce has been sold at discounted prices. The mobile market is a community-level intervention that can be evaluated with the RE-AIM model.¹⁹ The RE-AIM model focuses on *Reach*, or the target population; *Effectiveness* or efficacy; *Adoption* by target locations, institutions and staff; *Implementation* - consistency and costs of intervention delivery; and *Maintenance* of intervention over time.¹⁹

Methods

During the 2016 growing season, the farm stand served three sites on a regular, weekly basis. One site was a community centre, and two sites were low-income senior living communities, where the bulk of the farm stand's customers were located. In the 2017 season, the farm stand expanded to serve these and other sites on a regular basis. In-person surveys were conducted after the market season starting in 2016. Survey respondents were recruited by inviting facility residents to a community room, and by providing refreshments upon survey completion. Data collection took place after the farm stand season ended so that survey respondents could identify any changes in behaviour. The survey included questions on demographic information and behavioural change. Survey data was analyzed using descriptive statistics, and open-ended comments were analyzed by qualitative coding. Additional statistical analysis is ongoing.

Results

Table 1. Demographic Information on Survey Respondents

Gender			
2016 Season N=31	2017 Season N=18	2018 Season N=17	
Men: 21 % Women: 79 %	Men: 11 % Women: 89 %	Men: 12 % Women: 88 %	
Education			
	2016 Season	2017 Season	2018 Season
Nursery/Preschool to 8 th Grade:	0 %	0 %	6 %
Less Than High School:	0 %	5 %	0 %
High School Graduate or GED:	65 %	32 %	18 %
Some College, No Degree:	20 %	26 %	29 %
Associate Degree:	5 %	11 %	12 %
College Degree:	10 %	26 %	29 %
Master's Degree:	0 %	0 %	6 %
Race/Ethnicity			
	2016 Season	2017 Season	2018 Season
Asian	0 %	0 %	0 %
Black/ African-American	50 %	33 %	42 %
Latino or Hispanic	0 %	0 %	12 %
White	40 %	67 %	23 %
Native American	0 %	0 %	6 %
Other	11 %	0 %	6 %
Prefer not to say	0 %	0 %	12 %

Table 1 provides information on the demographics of survey respondents. Most survey respondents were women. The highest level of education varied considerably year to year. Black/ African-American and white respondents made up the majority for each year. With respect with the effectiveness of the farm stand, in 2016 most survey respondents reported satisfaction with the farm stand, and were especially appreciative of the quality and price of produce. Among the survey respondents who frequented the farm stand, positive comments included the following: “quality at farm stand was much better than grocery store.” The appreciation of the quality of produce was demonstrated by the fact that 82% of survey respondents reported eating more fresh vegetables because of the farm stand. In addition, 36% tried a new vegetable, 75% shared food with another person, and 55% stated it was their first time purchasing food from farmer.

In 2017, 44% of survey respondents who frequented the farm stand reported eating more fresh fruits and vegetables over the farm stand season than usual. 44% shared produce

they bought with others, 30% reported purchasing food from a farmer, and 63% reported cooking more from scratch. In 2018, 69% of survey respondents reported eating more vegetables as a result of the farm stand, and 44% reported being more interested in where their produce comes from. On the 2018 survey, specific questions were designed to assess the social impacts of the farm stand, including the chance for the older adults to socialize with the young people who managed the farm stand. On a scale of 1 to 5, in which 1 meant highly disagree and 5 meant highly agree, survey respondents indicated that they enjoyed interacting with young people from their community (mean=4.43), and that the farm stand provided them with an opportunity to interact with young people from their community (mean=4.36). In the 2018 survey responses, respondents were asked if they partook in any part of food aid programs including food stamps, meals delivered/meals on wheels, food pantries, soup kitchens, shelters, among others. The most utilized programs were food stamps and food pantries, where 36 % used food stamps and 36 % used food pantries. Roughly 18% of respondents used meals delivered/meals on wheels and about 9% used other means.

Discussion

In evaluating this initiative, RE-AIM focuses on several dimensions, including the reach of the target population. Table 1 shows that, demographically, survey respondents were primarily women. This suggests that the initiative may not be reaching older men. Additionally, across all three years, white and Black/African-American race/ethnicities were the majority of participants. A majority of participants from 2017 and 2018 had some college or a bachelor's degree or higher. The effectiveness of this farm stand was measured at the individual level and through a variety of questions in the survey that delved into topics such as trying new vegetables, sharing vegetables, or eating more fresh vegetables. Overall, there was a higher rate of satisfaction than dissatisfaction with the mobile farm stand. In addition, respondents reported positive nutritional outcomes.

The RE-AIM components of adoption, implementation, and maintenance are all more problematic factors for this project. While survey respondents provide findings that demonstrate that the project is effective, the price the customers pay for the vegetables does not cover the cost of running the farm stand. The farm stand is subsidized by grants and donations. Although the coalition organizing the initiative remains committed to the farm stand, it also has to devote considerable time fundraising and grant writing. Because produce prices are subsidized and set to a level this demographic can afford, it is difficult for the farm stand to make enough money to maintain it. Some other considerations regarding the mobile market funding is that it is possible that future grants will no longer be issued and the farm stand will either have to assume an entrepreneurial form or will have to shut down. Becoming a business may be difficult to achieve as the mobile farm stand customer base may be too small to be sustainable. Additionally, if grants were to cease, it is likely fruit and vegetable prices would increase and the current market locations may be affected and no longer be served.

Overall, there was an increase in fruit and vegetable consumption, which is a positive outcome for seniors who struggle with food insecurity. However, the goal is to sustain this initiative over time, but in order to do so, focus needs to be put on the implementation segment of the RE-AIM model. Financial solutions are necessary for the mobile food stand to remain in operation. Additionally, up until now, the efficacy of the initiative has been evaluated based on increases fruit and vegetable consumption. While this is an important endeavor, the findings from this research reveal that the farm stand has multiple benefits, in addition to increasing access to produce. For example, survey respondents reported that the farm stand provided positive social benefits. A similar project involving a mobile farm stand in another US city, found that there was a positive increase in socialization among farm stand customers.²⁰ Many customers looked forward to the farm stand visits as they viewed them as a social time, a good reason to get out of the house, and to get exercise and fresh air.²⁰ Not only did customers often linger to talk with one another but they also found enjoyment in socializing with the friendly staff.²⁰

Conclusion

The Social Ecological Model provides a framework to address the multiple, complex factors that increase food insecurity risks for low-income seniors. Although many causes of food insecurity in the older adult population are individual (including health-related causes), community-based barriers also inhibit food security. For example, in the US, many urban areas lack retail access to fresh fruits and vegetables. The local food initiative described in this article is one attempt to utilize local resources to address food insecurity and improve fruit and vegetable consumption through the use of a mobile farm stand. Although the survey reported positive results, the financial dependence of the farm stand on grants and donations must be acknowledged in analyzing this kind of initiative. While additional analysis is ongoing, further research is needed. For example, future research could better assess the barriers that individuals have in shopping at the weekly farm stand. Fruit and vegetable intake could also be measured more precisely and without the reliance on self-reporting. Future research could also examine any other effects this farm stand could be having, besides improving fruit and vegetable intake. For example, mobile markets could play a role in fostering community development and encouraging social interactions between people of different generations.

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Opportunities towards plant-based food consumption

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Introduction

Epidemiological data showed that people adhering to a plant-based diet live longer (avg. 11y) and with better health (delayed onset of Cardiovascular diseases, Type 2 Diabetes and Cancer) than those in other kind of diets. Additionally, small changes towards a healthier behaviour (e.g. plant-based meals) would have positive effect in improving diet quality (as measured e.g. by Dietary Approaches to Stop Hypertension (DASH) or Mediterranean Diet Score) and consequently in reduction of mortality (estimated 11% lower risk of early CVD death) (21). Consumers from different segments (particularly younger consumers) are interested in acquiring foods that make a difference, or that have an additional meaning such as healthiness, sustainability or wellbeing of animals (1).

Therefore, the market has responded: the plant based dairy alternatives market, valued at USD 7.37 Billion in 2016, is projected to reach USD 14.36 Billion by 2022. The global plant-based protein market is projected to reach \$5 billion by 2020, while meat substitutes market is projected to reach USD 5.96 Billion by 2022 (2). In 2017 1700 new plant-based dairy alternatives were launched in the global market, responding to the consumer demand following the perception that plant-based products are “better for you” plus the additional claims of health benefits, sustainability and “cleanness”. United States, Spain, Germany, United Kingdom led the product development (3). Millennials (those born between 1980 and 2000) and GenZ (born after 2000) correspond to 40% of the buying public and have been instrumental to the increase in demand for foods of plant origin. They are at the forefront of social, environmental and technological change, and they will constitute 75% of the global workforce in 2025 (4). Even in traditional meat eating societies, like Denmark, in 2017 8.2% of Danes (about 465,000 people) halved their meat consumption, and about 20% practice at least one “meat-free” day every week (5). In France only 17% of schools provide a vegetarian meal option, and from being a marginal issue, about 28% of complaints received by the Ombudsman for Consumers relates to lack of plant-based options at school foodservice (6). In Italy a rapidly growing segment of vegetarians and vegans (15% growth from 2013-2014) represents 7.1% of the total population (7); in UK 7% of population self-identify as vegans, and 15% vegetarians (8). Germany leads in EU with 10% of the population going meatless (9).

One of the current major challenges in the food system is the increasing demand for meat and dairy products (10). It is well known that a diet rich in fruits and vegetables are associated with lower blood pressure (11), later onset of chronic disease (12, 13, 14, 15), etc. If it can be managed to not only increase consumption from the most efficient sources that we have, but at the same time decrease overall meat consumption (16), it will not only be more beneficial for individual health, but also for the environment.

Given the societal mainstreaming of plant-based foods resulting of the increase in demand described, this paper addresses two main research questions: a) The opportunities and obstacles towards adoption of a plant-based diet from the consumer perspective; and b) To provide insights on possible consumer-oriented interventions and innovation towards plant-based eating.

Methods

This paper is the narrative synthesis of two rapid reviews (performed following the methodology of systematic reviews) and of two empirical consumer surveys performed among EU young adults.

Briefly, the reviews were performed as rapid reviews (quick synthesis of evidence mainly with the purpose of providing more timely information for decision making than e.g. Systematic Reviews, normally within 5 weeks. The search words used in the *first rapid review* were: (vegetarian* OR vegan* OR flexitarian* OR plant-based OR “plant based”) AND (attitude* OR barrier* OR facilitator*). *Inclusion criteria were:* Healthy adults above the age of 18; language English or Danish; consumer data from Europe, United States, Canada, and Australia. Intervention studies, quantitative studies, qualitative studies, and systematic reviews all if published after year 2005. The search words used in the *second rapid review* were: (plant-based OR ‘plant based’ OR vegetarian OR vegan) AND (consumer OR ‘consumer survey’) AND (determinant* OR barrier* OR facilitator* OR motivation). *Inclusion criteria were:* the studies should investigate plant-based or sustainable eating and it should be possible to find consumers’ perceived facilitators or barriers towards plant-based eating; data from consumer observations and data from consumer surveys; qualitative or quantitative studies.

Additionally, two online surveys were conducted and distributed through social media using snowball convenience sampling and using pre-tested questionnaires. The first one focused on Danish young millennial consumers (as representative of a traditionally meat-eating culture), while the second included respondents from Belgium (BE), Germany (DE) and The Netherlands (NL) to cover a larger regional scope and reach countries where availability of plant-based alternatives to dairy and meat have been available for longer time. Details about the questionnaires and data collection have been published elsewhere (17, 23). Briefly, questionnaires included information on socio-demographics (age, sex, education, employment, household size), self-identified diet lifestyle (omnivore, flexitarian, vegetarian, vegan), self-reported consumption frequency of food groups (e.g. meat, cereals, dairy, fruits, vegetables, etc.) and individual attitudes towards plant-based consumption or willingness to transition towards plant-based consumption. Respondents were segmented on their frequency of stated animal-based food consumption, and segments further identified through logistic regression. Data analysis were performed with SPSS v. 22 and results were considered statistically significant when $p < 0.05$.

Results

Rapid reviews: First rapid review yielded 670 articles (after removal of duplicates), of which 25 met inclusion criteria. The most important facilitators identified towards adopting a more plant-based diet were ethics, taste, animal rights and health. The more relevant barriers were: values and attitudes (low priority, cognitive dissonance), social norms, roles and relationships (perception of normative behavior), meat enjoyment, health, convenience and accessibility.

Second rapid review yielded 41 articles (after removal of duplicates), of which 8 met inclusion criteria. Identified facilitators were classified as: Health, Environmental concerns, Variation in Taste, Knowledge, Habitual reasons, Availability, Animal welfare. Identified barriers were classified as: Habitual reasons, Lack of knowledge, Enjoyment of meat (taste), Cooking skills, Health, Availability, Price, Satiation, Low interest, Effort.

Consumers in Denmark (17): In total 462 respondents (74% females, 71% with higher education and 78% living in a larger city) gave grounds to identifying four segments on the basis of their frequency of meat, fish, dairy and egg consumption. The groups “high dairy”, “high meat” and “high all” were similar to each other and opposite to the group “low all” (n=220) which had more positive attitudes regarding plant-based consumption: namely, they consider that cooking plant-based is easy, the taste of such foods is good as they perceive their protein content to be sufficient. Also, plant-based foods have a good satiety effect, and increased availability of plant-based foods make it easier to consume them, and together serve as facilitators towards adopting a more plant-based diet. Additionally, about one-third of the sample expressed their desire to reduce their meat intake, while 52% expressed their desire to increase their plant-based food consumption.

Consumers in BE, DE, DK & NL (23): In total 487 respondents provided complete questionnaires (85 in BE, 157 in DK, 73 in DE and 172 in NL; 72% females, 74% with University education, 55% students, 52% living in urban areas, 66% omnivores, and 37% consider meat main component in their meals). Two main cross-national segments have been identified based on the self-reporting of dietary lifestyle, those who eat meat and those who limit/avoid its consumption (reducers). Similar to the previous study, majority of respondents (67%) expressed their willingness to reduce meat consumption, however, only 57% of them would consider changing towards a more plant-based diet. What is interesting is that from the group of meat eaters, also 66% of them are willing to reduce their current meat consumption levels, and 80% of them would like to shift towards a more plant-based diet. The facilitators towards a plant-based diet identified by both meat-eaters and reduced meat-eaters are the reduced impact a plant-based diet has on the environment, increased animal welfare and positive health effects. And the main barrier identified is the family/partner support to a dietary change towards more plant based consumption.

In order to consolidate the two consumer studies, **Table 1** shows the identified facilitators and barriers towards plant-based consumption. Consumers are more focused on barriers than facilitators when reflecting on consuming a plant-based diet. A key challenge is to tackle the consumer perceived barriers and focus on the positive aspect of the facilitators. To support consumer behaviour change, specific consumer groups with differentiating levels of involvement, knowledge and cooking skills, must be targeted and addressed strategically. Interventions to promote plant-based consumption may be successful if directed e.g. towards practical cooking skills acquisition, knowledge provision and improved taste experiences.

Main drivers towards plant-based consumption are sustainability and the role that meat production plays on the environment. Additionally, consumers are highly motivated by a sense of mercy towards farmed animals that are perceived as abused by the food system. Affective attitudes have a significant impact the consumption of meat, mainly driven by social networks revealing that using emotional elements in communication strategies can achieve behavioural changes. The attitude towards a plant-based diet is associated with nutritional knowledge and convenience, especially convenience for the non-vegetarians.

Table 1: Facilitators and Barriers Towards Plant-Based Consumption

Facilitators/Drivers	Barriers
<ul style="list-style-type: none"> • Ethics, animal rights, environmental sustainability • Taste, variety and satiety • Health and wellbeing • Social support • Availability, accessibility, price and convenience 	<ul style="list-style-type: none"> • Cognitive dissonance • Taste and liking of animal based products • Perceived need for animal foods for health and wellbeing • Social and cultural norms, values and attitudes • Lack of cooking skills and knowledge about plant-based eating

Discussion

The strength of this study is that it puts together two recent rapid reviews and two recent consumer studies. Therefore, it contributes to the current state of art in the arena of consumer behaviour in relation to plant-based foods. It also highlights that young consumers in Europe are more ready to adopt plant-based foods given the increased availability in the market, but also considering the main consumer issues: health, sustainability and ethics. The main limitation is the data collection method used, which is convenience sampling using a snowballing approach. The advantage of the method is that it is useful when the common characteristics of the target group are relevant (24), in this case Millennial consumers.

Although a diet high in fruits and vegetables is associated with improved health outcomes, meat consumption has risen to a global level of 42 kg/person/y, 76 kg/person/y in EU,

and this number is expected to further increase (19). At the same time, the demand for foods of plant origin has increased even in meat consuming societies (17), creating as consequence a need to facilitate such choices for consumers. Based on evaluations of what worked or not in previous healthy eating campaigns (20) and accepting that knowledge or awareness are necessary but not sufficient to generate change, identifying facilitators towards adoption of healthier and sustainable diets (usually rich in foods of plant origin) provides useful tools for interventions. Additionally, measures to make such choices easier would be welcome. The attitude towards a plant-based diet is strongly correlated with nutritional knowledge and convenience, especially convenience for the non-vegetarians. Affective attitudes have a significant impact the consumption of meat, therefore, more it is suggested to use emotional elements in communication strategies to achieve changes.

Behaviour change related to consuming less meat can be understood in terms of the “meat-paradox” which is an experience where meat-eaters are reminded that their behaviours do not match their values and norms. This dissonance addresses the interplay between emotions and behaviour. When a behaviour contradicts someone’s values and norms, the person tries to avoid any information that could lead to strong emotional reactions (18, 20). Previous studies showed that successful communication campaigns are those that appeal to emotions (22), and this is confirmed in the present study. The emotional aspects of plant-based consumption vs. meat consumption are underscored.

Innovation in foods directed towards achieving improved plant-based diet may include e.g. the development of plant-based protein enriched products (and using raw materials such as tempeh, quinoa, amaranth, peas, lentils, almonds and nuts). Innovation in foods directed towards achieving a pro-vegetarian diet may include development of plant-based meals and recipes, and their provision either ready to eat, or as raw materials for preparation at home. Innovation could contribute to “increasing” the MedDiet Score of the consumers.

A sustainable diet will look differently in each country or region of the Planet. Use of local products and small scale processing of such foods may provide space for innovation. In some cases, adoption of sustainable diets will include small cattle production and consumption. The challenge for food consumer research (food science, nutrition, catering, gastronomy) is to identify the new products and the direction for plant-based innovation, taking into account the effect of climate warming on crop production and nutrient composition.

Conclusions

Reviews coincide in the identification of main facilitators or barriers towards plant-based consumption. Consumer survey data showed that in BE, DE, DK and NL added animal welfare as reason to adopt plant-based diets and underscored the role of the partner in the

process. In DK, where meat is linked to traditional eating, attitudes and objective knowledge towards plant-based diets constitute an arena of intervention, e.g. the beliefs that plant-based protein is insufficient or unsatiating. Interventions could focus on awareness and objective knowledge about healthiness and sustainability of a plant-based diet. Interventions should address cooking skills and taste experience and making plant-based choices easier.

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Dimensions for the valorisation of sea urchin (*Paracentrotus lividus*) roe production through the eyes of experienced chefs

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Introduction

Sea urchins are marine free-living animals that belong to the class Echinoidea of the Phylum Echinodermata. Indeed, *Paracentrotus lividus* is the most exploited and commercially important species in the Atlantic and Mediterranean coast, where its edible gonads are considered a delicacy, a gourmet seafood product, mainly in Mediterranean countries, being one of the world's costliest seafood products ^{1,2}. The increasing demand for urchins' gonad, its intensive harvest, as well as the global warming, have resulted in a drastic reduction of natural stocks ³⁻⁶. As a result, there is a worldwide interest in developing sea urchin aquaculture for the production of high-quality gonads, able to supply the expanding markets, filling the gap between the growing demand and decrease of natural supply ^{7,8}. Considering the role of Chefs in society, with an impact on the food debate in the media and society ⁹, the main goal of this research is to evaluate the Chefs' perceptions regarding sea urchin roe production and use. With an emphasis on the delicate Portuguese sea urchin to be reproduced under aquaculture.

Material and methods

Taking into account the exploratory nature of the subject, a qualitative research was applied. Face-to-face semi-structured interviews were carried out with the Chefs. The criterion to select these participants was based on the idea that people in charge of the entire kitchen and accountable for all kitchen operations are the most important source of information on how do they successfully create and design potential new dishes and menus made from sea urchin. In this context, Portuguese Michelin-star Chefs (MsCh) and Chefs from the Ericeira region (EriCh) were interviewed. The first were chosen for their exquisite trend-setting cuisine. While the Chefs from the Ericeira region were interviewed considering their vast knowledge about the product and cultural uses for cooking it. Ericeira is a village located 35 km Northwest of the capital of Portugal, Lisbon, presenting a vast sea urchin population, with a long standing tradition on culinary exploitation of this delicacy, with the own name of the village deriving from the Portuguese name for sea urchins: *ourico-do-mar*.

A semi-structured interview guide of open-ended questions was developed taking into account three dimensions, regarding sea urchin subjects: i) selection criteria and culinary applications ii) consumers' perception, iii) Chefs' perception of aquaculture. Chefs were interviewed individually by the first author, at a time and place of their choice, usually at their restaurants, between March 30th and April 7th, 2017. Interviews lasting, on average 25.73 (\pm 7.48) min, were voice and image recorded and then transcribed verbatim. The transcripts of the interviews were explored in a qualitative data analysis software, QSR NVivo8 (Copyright[®] QSR International Pty Ltd, Melbourne, Australia). Interviews were analysed using a thematic analysis procedure that involves a progression from description to interpretation data¹⁰. A comprehensive process of data coding and identification of dimensions, consistencies and discrepancies across dimensions was undertaken and explored to provide an in-depth understanding of the texts. To illustrate the analysis, direct quotes by the Chefs were transcribed, serving as a description of the topic explored. The quotes used in this text were translated into English.

Results

A total of eight Chefs, four Portuguese Michelin-star Chefs (MsCh) and four Chefs from the Ericeira region (EriCh) were interviewed. Three of the MsCh were executive Chefs in an author type cuisine, and one of them was a Chef in an author type cuisine. On the other hand, all EriCh were executive Chefs in a traditional type of cuisine located in the Ericeira region (Table 1). To note that Executive Chef is the individual who prepares the dishes and organizes all the cuisine of the restaurant, besides supervising the services of the cooks and planning menus.

Table 1. Characterisation of the restaurants and Chefs' work situation: Owner (O), Chef (C), Executive Chef (E.C.), Ericeira Chef (EriCh), Michelin-star Chef (MsCh)

Participant/Work bound	Chefs	Type of establishment/ Cuisine	No. Staff/ No. Cooks
P1/E.C.	MsCh	Restaurant/Author	6/2
P2/E.C.	MsCh	Restaurant/Author	20/3
P3/E.C.	MsCh	Restaurant/Author	6/2
P4/C	MsCh	Restaurant/Author	20/3
P5/O	EriCh	Restaurant/Traditional	4/1
P6/O	EriCh	Restaurant/Traditional	12/2
P7/C	EriCh	Restaurant/Traditional	8/2
P8/O	EriCh	Restaurant/Traditional	12/2

Three broad levels of analysis were identified which combined many dimensions, cutting across the different topics of discussion: i) culinary practice; ii) consumer's perception and iii) aquaculture (Figure 1). All of the eight participants reported these three broad levels in their interviews. The culinary practice category (95 references) allowed to understand the criteria used by the Chefs to select, purchase and prepare sea urchin

gonads. The consumers' perception category gives an overview on how the Chefs perceive the main aspects that drive consumers to accept or reject sea urchin (56 references). The aquaculture category (61 references) provided details about the Chefs opinion regarding their view towards aquaculture production and aquaculture product acceptability and marketability. Each of these dimensions and topics are described below.

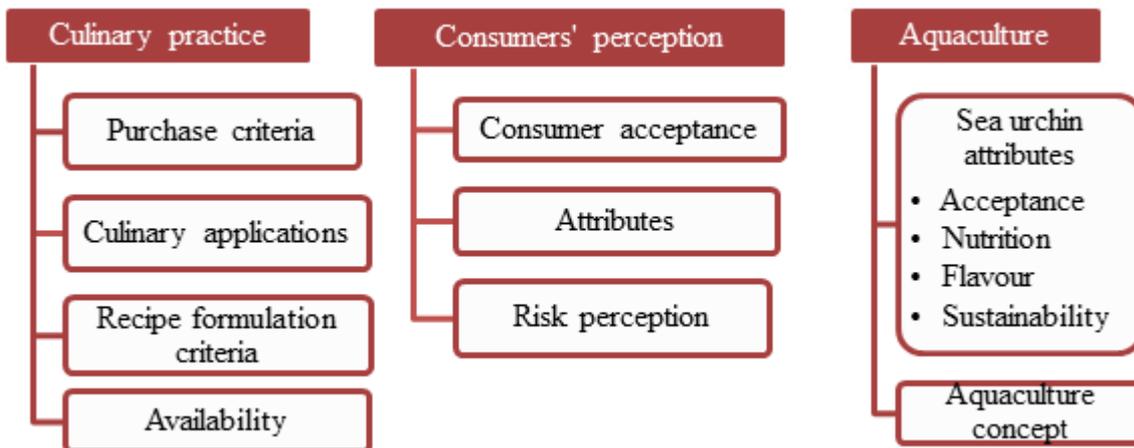


Figure 1. Data categorization

Both, the MsCh and EriCh usually use sea urchin for about one period per year (December to April), due to its seasonal availability, as reported by the majority of our participants:

“- There is a limitation of the supply of sea urchins” (P7)

“- The sea urchin availability is seasonal, and we can have it between February and April” (P3).

“- The best sensory traits are present between December and February” (P6)

As a result, according to our Chefs the supply constraint is the main factor that limits the use of this product in their restaurants: “In Portugal it is difficult to have fresh sea urchin, this is the difficulty we face daily. Sometimes we use preserved sea urchin gonads, allowing us to use this product all year round” (P1).

In relation to the sea urchin purchase criteria, freshness of the product was the most important criteria referred by 86% of the sample, followed by the related criteria “being alive” (43 %). In fact, in order to guarantee this freshness, 43 % of our Chefs referred that they use only “fresh and alive” wild sea urchin and 40 % of our interviewees referred that they paid attention to the flavour and the size of the gonads. Regarding the culinary applications, the majority of our Chefs (86 %) use raw gonads in their dish presentations; 43 % of them in risotto and sauces; 29 % in other applications, such as cocktails, entrees or grilled”. Half of the EriCh referred that they use steam to enhance the firmness of the product as mentioned in this quote: “- (...) only one minute on the steam to increase the firmness” (P6).

Our Chefs expressed different opinions regarding consumers' acceptance of sea urchin in their dishes, and the creation of sea urchin recipes. The MsCh reported that there is not a uniform consumer opinion, in sense that in their experience: "... some people like it a lot and some people do not like it (...)" (P1). By contrary, the EriCh's considered that sea urchin market is actually in an immature phase and in general consumers outside of the harvest region (like the case of Ericeira region) do not actually know this product: "It is not a product that is widely advertised in Portugal, people are a little afraid of consuming it. We have to evangelize the people for the consumption of sea urchin" (P8). They also mentioned that the effects of the annual sea urchin festival in this region (occurring between March and April), promotes the sea urchin consumption for that period of time:

"- Spanish and French markets and essentially from Europe, are very demanding of this type of product. But in Portugal (...), although this situation is being overcome with the Ericeira sea urchin festival" (P8).

Moreover, while the MsCh wanted to enhance the plate's sophistication, using the gonads to embellish, the EriCh use gonads as the main element in their recipes. The following quotes aimed to illustrate these dual positions:

"- (...) secondary element that ends up having a big statement in the mouth and plate (...) a simple sauce is sufficient to demonstrate a great magnificence in the plate." (P1).

"- The sea urchin has a leading role in my dishes. The main one is the one I've told you about, the sea urchin risotto (...)" (P6).

Additionally, our Chefs referred some intrinsic attributes that could influenced negatively the consumer acceptance of this product, namely: the "strong flavour", their repugnant "appearance" and the fact that sea urchins could be perceived as an "exotic product":

"- (...) they have a very strong taste, very intense (...)" (P1)

"- (...) the inner aspect is not inviting and then the taste is too strong (...)" (P1)

"- (...) the public is not yet educated for this. This turns out to be a very exotic product yet (...) not the microbiological risk, but the total ignorance" (P8)

Additionally, this product entails negative myths that increases aversion for the majority of the consumers. Consumers had this previous idea that this product have a bad taste or a slippery texture, decreasing its acceptance and consequently the chance of consumption:

"- This animal entails different myths, for instance that it is not good or that it is too strong, and this idea went through generations. Indeed, I remember that this animal was used to play because of the spikes, but was not seen as edible animal" (P1)

Nevertheless, our Chefs mentioned as well other intrinsic attributes that they valorised. Indeed, 57 % of the Chefs of our sample preferred a "reddish-orange gonad" with "intense and bittersweet flavour"; 43 % of them highlighted that this product is known for its "freshness", "iodine flavour and odour, saltiness" and "sea smell", while 29 % of them referred that natural roe with a "creamy and firm texture" are preferable. Another

description, for instance “(...) strong taste (...)” (P1) was also commonly used by our chefs during this part of the interview.

Considering aquaculture, the Chefs of our sample were very suspicious in the use of farmed sea urchin product in their dishes. About 57 % of our Chefs reported a negative opinion regarding aquaculture and said that they avoid aquaculture seafood products in general, because “(...) fish are produced like chicken and that is not good marketing (...)” (P3). For our Chefs, consumers are very cautious about accepting products from aquaculture production. Additionally, about 14 % of the Chefs interviewed expressed the opinion that the closed circuits and pellets (fish feed) used in aquaculture could “affect the products texture, flavour and consumers’ health” (P1), due to antibiotics and hormones they consider to be used. However, 29 % of them reported to appreciate the product control and the all-year round availability, only found in aquaculture systems.

“- Aquaculture presents nutritional and control benefits.” (P1)

“- Aquaculture is positive in the sense that it will control the quality of the water where the sea urchin will be produced as well as the quality of nutrients for the sea urchin to develop in perfect conditions for consumption. Also, could offer quality certification and guarantee of freshness status of the product.” (P7)

“- In addition they would be available all year round, but there is still a lot of work ahead.” (P8)

Discussion and conclusions

According to our Chefs interviewed, sea urchin products have intrinsic attributes that have a greater potential for valorisation, namely their reddish-orange gonad and their sea smell. Nevertheless, our Chefs also highlighted the fact that there are other intrinsic attributes that could influenced negatively the consumer acceptance of this product, namely their strong flavour, their repugnant appearance and the fact that sea urchins could be perceived as unfamiliar.

The supply constraint is another factor that limits the use of sea urchin products in their restaurants, limiting the sea urchin product availability and accessibility in the restaurants. Indeed, in Southern Europe, including Portugal, *P. lividus* is still under-consumed, mainly because it is not part of the national gastronomy culture, except in some local villages, as Ericeira. Even so, commercial harvesting of this species is increasing in Portugal, as observed by the raise in landings from 28 to 60 tons, between 2015 and 2016 ^{11, 12}

Additionally, our Chefs reported to use sea urchin products differently: the Ericeira Chefs used sea urchin products as an ingredient in various dishes, while the Portuguese Michelin-star Chefs prize the sea urchin as a delicacy¹³.

Although the interviewed Chefs recognized the fact that aquaculture production increases the supply of the product and improves the product control, they associated negatively aquaculture with “rearing” or “farmed production”. In this sense, they considered that the

use of farmed products, namely sea urchins, may not be the best way to advertise their dishes, receipts and restaurants. This concern is not surprising, as reported by other Portuguese studies, Portuguese consumers better accepted wild than farmed seafood products consumption^{14, 15}. In this context, aquaculture success, sustainability and market acceptability depend on the development of suitable and nutritionally adequate diets to produce high quality gonads for the caviar-like industry.

The population from Portugal is mostly concentrated in the coastal regions, so there is a close relationship between human activities and the exploitation of marine coastal ecosystems with economic purposes, such as fishing, seafood harvesting and navigation. The potential to explore new coastal resources is huge, especially if directed to exotic and prized species like sea urchins. Moreover, consumer shift towards seafood as key sources of protein, minerals and PUFA and the increased concern regarding seafood quality and security¹⁶ may represent an opportunity to explore *P. lividus* as a high-valued product. To sum up, Portuguese sea urchin market has a greater potential for consuming sea urchin products, following Mediterranean countries trend, such as Italy, France and Spain². However, marketing through locals, chefs and friends and presence of other gastronomic events will be required to endure the promotion of the consumer awareness about uniqueness of this product, allowing for the market growth¹⁷.

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The Construction of a Sustainable Food Supply Chain Performance Assessment Tool for Smart Systems Implementation

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Introduction

The UK's food sector is complex and highly dynamic in nature. The demands placed upon the manufacturing system through short-life products and raw materials, more demanding retailers and end users, and increased levels of legislation and regulation have resulted in organisations needing to respond on multiple levels and on a range of different issues in order to achieve economic and environmental sustainability¹. In some cases, these pressures have resulted in the sector becoming increasingly isolated from other manufacturing sectors as they deal with their own specific problems². The resulting problem of this isolation is that many food manufacturing companies are not necessarily aware of the advances in manufacturing technologies that are being throughout, the wider manufacturing industry. This, in turn, can lead to the creation of an environment where the food manufacturing industry may be left behind when it comes to adopting and benefitting from new and advanced manufacturing technologies³.

In order to cope with these business pressures, other manufacturing and production sectors have placed increasing focus upon the development and advancement of technology-driven manufacturing systems, such as Smart Factories, Smart Systems, and Industry 4.0 (I.E. 4.0). Recent years has seen step change improvements in terms of Smart Systems' capability, reduced cost of technology, and wider accessibility of the skills and knowledge required to implement them. However, what is unclear is whether the UKs Food Manufacturing Industry is aware of such systems and whether they understand the impact that SS can have on their productivity and manufacturing capability. This paper attempts to identify the current expertise and identify the technological priorities of the UK food manufacturing companies when considering the implementation of Smart Systems. To do this, the authors initially develop a unique SS profiling tool and then applies the tool to 32 Food Manufacturing Companies in order to test the tool and also, to obtain a high level profile of the sector's awareness and understanding of the implementation of SS.

Literature Review

UK food manufacturers are highly aware of the need to operate within visible supply chains. Smart Systems provide this essential link in that the technologies and systems enable an improved level of traceability right through the manufacturing chain, where machines are interconnected and, archiving data can be done automatically⁴. SS embraces a wide range of technologies, including Radio Frequency Identification (RFID), Near Field Communication (NFC), Wi-Fi, Cellular, and Bluetooth, all linked to networks that normally use the Internet as a form of communication⁵. SS technologies offer many benefits that link to the key sustainability dimensions, including the ability to improve food traceability, reduce food waste, and increase efficiencies in the transport and handling of food products, and in turn contribute directly to addressing both economic

and environmental sustainability challenges. On a wider scale, the virtualization of supply chains using SS technologies enables companies to optimise supply chain operations and characterise the dynamic nature of operations^{6, 7} and also enhances the opportunity to apply innovations and improvements in supply chains, and to subsequently plan for and assess these innovations without affecting the manufacturing system. Today, the technology is highly reliable, relatively cheap, and based on international standards that promote easy communication between different devices' tags and systems⁸. A further and more detailed review of the literature on Smart Systems, the technologies, and its impact on the sustainability dimensions is shown in Table 1. The literature analysis identifies nine key smart system clusters and are shown in Table 1. The analysis has further identified the key SS technologies and systems as well as the connectivity between SS and the sustainability dimensions. This analysis suggests that SS technologies and systems are at an advanced stage of development, and the connection between the sustainability dimensions means that the move towards the employment of SS in industry is likely to impact greatly (and positively) on improving the sustainability of companies, especially in the economic and environmental sustainability dimensions. Furthermore, this literature analysis, suggests that the food industry is ideally placed to benefit from adopting SS. The greater flexibility offered by SS will enable a product volume mix to be achieved with greater levels of consistency and efficiency.

Table 1. An analysis of the literature on smart systems.

Smart Systems Research Clusters	Smart Technologies and Systems	Sustainability Dimensions
Time compression, time to market.	Three-dimensional (3D) Printing, simulation, virtual reality (VR), customer integration, virtualization ^{6,9}	Reduced development time and tooling cost ¹⁰
Sustainable Product Innovation	Intelligent product design ^{11, 12}	Inter-functional collaboration, innovation-oriented learning, research and development (R&D) investment ¹²
Human Factors	Innovation, competency management ^{13,14}	Work practices, social dimensions, human rights, ergonomics, and safety ¹³
Knowledge Management	Intelligent Decision Making: predictive scheduling, fuzzy logic systems ^{14, 15}	Organisational and deep-learning systems ¹⁶
Energy Systems	Energy-neutral technologies through Internet of Things (IoT) ¹⁷	Waste reduction and energy monitoring ¹⁸
Enterprise Reconfiguration	Rapid supply chain reconfiguration through IoT & Cyber Physical Systems (CPS), Virtualization ^{6, 19}	Value Mapping and information sharing tools ²⁰
Collaborative Networks	Customer/supply chain connectivity ^{21, 22}	Company/Knowledge base collaboration, e-Word of Mouth (e-WOM), and Digital marketing ^{23,24,25,26}
Management Systems	Technology management, control, and monitoring ^{8, 15}	
Digital Systems	Digital supply chains, data analytics, cyber physical systems ^{27, 28}	Big data analytics on environmental impacts ^{29, 30}

The Research Method and Survey Design

A two-stage research approach was employed, consisting of; analysis of secondary research obtained from academic sources leading to the development of an SS profiling tool and, a small-scale pilot survey of food manufacturing companies in order to validate the tool and, to obtain primary data on Food Manufacturing Companies. One hundred and thirty requests were issued electronically to food manufacturing companies, thirty-two companies responded and agreed to undertake the survey. Table 3 shows the companies and food sectors that responded to the survey. The authors developed a sustainability profiling tool from the work undertaken in the literature analysis. The profiling tool is shown in Table 2 The tool utilises the SS research clusters, SS technologies, and

sustainability dimensions that were highlighted from the literature review and detailed in Table 1 of this paper to form the main body of the tool. Scores were assigned to each strategic driver and focused upon the current level of expertise the MD believed that their company had against the 18 technology/systems dimensions highlighted. The second stage of scoring required the MD to prioritise each dimension based on a two-year planning horizon (i.e., where they thought their company needed to be to meet the demands of their industry). This profiling allowed the team to determine the current state of operational excellence and also the strategic intent of each company in meeting the SS requirements.

Table 2. The sustainability profiling input sheet.

Smart Systems Sustainability Clusters	Smart Technology Areas	Average Current Level of Expertise	Average 2 Year Priority Score	Gap	Frequency (Current Expertise)				
					1	2	3	4	5
Time Compression, Time to Market (Ec)	V1 Customer Integration with product development process	4.3	4.75	0.5	0	1	2	15	14
	V2 Application of time compression technologies	3.85	4.5	0.7	0	1	11	12	8
Sustainable Product Innovation (Ec)	V3 Robust New Product Development/Introduction (NPD/I)	4.4	4.65	0.3	0	0	1	16	15
	V4 Intelligent and Customised products	3.95	4.45	0.5	0	2	8	12	10
Human Factors (Ec/En)	V5 R & D Systems/Co-Innovation/creativity	3.45	4.25	0.8	3	4	8	9	8
	V6 Competency management	3.1	4.75	1.7	5	6	7	7	7
Knowledge Management (Ec/En)	V7 Organisational Learning systems	1.9	4.75	2.9	14	10	5	3	0
	V8 Intelligent decision-making systems	4.15	4.75	0.6	0	0	8	12	12
Energy Systems (En)	V9 Waste Reduction Systems	4.3	4.85	0.6	0	0	3	17	12
	V10 Energy neutral production systems	3.6	5	1.4	3	2	8	11	8
Enterprise Reconfiguration (Ec/En)	V11 Information-Sharing Systems	2.55	4.4	1.9	8	9	7	5	3
	V12 Rapid Supply Chain Reconfiguration	3.8	4.25	0.5	0	2	11	11	8
Collaborative Networks (Ec/En)	V13 Customer and Supply Chain Collaboration	3.4	4.1	0.7	2	6	8	9	7
	V14 Company/University Collaboration	2.3	4.9	2.6	7	14	8	2	1
Management Systems (Ec/En)	V15 Manufacturing Fitness	4.05	4.4	0.4	0	0	9	13	10
	V16 Technology Management Systems	4.2	4.6	0.4	0	0	5	16	11
Digital Systems (Ec/En)	V17 Digitally Connected Supply Chains	1.6	4.85	3.3	16	13	2	1	0
	V18 Data analytics and Production Analytics	1.55	4.65	3.1	16	15	1	0	0

Note: Abbreviations: Ec, Economic Sustainability Driver; En, Environmental Sustainability Driver; Ec/En, both.

Table 3. The companies and sectors that responded to the survey

Sectors	Companies per Sector	Employees 10–50	Employees 50–150	Employees 150–200
Packaging and Logistics	4	1		3
General Drink	2		2	
Wines, Beers, and Spirits	5	3	2	
Ready meals and processed foods	5	2	3	
Cheese and Dairy	4	2	2	
Bread, Bakery, and Snacks	10	6	3	1
Biscuits, cake, and chocolate	2	1		1
Totals	32	18	10	4

The Results of the Survey and Interviews

Table 3 shows an average score of the 32 food manufacturing companies on their assessment of their current technological expertise, and also their two-year technology priority score. Furthermore, the table also shows a frequency analysis that profiles the score each company provided against each technology area. This enabled the researchers to understand the relative level of expertise each company had in relation to the technology areas. Figure 1 focusses specifically upon the sample group’s average current expertise profile in ranked order. Taking the top four criteria from this figure shows that the companies’ new product development and introduction capabilities, along with their customer integration, waste reduction, and technology management expertise, were considered to be strong and well-developed. Where the companies scored less-well were in the lower four criteria, namely knowledge base collaboration, organizational learning, digital connectedness, and data analytics. Figure 1 also shows the average 2-year priority scores offered by the sample group of companies. The 2-year priority profile is a measure of what the companies considered to be the key technologies and systems that need to be in place in order for the companies to remain competitive over the medium-term strategic planning horizon. The figure shows that the top four priority areas to focus on are: energy-neutral production systems; competency management; digitally connected supply chains; and university/company collaboration. The four criteria of lower concern are: supply chain reconfiguration; customer and supplier collaboration; information sharing; and Research and Development and Innovation.

An analysis of the 2-year technology priorities showed that companies were very aspirational in implementing and developing state-of-the-art technologies and systems. In particular, the focus on reducing energy consumption and moving towards energy-neutral manufacturing systems is interesting, since companies felt that their waste reduction strategies were relatively well-advanced but, company energy-reduction strategies needed further work and development. Of further interest was the identification of the priority to have ‘digitally connected supply chains’. Although seen as a strategic priority, the companies did not see themselves having the current expertise (or knew where to access the expertise) in order to move towards this priority area. This issue links strongly with the disparity seen between the current overall lack of development in the areas of competency management, knowledge management, and University/company collaboration. The external drivers, such as Brexit, outweighed the potential barriers and internal issues, such as the costs of training and equipment, as they saw the threat of significant external change as being greater than the internal resistance that had previously been seen. Further analysis of the data identified that the Small SMEs (10–50 employees) performed better on the whole in the deployment of internet and smart systems technologies, and were better aligned to meeting the social, environmental, and economic sustainability goals. Although their technologies and systems lacked the

sophistication of the larger companies, the application of internet and cyber physical systems pertaining to their own production operations were better developed. A particularly well-developed area amongst the Small SME companies is the development of excellent supply chain collaboration practices between customer and supplier that are delivered through internet technologies (internet and social media platforms).

Through the development of closer collaboration within the supply chain, small SMEs benefited from greater opportunities to develop more customised products and services through the co-creativity of new products and innovative solutions to particular production issues. A particular strength of the medium-to-large companies was their ability to manage their technologies and to operate lean production systems as well as utilizing time compression technologies, such as automated production systems and the simulation of new production layouts for a new product's introduction. However, whilst these technologies are utilized and well-developed, their overall connectivity to Cyber Physical Systems (CPS), which provide the basis for Smart Systems, was missing in all companies surveyed. Therefore, two distinct patterns emerge from this study that emphasise the difference in attitudes between Small SMEs and Medium SMEs / larger companies. Smaller SMEs use less sophisticated technology but utilize their systems to better effect, linking their technologies to both the customer and the supplier in more of a traditional Smart Systems approach, whereas medium-sized SMEs and larger companies employ more sophisticated technologies, but they lack the interconnectivity and CPS technologies to turn their technology into Smart Systems.

Conclusions

Food Manufacturing Companies in the UK face many challenges and opportunities to achieve economic sustainability. One such opportunity is through the application of Smart Systems. This study has attempted to develop an understanding of the attitudes and priorities of FMCs to the adoption of SS. Through the application of a new measuring tool that was developed and tested in this paper, the research team has been able to profile a range of food manufacturing companies and to determine the strategic drivers and challenges that these companies have in the implementation of SS. Through the use of this profiling tool and the adoption of the two-stage research approach, the research team has been able to identify a complex range of company demands and pressures, which indicates that a one-size-fits-all strategy for supporting such companies is going to be largely ineffective and costly.

In this study, the issue of a company's preparedness for SS was examined based on both external and internal drivers. The study showed that external drivers are currently more important than internal drivers in moving towards the implementation of SS in these food manufacturing companies. The external drivers, such as future political changes and the associated potential loss of a low-cost labour workforce, is driving larger food manufacturing companies towards the implementation of responsive Smart Systems. The smaller food producers are focused on more proactive tools, including how SS can successfully be used to improve efficiencies in small batch manufacturing, time to market, and promotion of the company on a much wider scale than it currently does. Interestingly, companies see that these external drivers outweigh the internal issues, such as training and costs, and seem to be more willing to overcome the internal barriers as the external drivers seem to be greater than the internal resistance that has previously been seen. Furthermore, a simultaneous approach to the issue of implementing Smart technologies

in the UK food sector regarding internal and external drivers is another feature of this study, whereas in most previous studies, the issue of Smart technology implementation is studied from the internal perspective (training, costs, etc. as being barriers towards implementation).

A limitation of this study is the limited sample size obtained for the survey. Whilst the total response level of 32 companies enabled the research team to identify a number of key themes around Smart Systems within the food manufacturing industry, the work cannot be considered to have any statistical significance and, therefore, the outputs of the study are to be considered with this limitation in mind.

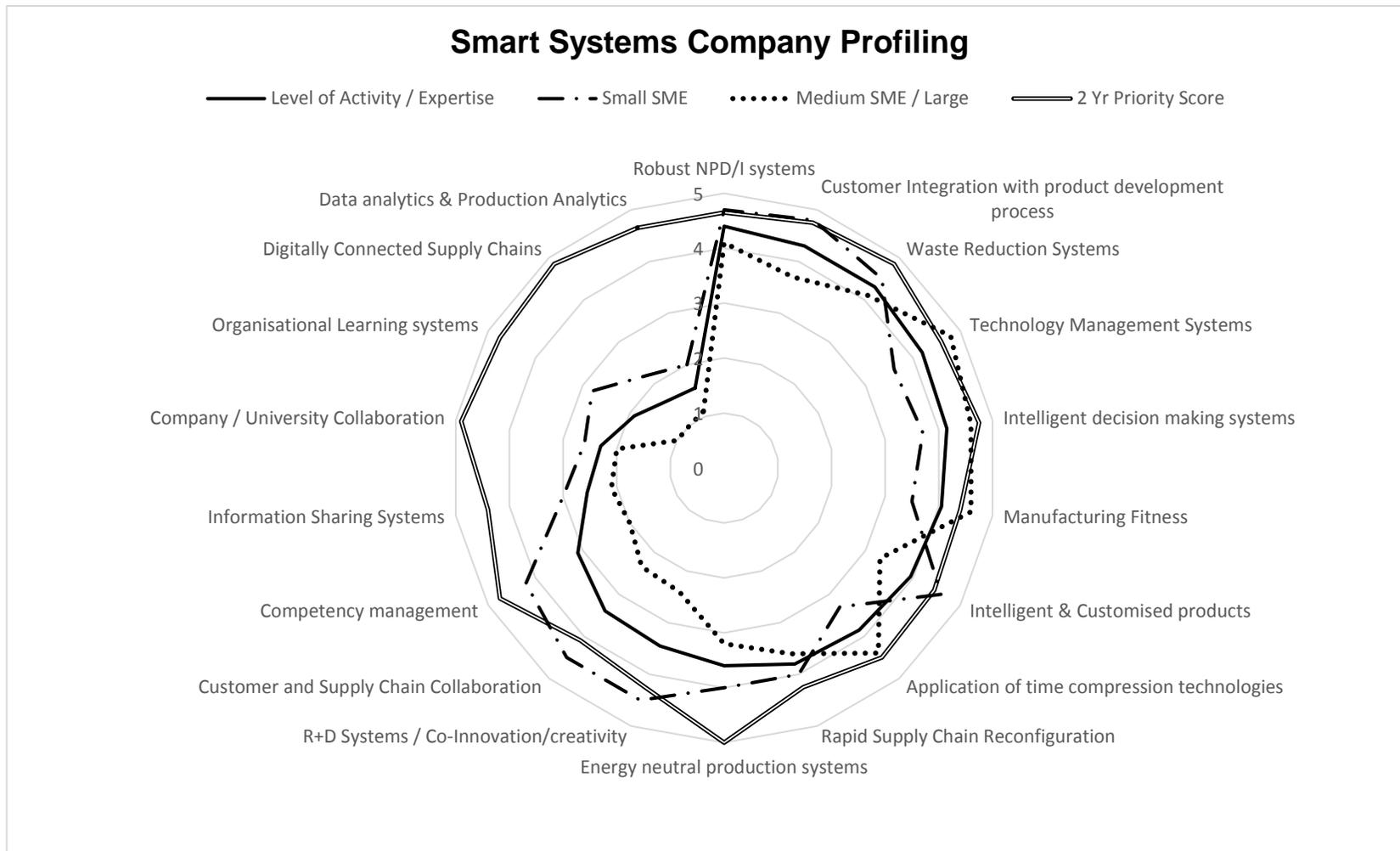


Figure 1. The analysis of current and future profiles in ranked order.

Acknowledgments: Dedicated to the memory of Richard Barton.

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Availability of Foods and Beverages in Food Commissaries of a University in the South of Brazil

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Introduction

The food environment is described by the food options available to the community and other factors that meddle their access to food, mainly healthy food. These aspects include political, environmental, individual and behavioral factors that can define individual food choices¹. In universities, the food environment may encourage or even discourage a healthier diet, through barriers or facilitators of food consumption². Tertiary or college students spend most of their daytime at these places. Therefore, the availability of food can change their nutritional and health status^{3,4}. The young adult's admission to the university is evidenced by changes in their habits and lifestyle. Usually, the university environment increasing stress levels, lack of time, and also reduced financial resources. These factors were identified as causes for less healthy eating, such as consumption of processed and ultra-processed foods, and low intake of fruits and vegetables^{6,7}. In addition, some studies have demonstrated that eating out of home is associated with higher intake of energy, fat, sugar and sodium^{3,4}.

Previous studies have shown that the food availability in the university reduces students' options and access to healthier foods². In the food commissaries of the main campus in a public university placed in the southern of Brazil, healthy options were limited and related to high prices compared to less nutritional quality versions^{2,5}. In Brazil, the most financially accessible and widely available foods at commissaries were *salgados* (savory snacks with refined dough and filling), pastries, candies and other options with lower nutritional quality. These products are made with processed ingredients high in sugar; fat and/or sodium content. Usually, *salgados* and pastries are prepared with refined flours and deep-frying as cooking method⁷. So, it is considered products with low nutritional quality. The regular consumption of products with low nutritional quality and the adoption of unhealthy diet contribute to the development of non-communicable diseases (NCDs) and can also, increase overweight in population, mainly in low- and middle-income countries^{8,9}.

Considering the environment influence on food choices, it is essential to recognize and characterize the university's food environment. The food environment assessment can show the food options available, besides the variety and nutritional quality¹⁰⁻¹². Thus, the aim of this research is to evaluate the availability and nutritional quality of food and beverages at food commissaries in a huge public university in southern Brazil, comparing the products sold among 2012, 2014 and 2017, demonstrating the food environment changes occurred over time.

Methods

This study is a longitudinal panel with three data collections, carried out during the years 2012, 2014 and 2017. Nutrition researchers, through direct observation at the food commissaries, conducted the data collect. Some data was collected by managers' interview, such as: hours of operation, food or drinks' best sellers and the presence of technical responsible for the business

(nutritionist). In 2012, the research group developed a spreadsheet to collect and analyze the products sold at the food commissaries. In 2014, the same spreadsheet was used to a new data collect¹³ and this tool was adapted and enlarged with the Nutrition Environment Measures Survey – Restaurants (NEMS-R)^{14,15}. In 2017, these two instruments were used to data collect, added from another, which was developed and validated to evaluate specifically university food environment in Brazil¹⁶.

The nutritional quality of foods and beverages was assessed by the taxonomy developed by researchers^{2,17}. Basically, the nutritional quality of *salgados* and pastries was defined by type of dough (refined, whole-grain or high-fat), and type of preparation technique (baked or deep-fried). Besides these items, for *salgados* was considered the type of filling (no filling, with red, white meat or deli meat or egg, with fresh or preserved vegetables, with high or low-fat cheese). These were the most usual fillings of *salgados* at food commissaries on campus. The nutritional quality of cookies and biscuits was defined by type of dough (refined or whole-grain) and type of filling (with or without filling). For candies and fruits preparations, the nutritional quality was described by amount of added sugar and level of food processing. The nutritional quality of beverages was evaluated by level of added sugar and food processing (processed or made-in-house drinks). As Processed beverages was considered packaged, boxed and canned drinks added sugar (energy-drinks, milk-based, soft-drinks, tea, juices and conventional or with artificial sweeteners – diet, light or zero). For Made-in-house drinks were contemplated all drinks prepared at food commissaries after customer request, which are as standard no added sugar (coffee, milk and fruit smoothie, natural juices and infusion teas). All data were analyzed by descriptive statistics using the Stata® version 11.0. This study was approved by the University's Ethics Committee (n°. 438.564 / 2013, 100.204 / 2017) and followed all the ethical principles and rules of Brazilian Resolution 466/2012¹⁸.

Results

All food commissaries inside the main university campus were evaluated three times - 2012, 2014 and 2017. In 2012 had 12 establishments on campus; in 2014 had 13 and in 2017 had 14 food commissaries. The main campus includes two campuses in the same city (Florianopolis), located in two different and close neighborhoods, where more than 55 thousand people are studying and working daily. Table 1 shows the percentage of food commissaries that sold each type of food.

Table 1. Percentage of food commissaries that had available each food options (types of food) through 2012, 2014 and 2017, by type and variety

Food sold by the commissaries	Food commissaries during the years		
	2012 (#12)	2014 (#13)	2017 (#17)
SALGADOS	%	%	%
Preparation technique			
Baked	100	100	100
Fried	77	64,3	93
Type of dough			
Refined	100	100	100
Wholegrain	85	100	79
High-fat	85	100	93
Type of filling			-
No filling (cheese roll)	92	92	86
Beef	100	86	93
Beef with high-fat cheese	100	77	71
Beef with fresh vegetable	15	-	14
Beef with preserved vegetable	69	-	-
Beef with vegetable and high-fat cheese	-	-	7
Beef with processed or deli meat	-	8	21
Chicken	-	85	93
Chicken with deli meat and high fat cheese	-	-	43
Chicken with high-fat cheese	-	100	21
Chicken with preserved vegetable	-	77	86
Deli meat	100	85	93
Deli meat with high-fat cheese	100	100	86
Deli meat with vegetable, high-fat cheese and egg	-	8	-
Deli meat with vegetable	-	39	36
Deli meat with vegetable and high-fat cheese	-	23	57
High-fat cheese	100	77	79
Fresh vegetable	-	62	71
Fresh vegetable with cheese	-	31	36
Fresh vegetable with high-fat cheese	61	62	71
Preserved vegetable	92	69	50
Preserved vegetable with cheese	-	23	-
Preserved vegetable with high-fat cheese	-	23	-
Egg	-	-	7
PASTRIES			
WARM PASTRIES			
Preparation technique			
Baked	100	54	79
Fried	-	42	57
Type of dough			
Refined	42	46	93

Table 1. Percentage of food commissaries that had available each food options (types of food) through 2012, 2014 and 2017, by type and variety (continued)

Food sold in the commissaries	Food commissaries during the years		
	2012 (#12)	2014 (#13)	2017 (#17)
High-fat	75	15	71
Wholegrain	-	-	-
COOKIES			
Refined with filling	82	62	71
Refined without filling	91	42	93
Integral without filling	83	54	71
BISCUITS			
Refined without filling	75	42	93
Refined with filling	17	62	7
Wholegrain without filling	67	54	50
Wholegrain with filling	-	-	-
CANDIES AND SNACKS			
Cereal and protein bar	100	69	64
Milk chocolate	100	92	93
Gum and chewy candies	100	92	86
Homemade simple sweet	92	85	71
Process simple sweet	100	85	93
Processed puffed snacks and potato chips	58	54	71
Packaged processed peanuts	92	77	71
Popcorn (processed, sweet without oil)	58	31	50
Popcorn (high processed, with oil)	-	-	43
Cup noodles	-	-	7
Peanuts and similar	-	62	86
Semisweet chocolate	50	23	50
Chocolate with artificial sweeteners	58	-	14
Chocolate without lactose	42	-	36
Ice cream and popsicles	-	23	21
FRUITS			
Fresh fruit (<i>in natura</i>)	17	-	-
Simple Fruit Salad	100	85	64
Fruit salad with topping (yogurt and granola)	-	77	43
Açaí	-	54	7
Açaí with toppings and syrup	-	15	71
Fruit bar with sugar	-	62	-
Fruit bar without sugar	-	-	-
Dehydrated fruit	-	62	36

Table 2 presents the percentage of food commissaries that sold each beverage (type of drinks).

Table 2. Percentage of commissaries that sold beverage during 2012, 2014 and 2017, by type and variety

Drinks sold at the commissaries	Food commissaries during the years		
	2012 (#12)	2014 (#13)	2017 (#14)
Made-in-house drinks (no added sugar)			
Brewed coffee	100	85	86
Espresso coffee	100	62	93
Cappuccino coffee	100	77	64
Hot chocolate	100	62	64
Milk & fruit smoothie	92	69	14
Natural juice or pulp fruit juice	92	69	93
Infusion teas	77	39	57
Milk	-	62	57
Packaged, boxed and canned drinks (added sugar or similar industrially)			
Milk-based or with milk	100	85	64
Coffee based	-	23	29
Conventional teas	100	39	93
Teas with artificial sweeteners	100	54	14
Conventional soft drinks	100	92	57
Diet soft drinks (artificial sweeteners)	100	92	43
Processed or fruit concentrate juice sweetened	92	85	79
Juice with artificial sweeteners	92	62	7
Energy drinks	77	77	86
Yogurt	-	23	-
Bottled drinks (no added sugar)			
Natural fruit juice (100%)	-	62	93
Mineral water	92	92	86

Discussion

The present study evaluated the availability of food and beverages in all the food commissaries located in the main campus of a huge Brazilian university, during 5 years, through 3 transversal collect data in longitudinal panels. The highlights of salgados at food commissaries environment through the years are: increased the availability of fried salgados and reduced the availability of whole-grain salgados and without filling. Even though the most used preparation technique to salgados and pastries was baked, the availability of fried salgados and pastries increased over the assessed years. Also, the researchers found an increasing supply of salgados filled with low nutritional quality (e.g. high-fat cheese, processed or deli-meat, deli meat with high fat-cheese) and a decreasing supply of fillings with better nutritional quality (e.g. vegetable, beef with vegetable). These salgados are classified as ultra-processed, because contain high amounts of sodium, saturated fat and trans fatty acid, besides reduced in fiber, vitamins and minerals¹⁹.

The highpoints about cakes and pastries are: increased the availability of fried pastries, also refined and high-fat dough. Since ultra-processed foods are progressively growing in Brazilian diet, the increase in the consumption of ultra-processed foods may be linked to gain weight and, consequently, developing more NCDs²⁰. About candies, the

researchers a higher availability of candies over the years, with reduced availability of cereal and protein bars, but with the offer of cup noodles, an example of a very bad option of ultra-processed food. These candies consumption are often related to overweight and NCDs, such as diabetes. Currently, the prevalence of overweight in Brazilian adults is 54%²¹. In addition, the increase of overweight and obesity in the last few years has been associated with the consumption of foods with low nutritional quality. In Brazil, the prevalence of eating outside of the home is 40%²², and people who eat away from home tend to consume more calories, sugar and salt when compared to those eat and prepare their meals at home²³.

The highlights of fruits at food commissaries environment through the years are: reduced the availability of whole and fresh fruit, and also fruit salad and dehydrated fruit. However, increased the availability of fruit with high amount of sugar, such as acai berry added syrup and topping as condensed milk (high in sugar) and powder milk. The availability of fresh and whole fruit on campus was observed only in 2012, at one food commissary. In the following years, none of the food commissaries offered whole fruit. Nevertheless fruit salad was available in all food commissaries on campus, but it is more expensive than a whole fruit. Consequently, it can difficult the fruit consumption by students that need to eat at least 400g per day of fruits and vegetables, according to the World Health Organization recommendation⁹.

The highlights of beverages at food commissaries environment through the years are: reduced the overall availability of made-in-house drinks, which are standard no added sugar, but increased the bottled natural fruit juice (100%). Otherwise, a good point observed was a reduction about availability of some processed drinks, such as conventional and artificial sweeteners sodas, and processed juice; but increased the availability of conventional teas, coffee based drinks and energy drinks. All of processed beverages contain high amounts of sugar and/or artificial sweeteners. Recently, the Brazilian Ministry of Health, the Brazilian Health Regulatory Agency (ANVISA) and Brazilian Association of Food Industry (ABIA) signed an Agreement Term to reduce the sugar content of processed foods to less than 10% of the total daily calories. The aim of this agreement is to reduce the sugar content of beverages, biscuits, cakes and blends for cakes, chocolate powder and dairy products²⁴. This fact alone is not a big deal and cannot help or improve the health status of population. An improvement of the quality of diet, it is necessary eat more fresh food and more fruits and vegetables, to help people to reduce the risk of preventable diseases.

Conclusions

Considering the evaluation of the whole campus food environment, there are limitations of healthy options comparing to all food options available. This study observed an increasing variety of low nutritional quality of food and beverages at food commissaries. Moreover, it was observed also, a reduced availability of natural fruit juices and whole fruit on campus food environment. Lastly, the researchers observed more availability of products prepared with refined dough and fried, reduced options of wholegrain and baked salgados or pastries, although the number of unhealthy options (variety) was enlarged altogether.

This study suggests more detailed analyzes about nutritional quality of food sold on campus, according to sugar, salt, saturated fat, and trans fatty acid content. Other

important point is to evaluate the students' food choices at food commissaries, and how could be their behavior if they found healthier options available at the university food environment. Knowing the nutritional quality of food environment and the availability of food and beverages on campus, it is possible to implement healthier options, initiate nutritional education campaigns to show the best options to students and staff, and what they should avoid or eat less often. These campaigns can help students and staff to reduce their consumption of poor nutritional quality products such as fried salgados and soda, and stimulate the intake of foods and beverages with better nutritional quality.

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University Food Environment: Development and Test of Healthy Food for sale in Commissaries in a University in the South of Brazil

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Introduction

Several factors can determine the consumption of a healthy diet, such as specific preferences and factors such as physical, economic, political, cultural and social, which can influence eating patterns of population, either positively or negatively¹. The university food environment can modify the students' eating behavior. It happens because students stay inside universities for a long period of time². Thus, improvements in this environment can be a strategy to promote healthy eating intake, considering the availability of healthy food, which could increase the consumption of healthy food options³. A study in Florianopolis, State of Santa Catarina, southern Brazil, evaluated the food environment of a huge public university that sell a large variety of products with low nutritional quality, such as sweet and savory salgados (baked or fried snacks) made with refined flour, high amount of sugar, salt and fat, including trans fatty acid; sweet and savory biscuits, and sandwiches with white bread⁴. Considering the results based on previous studies, and the relationship between quality of food available and consumer choices, it is important to develop initiatives that improve the nutritional quality of food and beverages sold on campus food environment. Thus, the aim of this study is to develop and to test healthy and low-cost food products (culinary preparations) to sell at food commissaries on campus at a public university in southern Brazil.

Methods

This exploratory research was carried out in a huge public university, located in southern Brazil, between March and July 2018. The university has more than 40,000 students registered⁵ and 14 food commissaries and 6 restaurants⁶. Healthier products (culinary preparations) were developed or adapted, and tested. The recipes followed the recommendations of Dietary Guidelines for the Brazilian Population¹. The standard recommendations used are presented in Table 1.

Table 1. Standard recommendations of the Dietary Guidelines for the Brazilian Population¹ used to develop or adapt the recipes for the new products.

Recommendations of the Dietary Guidelines for the Brazilian Population¹

- Natural or minimally processed foods should be the basis of your diet. Example: variety means foods of all types — cereals, legumes, roots, tubers, vegetables, fruits, nuts, milk, eggs, meat — and diversity within each type — such as beans and lentils, rice and corn, potato and cassava, tomatoes and squash, orange and banana. Eat all food with no added sugar.

- Use oils, fats, salt, and sugar in small amounts when seasoning and cooking natural or minimally processed foods and to create culinary preparations. As long as they are used in moderation in dishes and meals based on natural or minimally processed foods, oils, fats, salt, and sugar contribute to diverse and delicious diets without making them nutritionally unbalanced.
 - Limit consumption of processed foods. The ingredients and methods used in the manufacture of processed foods — such as vegetables in brine, fruits in syrup, cheeses and breads — unfavorably alter the nutritional composition of the foods from which they are derived. In small amounts, processed foods can be used as ingredients in dishes and meals based on natural or minimally processed foods. Avoid consumption of ultra-processed foods. Because of their ingredients, ultra-processed foods such as salty fatty packaged snacks, soft drinks, sweetened breakfast cereals, and instant noodles, are nutritionally unbalanced. As a result of their formulation and presentation, they tend to be consumed in excess, and displace natural or minimally processed foods. Their means of production, distribution, marketing, and consumption damage culture, social life, and the environment.
 - Always prefer natural or minimally processed foods and freshly made dishes and meals instead of ultra-processed foods.
 - Use natural seasoning such as onion, garlic, parsley, chives, pepper, coriander and others.
-

The criteria used to define the preparations were: the recipes developed were based on fresh or minimally processed food; the cooking technique used was baking; small amounts of oil and fats, sugar and salt; natural seasonings was used; ingredients and food from local and of the season were preferred; ingredients less expensive and more accessible; adapted to the food habits and food culture of the region. After brainstorming, discussion and consensus among researchers and students of the research group, ten preparations were selected. Then they were tested in the Laboratory of Dietetic Technique of the university, following all the protocols for the development of new recipes and products. The data was inserted in a Technical Data Sheets for each recipes formulated and tested⁷. All ingredients were effectively weighed in the Electronic Kitchen Scale sf-400® scale and converted to homemade measures. In addition, the steps of culinary preparations and the yield of each one were documented.

At the end of each recipe and products experiment, the culinary preparations were evaluated by hedonic scale of qualitative sensorial test (smell, taste, appearance and texture) by a group of experts, covered by professors from the Department of Nutrition and nutrition postgraduate students. When necessary, some adjustments were made and the group of experts carried out new tests until the recipe was completely adequate and a positive evaluation. In order to determine the cost of each preparation, the actual Brazilian currency value (R\$) of each ingredient was used. At the end of this process, the Technical Preparation Sheets can be used and it will be available for the food commissaries' owners at the main campus. All developed recipes could be included on the menu's food commissaries, since they are easy to prepare or buy at regular suppliers.

Results

This study developed, adapted and tested ten healthy products/recipes (culinary preparations) with better nutritional quality than similar current products usually sold by the food commissaries, and also less expensive than the regular version available, to

enable improving the consumption by students. The preparations can be visualized in Figure 1.

Figure 1. Culinary preparations developed and tested



According to the recommendations of Dietary Guidelines for the Brazilian Population¹ used for the recipe concept, the research team decided to prioritize the use of whole-wheat flours to develop healthier snacks, to improve the nutritional quality of these products. The sweet culinary preparations (sweet toppings and fillings) used only brown sugar, fresh fruits, peanut butter, cocoa powder, whole milk and butter. For salads, pies and sandwiches, the team selected fresh or natural, or minimally processed protein sources, such as breast chicken as white meat, low-fat red meat, low-fat cheese (ricotta) and yogurt with no added sugar. To reduce the amount of sodium in the new products, the strategy adopted was to use less sodium in the culinary preparations but enough to not reduce the sensorial quality of the product.

The new preparations developed were similar to regular ones available in the food commissaries at the university. Nevertheless, the proposed products have better nutritional quality, according to some ingredients used, such as whole-grain flours, seeds, fresh fruits and vegetables. These ingredients selection were used aiming to increase the amount of fiber, vitamins and minerals and also to reduce fat, sodium (salt) and sugar. Table 2 shows the products developed and tested in the Technical and Dietetic Laboratory, with ingredients used and respective order, such as the yield and cooking technique employed.

Table 2. Yield, Cooking Technique and Ingredients of Culinary Preparation Developed and Tested

Preparations	Yield	Cooking Technique	Ingredients
Whole-grain peanut cake with topping	15 units (44g)	Baked	Oatmeal, eggs, peanuts, brown sugar, soybean oil, whole milk, peanut cream, baking powder
Whole-grain and crumble apple cake	12 slices (62g)	Baked	Apple, eggs, brown sugar, whole-wheat flour, soybean oil, oatmeal flour, baking powder, butter and cinnamon powder

Whole-grain carrot cake with topping	15 slices (56g)	Baked	Carrot, brown sugar, eggs, soybean oil, wheat flour, oatmeal, whole milk, water, baking powder, butter, cocoa and salt
Sponge cake with pineapple and coconut cream	12 units (152g)	Baked	Pineapple, whole milk, eggs, sugar, sour cream, wheat flour, coconut milk, water, milk powder, coconut flake and corn starch
Pie of heart of palm (savory)	10 units (80g)	Baked	Heart of palm, tomato, whole-wheat flour, wheat flour, soybean oil, whole milk, onion, eggs, chives, sesame, salt, corn starch, parsley and sweet paprika
Pie of chicken and vegetables (gluten free)	14 slices (77g)	Baked	Breast chicken, cherry tomatoes, whole milk, eggs, tomatoes, carrots, rice flour, onion, soybean oil, peas, golden flaxseed, chives, garlic, salt, cornstarch, salt, sweet paprika and oregano
Whole-grain sfiha with meat	13 units (85g)	Baked	Beef, whole wheat flour, tomato, eggs, whole milk, onion, wheat flour, soybean oil, lemon, garlic, chives, brown sugar, salt, baking powder, parsley, sweet paprika and Syrian pepper
Preparations	Yield	Cooking Technique	Ingredients
Whole-grain wrap filled with vegetable and low-fat cheese	8 units (115g)	Baked	White cheese, whole wheat flour, cherry tomatoes, eggs, leeks, whole milk, wheat flour, soybean oil, brown sugar, salt, dried yeast and oregano
Whole-grain coconut biscuit	25 units (15g)	Baked	Oatmeal, brown sugar, eggs, whole wheat flour, oats flakes, butter, coconut flakes and dried yeast
Sandwich with low-fat cheese, vegetables and basil	3 units (168g)	-	Sliced whole-grain bread, ricotta, tomatoes, yogurt, lettuce, zucchini, olive oil, salt, basil and black pepper
Sandwich with low-fat cheese, tomato and arugula	3 units (186g)	-	Sliced whole-grain bread, ricotta, yogurt, dried tomatoes, carrots, arugula, olive oil, salt and pepper

To matter the low cost recipes and culinary preparations, the ingredients were easily found in food outlets. The final cost of each preparation is showed in Table 3.

Table 3. Cost of recipes developed and tested

Recipes (Culinary Preparations)	Portion price (R\$)
Whole-grain peanut cake with topping	0.49
Whole-grain coconut biscuit	0.52 (2 units)
Whole-grain carrot cake with topping	0.52
Whole-grain crumble apple cake	0.54
Pie of heart of palm (savory)	1.15
Pie of chicken and vegetables (gluten free)	1.29
Whole-grain sfiha with meat	1.27
Sponge cake with pineapple and coconut cream	2.08
Whole-grain wrap filled with vegetables and low-fat cheese	2.57
Sandwich with low-fat cheese, vegetables and basil	3.19
Sandwich with low-fat cheese, tomato and arugula	3.31

Discussion

This study developed and tested ten healthy recipes to be commercialized by food commissaries on campus, inside the university food environment. To develop health promotion actions and interventions on campus, such as increasing the availability and access of healthy food options, may be a good strategy to help consumers, because it provides healthy food choices at worksite and study place^{8,9,10}. Thus, the food culinary preparations developed in this study have high amount of fiber, vegetables and fruits. Furthermore, the news products are tasteful, and can be very well recognized by university community. These products can represent the availability of healthy food options with low-cost and good sensorial quality on campus. These products also support healthy options, which can stimulate the consumption of whole-grain snacks, besides the increase of intake of fruits and vegetables at the university. Usually, students spend several hours per day at this environment. Even more, students and staff can reduce the consumption of refined products rich in sugar and fat.

Improve the diet quality is important considering that about 2/3 of people has overweight and the same proportion of deaths by non-communicable diseases (NCD) occur in low- and middle-income countries¹¹. Unhealthy lifestyles, such as tobacco use, harmful use of alcohol, physical inactivity and unhealthy diet, all increase the risk of NCDs. Unhealthy diet is recognized as one of the most important factor. If university students and staff accept these products, it could strengthen the beginning of changes to improve the university' food environment and food habits. Healthy eating is a key to improve lifestyle, reducing the morbidity and mortality¹²⁻¹⁵.

Considering the importance of health promotion and disease prevention, these products were developed following guidelines to improve the consumption of foods with better nutritional quality, such as fruits, vegetables, beans and nuts; as well as limiting red meat, processed meats, and ultra-processed foods; excluding manufacturing trans fat of processed foods, and reducing salt and sugar intake. It is necessary also to encourage the access to food labels and nutritional information¹⁶⁻¹⁹ at the food commissaries on campus.

The efforts mentioned before are due to the current food setting. In Brazil, there is a high consumption of salt and sugar among the population, low consumption of fruits and vegetables, and an increasing consumption of ready-to-eat food, which increased from 20% in 1980 to 28% in 2012²⁰. A review study carried out in the United States evaluated

interventions in small food stores, and found 16 studies focused on change the food environment, by increasing the availability of healthy food. Therefore, these studies showed a positive relationship between availability and food sale, showed by food purchasing and consumption²¹. The acceptance and sensorial analysis by students, about the developed preparations at this study, will be carried out in the next step of this research, which will be conducted by the same research team.

Conclusions

The university food environment where this study was performed, offered very limited healthy options in food and beverages, mainly with low-cost, when compared to whole options available on campus. The large number of food options with low nutritional quality could be the major barrier to healthy eating by university community. As some examples of products with low nutritional quality are cakes, cookies, pastries, savory snacks, candies, sandwiches filled with high amount of fat and sodium. In addition, there are huge offers of sugary drinks such as soda, energy drinks, canned teas comparing to fresh fruit juice. Beside this, healthy options on campus are more expansive than unhealthy options (low nutritional quality), which is another barrier to promote healthy eating. To keep the demand for best sellers we developed similar products, but with better ingredients, with more nutritional quality, improving fiber content and reducing sugar and fat content. This was a strategy adopted by research team to involve students and staff to choose better options without giving up flavor and taste. It could be an initial strategy to sell better and healthy items on campus to improve the university food environment. To implement this initiative, there will be offered to the owners and managers of all food commissaries on main campus the technical healthy recipes. This project aims to improve the availability of healthy food options at commissaries.

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Cultural differences in insect acceptance – a comparison between students in Sweden and Thailand

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Introduction

The global demand for nutritious and acceptable food, driven by a growing population as well as increased consumption per capita, is increasing ¹. Extrapolating the current trend of rising incomes driving the demand for meat protein and total calories will, according to Tilman and Clark (2014) result in an increased global consumption. In 2050 humanity will need a total of 15% more calories and 11% more protein, compared to today. These trends pose a threat to a sustainable development, from an environmental as well as a health perspective, and alternative dietary scenarios are needed. As one of many possible alternatives, edible insects have been put forward as a resource efficient source of protein and other essential nutrients².

Insects is already part of the diet in many regions of the world, and in parts of Asia, Africa, Mexico and Southern America the eating of insects is part of a long tradition and cultural heritage³. An example of a country where the consumption of insects is steadily increasing is Thailand⁴. Today, some 200 insect species are eaten in Thailand. Bamboo caterpillars, house crickets, giant water bugs and grasshoppers dominate the commercial sales in markets. In particular, Thai people like to eat giant water bugs (*Lethocerus indicus* Lep.-Serv.) with a unique catty and ripe guava-like odour⁵ and flavor of male specimen and a texture described as watery scrambled eggs. Many species are collected from the wild and sold seasonally in local markets. House crickets and palm weevils have been farmed successfully in many Thai provinces since the mid-1990s. Nowadays the practice has increased in popularity and has expanded nationwide. Consumption patterns of insects continue to evolve and recently emphasis has shifted to convenience and consuming insects as snacks⁴. The price of insects in Thai markets is often three or four times the price of meat and fish on a per kilogramme basis⁶. Interestingly, parallel to the trend of a rapid consumption increase, a very large share of Thai people are, based on disgust and perceived side effects or dangers from eating insects, still sceptical to insects as food.

In Europe on the other hand, eating insects is still unfamiliar to most people. Several studies have shown that most people in the western part of the world have difficulties accepting insects as food^{7,8}. This is also related to the fact that it has been forbidden to sell insects as food in the EU for the last 20 years. As part of the legislation related to Novel foods, insects as food must be approved according to a particular EU process ⁹. The purpose of the legislation is to protect consumers from unknown hazards such as allergies, poisons and infections. However, some countries in EU, such as the Netherlands, Belgium, France, the UK and Denmark have interpreted the law in a less strict manner, enabling selling as well as rearing insects to a certain extent¹⁰, where the most common is insects that has been pulverised or sold as dried or freeze-dried products. In Sweden selling and rearing insects as human food is still prohibited.

In the quest for more sustainable protein sources, the fact that a variety of climatic, cultural, religious and historic reasons affects the diets of different nations and regions has to be acknowledged. A sustainable transition to a diet that includes components that are novel to consumers, like edible insects are to Swedish consumers, will require careful consideration with regard to the local food culture and heritage. In fact, the general acceptance of edible insects in most Western societies is low and eating insects is often perceived as disgusting and primitive. An acquired familiarity with the notion of eating insects has been shown to be a powerful driver for acceptance⁸. An awareness of what the eating of insects is all about may result in more positive intentions towards buying and including insects in the diet, both in relation to one's own diet and in relation to trying to affect friends and relatives to include insects in their diet^{11, 12}.

In order to promote entomophagy – the practice of eating insects – the disgust factor must be addressed^{7,13}. Disgust elicitors may be similar across cultures or culturally specific¹⁴. This variability makes a theoretical model to classify disgust elicitors, not only associated to mere pathogen avoidance but also in relation to different types of moral violations, relevant. Concerning food, the moral domain of disgust is of relevance when it comes to for example acceptance of new food technologies or to the differentiation of various animal based proteins into either appropriate or inappropriate to ingest¹⁵. Disgust can be monitored through the Food Disgust Scale (FDS), a self-report measure that enables the assessment of an individual's emotional disposition to react with disgust to certain food-related (offensive) stimuli¹⁵.

In a recent master thesis, an attempt to understand how Swedish consumers think about eating insects through semi-structured interviews reveal that that curiosity, fear, disgust are the main perceptions among the 18 participants. The author argues that the negative perceptions arise mainly out of cultural/social construction and low exposure to insects¹⁶. In another, cross-cultural qualitative study the basis of acceptance and rejection of various insects and insect containing foods amongst Thai and Dutch consumers was examined¹⁷. The interest here laid in the tension between a culture where insects are part of the cuisine and one where insects are generally not considered food¹⁷. Inspired by this approach we wanted so use the FDS and the concepts of familiarity and intention to buy, to make a quantitative description of young consumers reactions and attitudes to various food related stimuli and insects in Sweden and Thailand. The aim of the present study was thus to explore cultural differences between Swedish and Thai students with regard to their disposition to react with disgust to certain food-related stimuli. Further the study aimed at elucidating differences in familiarity and intention to include insects in the diet between these groups.

Methods

A questionnaire adapted from the studies by Verneau et al. (2016) and Hartmann & Siegrist (2018) was administered electronically, using the software EyeQuestion, to a sample of Swedish students at Kristianstad University (Sweden) and Thai students at Rangsit University (Thailand) in September-October 2018. The questions included demographics in that the students were asked to indicate gender. Further, an adaption of the FSD on a continuous scale (1-7) using the following wording and translated to Swedish and English, was used:

How disgusting do you perceive:

- To put animal cartilage into my mouth? (Not disgusting at all - totally disgusting)
- To eat with dirty silverware in a restaurant? (Not disgusting at all -totally disgusting)
- Food donated from a neighbor whom I barely know? (Not disgusting at all-totally disgusting)
- To eat hard cheese from which mold was cut off? (Not disgusting at all -totally disgusting)
- To eat apple slices that turned brown when exposed to air? (Not disgusting at all - totally disgusting)
- The texture of some kinds of fish in the mouth (Not disgusting at all - totally disgusting)
- To eat brown-colored avocado pulp? (Not disgusting at all -totally disgusting)
- To eat a salad if there is a little snail in it (Not disgusting at all -totally disgusting)

Familiarity was monitored via the question “Have you ever heard of the eating of insects?” with the reply alternatives:

- Yes, I have heard of the eating of insects and I know what it means
- I have heard of the eating of insects but actually don't know what it means
- No, I have never heard of the eating of insects
- I don't know

Intention to include insects in the diet was monitored by the following questions:

- If you have heard about eating insects, is your intention then to introduce insects in your diet?
- If you have heard about eating insects, is your intention then to suggest to introduce insect proteins in friends and relatives diets?
- If you have heard about eating insects, is your intention then to buy products with insect proteins rather than traditional protein sources, if available on the market?

In total, 42 Swedish students and 39 Thai students responded to the questionnaire. Data was analysed using the students t-test for FSD questions and chi-squared tests for the non-parametric data using Microsoft Excel.

Results

Indications of poor hygiene, like having to eat with dirty silverware in a restaurant, was found to be the most disgusting food-related stimuli among Swedish and Thai students alike. Swedish students were significantly more concerned than those from Thailand about putting animal cartilage into the mouth and by eating with dirty silverware in a restaurant ($p=0.004$ and $=0.005$, respectively). Thai students were more disgusted than Swedes by eating hard cheese from which mold was cut off or to eat apple slices that has turned brown when exposed to air ($p=0.002$ and 0.000 respectively).

In Sweden 98% of the respondents had heard of eating insects but of these, only 25 % stated that they did not know what eating insects actually meant. Among Thai students, 89% had heard of eating insects but among these, 26% did not know what this actually meant. However, there was no significant difference between Swedish and Thai students in their intention to incorporate insects in the diet of their own or in recommending it to friends and relatives. Further, no difference in the intention to buy products with insect protein rather than traditional protein sources was detected (table 1).

Table 1. The intention to buy products with insect protein rather than traditional protein sources among Swedish and Thai students, respectively.

Intention to buy products with insect protein rather than traditional protein sources, if available on the market	Country		Total
	Sweden	Thailand	
No	28	26	54
Yes	14	13	27
Total	42	39	81

Discussion

By studying the impact on disgust induced by different factors the understanding of how to promote new foods, *e.g.* insects, in different cultures may increase. From the results it was clear that Swedish students were significantly more concerned than those from Thailand about putting animal cartilage into the mouth. This might be explained by the different cultural background, where the Thai students were more familiar with this type of food matrix. Previous research strongly emphasize the role of culture, including familiarity, in acceptance of food in general, and in regard to insects in specific^{8,18}. The food that has been part of growing up is also important in the acceptance, as well as the preferences of certain food and food ingredients later in life. In the present study, this was further illustrated by the fact that the Thai students where more disgusted than Swedes by eating hard cheese from which mold was cut off because Thai students were not familiar with the idea of eating cheese. With reference to anthropologist and cultural theorist Mary Douglas (2002) there are also cultural differences regarding what is perceived as “disgusting” and what is seen as dirty or pure. In her discussions about purity and danger, certain food can be considered as dangerous/dirty, and be harmful to the prevailing norms in society in one cultural context and historical time and not in another¹⁹. This also highlights the importance of acknowledging the symbolic, as well as changing nature of how certain food is defined as well as categorized. However, something can also be considered as dirt when crossing a certain symbolic border – for instance – food on the floor might be perceived differently (as non-food) from food on the plate. In relation to insects – the disgust factor might increase when imagining eating the insect, not by watching it in its natural environment.

From the results, there was no significant difference between Swedish and Thai students in their intention to incorporate insects in their own diet or in recommending it to friends and relatives. The majority of students of both nationalities, did not intend to incorporate insects in their diet. This was somewhat unexpected but seems to illustrate that many consumers, independently of their cultural background may associate entomophagy with disgust and perceived side effects or dangers from insect consumption²⁰. In the study of Tan et al. (2014), liking or aversion of insect-containing foods was found to be an interplay of cultural and individual preferences and motivations. The authors showed that extrinsic motivators such as healthiness and sustainability may appeal to consumers but that the psychological barriers to consumption are often stronger. Sensory expectations and perceived appropriateness of a food play very large roles in the intention of eating. If insects are considered inappropriate or are not even regarded as food, insect containing foods will be very hard to accept, be it in Thailand or Sweden. In Thailand, however, insects as food has made a type of “class journey” – being not only considered

inappropriate “low class food”, but also being trendy and consumed as convenient food in urban environments. In fact, curiosity may drive intentions to try, irrespective of actual liking¹⁷. This, along with acquired familiarity may be a key factor in increasing acceptance^{21, 22}. Another promising method to increase willingness to eat insects is to offer products made from processed insects²³. Further, as stated by Tan et al. (2014) the promotion of insects should not solely focus on communicating its functional benefits but should pay due attention to creating products that suit consumer expectations in their own cultural context.

Methodological reflections include the targeted group of respondents. Students are the consumers of tomorrow and their age and education level impact their feeling of disgust. In future studies it would be interesting to look at acceptance among a variety of ages and in larger populations. Other methodological concerns may be the way the FDS scale was combined with questions regarding familiarity and intention to include insect in the diet. A questionnaire set up in this manner may trigger the thought of contamination whereupon the respondents may perceive the insects as a contaminants^{21,24}.

Conclusions

There were some cultural differences between Swedish and Thai students in regard to their disposition to react with disgust to certain food-related stimuli as measured by the Food Disgust Scale. Swedish students were more concerned than those from Thailand about putting animal cartilage into the mouth and by eating with dirty silverware in a restaurant. Thai students were on the other hand more disgusted than Swedes by eating hard cheese from which mold was cut off or to eat apple slices that has turned brown when exposed to air. Almost all Swedish students were familiar with insects as food while a somewhat smaller share of the Thai students were familiar with entomophagy. The intention to include insects in the diet was however similar between the groups. Approximately one third of the respondents planned to incorporate insects in their future diets.

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Insects as food - a review of sustainability, nutrition and consumer attitudes

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Introduction

Interest in the use of insects as food is increasing, not least because they are both nutritious and sustainable! Despite these factors, the vast majority of people, mostly in Western cultures, are reluctant to put insects into their mouths. In some European countries the use of insects as food is prohibited by law¹. From an international perspective, there is nothing strange about eating insects. There are more people in the world who include insects in their diet than those who do not. Insects are a large group of animals that fall under the group of arthropods: phylum arthropoda. It is common to consume insects as food in about 120 countries around the world, and it is estimated that more than 2000 insect species are edible². Historically, it was most common to eat insects that were harvested in the wild and this is still true today. In order to ensure stable access to edible insects, the International Center of Insect Physiology and Ecology (ICIPE) in Kenya is studying different ways of rearing insects³. More and more cookbooks are appearing that aim to increase interest in the use of insects as food, for example the University of Columbia has published a cookbook with recipes for how to cook different insects⁴. Three "gateway" insects are being referred to as being those that will pave the way for increased insect consumption in Western cultures; these are meal worms, crickets and locusts. Some of the arguments for eating insects are that they are nutritious, sustainable and tasty! In a newly published report, the Dutch Council of Affairs describes an increased interest in consuming insects and proposes large-scale production in Europe⁵. The aim of this review is to give an overall insight into insects as food from the perspectives of sustainability, nutrition, consumer attitudes and European legislation.

Methods

A literature search was performed using the Web of Science and Diva databases; personal communications with persons engaged in Insektsföretagen (the Swedish insects organisation) provided guidance regarding useful websites. The search terms used were: insects, food, sustainability, nutrition, consumer attitudes and European legislation. The search identified a small number of key references which give an overall insight into the area of insects as food.

Key References

The key references identified included 44 items in total, of which 25 were research articles, 3 books, 4 reports, 4 master's/bachelor's theses, 4 websites and 4 others. The references were divided into the sub-themes: sustainability, nutrition, consumer attitudes and legislation.

Results

Sustainability

The world's population is increasing and is expected to reach around 11 billion people in 2050⁶. This increases the pressure on the earth's resources. It is therefore necessary to

review our eating habits and consumption patterns in order to ensure the food supply for the world's population⁷. Based on population growth, FAO estimates that food production must increase by 70 percent by 2050⁶. We face major challenges, and new methods and new strategies are necessary in all areas of the food chain. Both nationally and internationally, the consumption of meat and fish is increasing, leading to higher use of both resources and energy⁸. Although the increase in meat consumption is both well known and not sustainable, there are few signs that global consumption is decreasing. With a growing global population and a consumer demand for high-quality food including meat, it is necessary to find and use new sources of production of important nutrients and to inform consumers about alternatives to meat and fish, i.e. alternative proteins⁹. One such alternative could be to increase the use of plant protein, such as in peas and legumes, another would be to use insect protein.

Insects do not contribute to greenhouse gases to a large extent, and the rearing of insects requires fewer resources than livestock farming. The production of insects as food exerts less ecological pressure than that of conventional livestock, such as cattle, pigs, poultry, by requiring less feed, soil and water^{4,10,11,12,13,14,15}. Dobermann et al¹⁶ argue that the economic value of insect production may be higher than conventional meat production. Insects convert the feed they eat effectively and can therefore be seen as efficient protein producers. For example, about 10 kilograms of feed are required to produce one kilogram of beef protein, while only 2 kilograms of feed are required to produce one kilogram of insect protein. In addition, insects can be fed on various residuals and by-products, such as bran from wheat and rye kernels. Another advantage is that insects tend to live close to each other, thereby requiring a smaller production area and reducing the burden on the environment⁴. However, there are studies indicating that the environmental impact is very different between different insect species¹⁷ and there is some debate as to whether the pressure on the environment can be eased by an increased production of insects¹⁶.

Nutrition

Nutritionally, insects contain proteins, fats, vitamins and minerals. The nutritional content of insects varies between species, stage of growth and breeding factors such as feed, temperature, water and location. The reported nutritional content of insects may also differ between different research references, which may be due to the above-mentioned variations and differences in analytical methods, and if analyses have been carried out on fresh or dried raw materials^{18,19,20,21}. Table 1 shows the nutritional values for the three gateway insects: cricket, meal worm and locust.

Table 1. Nutrient composition of cricket, meal worm and locust per 100 gram dry matter²⁰

	Cricket (<i>Grylloides sigillatu</i>) per 100 gram dry matter	Mealworm (<i>Tenebrio molitor</i>) per 100 gram dry matter	Locust (<i>Schistocerca gregaria</i>) per 100 gram dry matter
Macronutrient			
Protein (g)	70	52	76
Fat (g)	18	25	13
Fiber (g)	3,6	2,0	2,5
Ash(g)	4,7	3,6	3,3
Energy (kcal)	1900	1860	1820

Energy (kJ)	452	444	432
Mineraler			
Calcium (mg)	130	41	70
Iron (mg)	4,2	3,3	8,4
Potassium (mg)	1190	840	750
Magnesium (mg)	100	300	80
Sodium (mg)	330	57	173
Zinc (mg)	13	11	19
Fatty acid composition (% fat)			
SFA	34	25	35
MUFA	35	43	38
PUFA	32	31	26

The protein in insects generally contains a high proportion of essential amino acids, and the fats in insects include a high amount of polyunsaturated fatty acids^{4,19,22}. The protein content in edible insects is generally high and varies between 20 and 70 percent (dry matter basis). Protein quality is determined by both the content of amino acids and its digestibility. Virtually all amino acids can be found in insect protein, although tryptophan and lysine are only found in limited amounts, and digestibility is very high^{23,24}. Insect protein has been shown to be of higher quality than soy protein²⁵. The fat content of different insect species varies greatly, but they all contain a high percentage of polyunsaturated fatty acids, see Table 1. It is noted that the level of n-6 (omega-6) is high compared to n-3 (omega-3)^{20,24,26}. As far as the content of minerals and vitamins is concerned, this varies widely between species, but is also dependent on the environment in which the insects are present, their feed etc. For example, it is noted that the iron content may differ largely between species. Furthermore, insects can be a source of vitamin B12^{20,27}. It can also be noted that vitamin D content may vary depending on the insects' exposure to the sun or UVB irradiation²⁸. In conclusion, it can be said that insects are good sources of energy, protein, fat, minerals and vitamins. They are usually fully comparable to other protein sources, such as meat, fish and soybeans, although there is a large variation between and within different insect species. A number of research articles indicate that insects have the potential to play an important role in covering the future need for protein and other nutrients. However, whether they can reduce malnutrition globally is a matter currently being debated^{16,26,29}.

Consumer Attitudes

The inclusion of insects in our food would mean benefits from a nutritional and sustainability perspective⁷. Another important criterion for accepting insects as food is that they taste good. The three so-called gateway insects - meal worms, crickets and locusts - are all described as tasty due to their mild flavours. The flavour of meal worm is described as nutty with a taste of umami and cereals, cricket resembles popcorn with a hint of chicken and umami, while locust has the flavour of shrimp, nuts and vegetables^{30,31,32}. Insects may be eaten raw or cooked in a variety of ways⁴. Despite all the possible benefits, the acceptance of insects is very low, at least in Western societies. Only a few studies have mentioned positive culinary aspects and consumer attitudes about food based on insects³³. Several studies indicate that it is easier to accept insect products

with neutral and less visible or minced insect ingredients than dishes including whole insects^{34,35}.

The underlying causes of the low acceptance of insects as food can, to a great extent, be attributed to aversion and negative attitudes towards insects, which may be perceived as things that are creeping and crawling. Aversion can be the result of various sensory signals, such as ugliness or bad odour, and is often associated with feelings of anxiety. It is a human reaction which is considered to be part of the so-called behavioural immune system since it triggers actions designed to avoid health risks³⁶. A negative attitude towards invertebrates, both generally but especially as food, is deeply rooted in Western culture³⁷. One way to measure aversion to food is to use the so-called Food Disgust Scale (FDS)³⁸. This has been used to measure the level of aversion to various types of food in different populations. What is classified as food that can be eaten, however, differs between cultures and the same is true for what evokes disgust. The disgust factor is seen as a serious threat to the introduction of insects into the daily diet in cultures where insects are not normally eaten³⁹. However, in countries where eating insects is the norm, they are seen as a valuable protein source and knowledge about which species are edible is considered important¹⁶.

In an effort to answer the question about what can be done to reduce the aversion to insects in Western culture there are, according to Looy, et al.³⁷, a few key aspects to consider in order to achieve a lasting change in attitudes towards insects. In such work, there must be an awareness of the psychological and cultural barriers to a positive attitude towards insects as well as an understanding of the processes through which these barriers have arisen. Furthermore, clear communication of the fact that insects are required as a valuable food resource is necessary. It has been demonstrated that the acceptance of insects as food increases when consumers are given the opportunity to familiarise themselves with this new raw material, for example by having a taste of insect products and perhaps even preparing their own insect dishes in which, for example, meal worms or locusts are included⁴⁰. In the Netherlands, entomophagy has been successfully promoted for almost 30 years and, according to Dickie et al.⁴¹, the key to success has been technological congruence of the research community, the private sector, universities, state and local governments, foundations, and non-profit organisations.

Legislation

Legislation regarding using insects as food varies between countries¹. In Europe, insects are considered as novel foods according to Regulation (EU) 2015/2283 of the European Parliament and of the Council, since they had not been significantly consumed in the EU before May 15, 1997. This means that the production of insects for food purposes is not allowed, furthermore it is forbidden to sell insects for human consumption unless the specific insect species has been assessed as safe after examination by the European Food Safety Authority, and approved by the European Commission. Since January 1, 2018, Novel Foods have been governed by Regulation (EU) No. 2015/2283, based on the same principles as the previous Regulation (EC) No 258/97. Although the legislation is common in the EU, the regulation is applied differently in different countries. Some countries, such as Belgium, the Netherlands and Denmark, have interpreted the regulation less strictly than others, such as Sweden and Great Britain. In the less strict countries, the rules have been interpreted such that whole animals cannot be counted as novel foods. Therefore, all insects can be sold without special approval. As of January 1, 2018, the

regulations state that whole animals are new foods. Therefore, Sweden and other EU countries follow the interpretation that insects must be examined and approved before being sold for human consumption. Special rules apply to "traditional food from third countries", that is, food that has been proven to be consumed in non-EU countries. These rules can simplify the process of specific insect species being consumed without harm to people and being sold within the EU; this is according to EU 2015/2283 Regulation. To ensure that this type of food is not harmful to health, any company who wishes to sell the food is required to provide proof that it has been eaten as food

- in at least one third country
- for at least 25 years
- by a large proportion of the population
- as part of the usual diet, without harming the population ¹

Discussion

Insects are common foods in many countries, their nutritional values are good, they are mild in flavour, and are a sustainable source of protein and other nutrients. The environmental and nutritional aspects of edible insects appear to be highly convincing arguments for their consumption⁴². Although there seem to be several rational reasons for eating insects, most people in Western societies regard insects in the diet as something strange and even disgusting. With an ambition to promote insects as a part of the diet and as part of sustainable development, it is necessary to consider how aversions and negative attitudes can be addressed and overcome. A better understanding of what might evoke disgust in food would be helpful to bring clarity here. Information and education are important to give objective insight into sustainability and nutrition. These factors might appeal to moral issues such as a person's value orientation, moral obligation and environmental concerns regarding food choices⁴³. However, sensory and visual aspects of food are important criteria for consumers when deciding on the overall acceptability of a dish⁴² and have to be taken into account when forming messages about using insects as food. Moreover, factors such as neophobia and disgust are very strong, but may vary in individuals over the course of a lifetime⁴⁴.

Conclusion

The aim of this review was to give an insight into the use of insects as food from the perspectives of sustainability, nutrition, consumer attitudes, and European legislation. It can be concluded that insects have the potential to be part of a sustainable, nutritious and flavourful diet.

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ABSTRACTS

The social, cultural and health aspects of food in a global industry: The case of seafarers

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Keywords: Food; Globalisation; Health; Multicultural work environment; Shipping

Food plays a vital role in our lives, whether we want it to or not. But what role does food play for workers in a highly isolated and multinational work environment? Building upon two qualitative research projects that involved in-depth research with over 100 maritime related individuals, this paper seeks to extend our understanding of the cultural, social and health issues surrounding food on board cargo ships. In the globalised and unique work-setting of shipping, seafarers work in multinational work environments, i.e. cargo ships, where they spend long periods of time away from their families in an isolated work environment, and often experience poor working conditions such as long working hours without holidays for periods lasting for up to a year at a time. Within this context, food can play an important role in seafarers' lives well beyond the basic human need, as it can influence their physical and psychological wellbeing while on board. In this context, future research areas will be discussed. As the ship has previously been likened to other closed institutions including prisons and mental health hospitals, findings from this research potentially have implications for research in other closed and restricted working environments.

An Assessment of Digital and Sustainability Skills Needs in the Food and Beverage Sector in Wales

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Keywords: Skills, Tourism, Digital, Sustainability, Wales

This paper will present and discuss research findings on digital and sustainability skills needs in the food and beverage sector in Wales. Enhancing digital, green and social skills are contemporary priorities for sustainable tourism development and are high on the policy agenda. Food is a key component in tourism and both have been identified as foundational sectors in the national economic action plan, *Prosperity for All*. The research approach is an online Qualtrics survey of Welsh businesses in the food and beverage sector followed by interviews between January-February 2019. The research is being undertaken by the Next Tourism Generation Project, a European Commission funded project that aims to assess and respond to gaps in digital, green and social skills sets. Quantitative and qualitative results from the survey and interviews will be presented. The analysis will focus on the extent and type of digital and sustainability skills needs in the food and beverage sector in Wales. Preliminary insights will be provided on how skills needs maybe addressed.

Added sugars and low-calorie sweeteners on labels of packaged foods sold in Brazil

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Keywords: *Sweeteners. Industrialized food products. Food labeling. Ingredient list. Food legislation*

The World Health Organization (WHO) recommends reduce the intake of added sugars (AS) for adults and children, since evidence suggests that the excessive intake is harmful to health. Low-calorie sweeteners (LCS) can be used as sugar substitute, but they also have negative health effects. This study analyzes the presence and types of AS and LCS in the labels of packaged foods. A cross-sectional census study was carried out. Ingredients lists of all the available packaged foods for purchase in a large Brazilian supermarket were analyzed. From the 4.539 analyzed food, 3.276 (72%) contained some sweetener, including 60% with AS only, 1% with LCS only, and 11% with both AS and LCS. Biscuits, cake mix, and sweetened beverages were the ones with greatest prevalence of both AS and LCS. Salty food such as bottled vegetables, meats, cracker, and ready-made sauce also had AS and LCS. Packaged foods are the main source for consumption of AS and an important source of LCS intake. Yet, there are few initiatives to label AS and LCS quantity, especially in Brazil. The lack of information hampers the identification of these components by consumers when buying food⁸. The majority of packaged foods available for purchase in Brazil have AS, LCS or both in their composition. The present study suggests efforts to make information on these components clearer on food labels. It is necessary the revision of the Brazilian legislation on food labeling by making the information easier to understand by consumers.

Sensory characterization and evaluation of salty miso-like and tempeh fermented grass pea products: construction of a preference mapping

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Keywords: *salty miso, liking, grass pea, tempeh, sensory profile*

Grass pea (*Lathyrus sativus* L.) is a robust grain legume with high nutritional value. In Portugal it is a part of the traditional heritage of dryland communities, representing an

important source of revenue for some local economies. However, as a result of minimal breeding efforts, grass pea's potential has been underexploited and is presently endangered, with consumers finding current grass pea-based foods unappealing. The aim of this study was to trace a preference mapping of innovative samples of miso and fried tempeh-like fermented grass pea products, using Flash Profile correlated with an overall liking evaluation. The sensory profile and consumer perception of five different miso and tempeh-like samples were assessed, using the Flash-profiling technique, performed by 16 semi-trained judges, complemented with the evaluation of overall liking, over a 9-point scale by a panel of 60 naive tasters. Results show a pronounced preference for the grass pea-based sample of salty miso, but a clear rejection of the fried tempeh-like sample. The Flash-profiling revealed that the miso of grass pea is characterized by its clear appearance, blond colour, soft and salty taste, and velvety texture. Considering the fried tempeh grass pea-based sample, its rejection can be related for the brownish colour, sickening taste, intense odour, taste, and aftertaste. Plotting both results on a preference map, one can conclude that the preference tends towards the grass pea-based miso driven by the above-mentioned characteristics, however the tempeh product was not accepted by consumers.

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An in-depth insight into older adult consumers' domestic risk factors associated with listeriosis.

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Keywords: domestic kitchen; consumer food safety; cognition; behaviour; observation

Older-adults (≥ 60 years) are associated with increased listeriosis incidence and there's a need to explore older-adults' domestic food handling/storage practices associated with listeriosis to potentially reduce incidence. This study combines multiple, published, research approaches to give in-depth cognitive/behavioural/microbiological insight into older-adult listeriosis risk-factors. Data associated with listeriosis risk-factors from the following sources were linked and combined: a desk-based review of consumer food-safety (CFS) studies, interviews regarding attitudes towards domestic food-safety, questionnaires concerning knowledge/self-reported practices, model-kitchen observation of food-preparation, observation of domestic storage-practices, domestic-kitchen microbiological survey, domestic refrigerator time-temperature profiling and a laboratory re-enactment of behavioural risk-factors. Analysis of previous research identified majority of CFS-studies relate to cognition; data detailing older-adult attitudes and behaviours were lacking. Listeriosis risk-reducing practices were defined as temperature control ($\leq 5.0^{\circ}\text{C}$), 'use-by' date adherence and preventing prolonged-storage. Although knowledgeable of some risk-reducing practices, discrepancies were identified between

self-reported and observed behaviours. Many older-adults failed to express positive-attitudes towards required listeriosis risk-reducing practices. *Listeria* was infrequently isolated in domestic-kitchens (2%), however, prolonged-storage and inadequate refrigeration ($>5.0^{\circ}\text{C}$) was widespread. Re-enactment of observed storage-malpractices determined *Listeria monocytogenes* growth was significantly greater ($p<0.001$) than when following recommended risk-reducing practices, thus potentially making foods unsafe for consumption which may contribute to the increased risk of listeriosis among older-adults. Completion of the study has combined cognitive and behavioural research approaches to identify behavioural risk factors associated with older-adults. This study utilised an innovative combination of data collection methods and measures to increase our understanding of older adult consumers' cognitive and behavioural risk factors associated with listeriosis.

Exploring the use of remote covert-observation to assess hand-hygiene compliance in food manufacturing and processing environments.

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Keywords: hand hygiene; food safety; cognition; behaviour; observation

Ensuring hand-hygiene compliance in food manufacturing/processing environments is of utmost importance for food-safety, however assessment methods can influence the type of information that can be captured. Although informative, food-safety cognitions (knowledge/attitudes/self-reported practices/intentions) are not indicative of actual-behaviour and may be subject to biases. However, researcher presence in overt-observation of behaviour can cause reactivity-bias, whereas remote covert-observation (using CCTV) can provide comprehensive analysis over a sustained period whereby familiarity with CCTV cameras may reduce reactivity-bias. A mixed-methods research approach explored the use of behavioural observation in the food industry, which included; a desk-based review of professional food-handler food-safety studies ($n=20$), interviews with managing directors and technical managers/supervisors from manufacturing/processing business ($n=11$) and structured remote covert-observation of hand-hygiene practices in a business. Ethical approval was granted by the Cardiff School of Health Sciences research and ethics committee (Project reference: 8152), consent was obtained by completion of a consent form. As food-safety cognitions from survey-based methods were most frequently included in reviewed food-handler research (80%), observational data, particularly from manufacturing/processing environments were lacking. In interviews, businesses expressed positive attitudes towards utilising covert-observation to assess hand-hygiene compliance, although businesses had cameras recording activity, none had resource/time to conduct frequent/structured observations. Covert-observations determined that only 2% of hand-hygiene attempts when entering production were compliant with hand-hygiene protocol. Although positive attitudes were expressed towards the use of remote covert-observation, CCTV cameras were more frequently utilised for security rather than food-safety purposes. The study has determined current hand-hygiene practices, identified site-specific issues relating to malpractices and failures to comply with the company hand-hygiene policy. Remote covert-observation is

a useful yet under-utilised resource that provides valuable insight into actual hand-hygiene behaviour and food-safety in manufacturing/processing environments.

Understanding Kimchi's Role in Korean-America Trans-ethno Space: An Inductive Investigation

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Keywords: kimchi, transnational, immigrant, culinary, culture

The literature has indicated that culinary symbolism links the senses with memory and social attributes for transnational migrants and that these connections are pronounced by particular ethnic food preparations. Food's apparent worth as a conveyor of cultural capital diametrically increases as distance and time fray an immigrant's links to the motherland. Kimchi has been touted for its health benefits. Understanding Korean-America consumer's reported strong connection to kimchi could help marketing strategies for the generalized consumption of this and other underutilized healthy products. By using focus group evidence and Grounded Theory, this investigation tested the connectivity of kimchi to Korean-American identity and possible overt and covert associations. 5-focus groups were conducted with 35 Korean-American adults. Seven themes were uncovered: Recreating Memories; Affirmation of Family Structure; Kimchi Is Love; Territorial Space; Acquired Taste; Cheating Memories-Shame and Sadness; and Female Kitchen Agency and Power Relations. Kimchi has held on through space and time to provide a shared sense of connectivity to informants, more intensely and democratically than in Korea, their ethnic homeland. Reported kimchi taste acquisition followed a trajectory from aversion to longing. The positioning of kimchi's ethno-space in the US has required adjustments, which have led to feelings of shame, guilt and sadness to some. Concessions have been made. Manufactured kimchi provided generic bridge for the Korean-American community. However, the move away from home-prepared kimchi took a toll on family's historic, structural connectivity, emotions and the deliverance of cultural capital and the distribution of household agency.

Cooking skills intervention increase self-efficacy for consumption and for use of fruits and vegetables among Brazilian university students: a randomized controlled trial

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Keywords: cooking skills; culinary intervention; randomized controlled trial; recipes; college students

Cooking skills interventions have been related to improve dietary quality. The Nutrition and Culinary in the Kitchen (NCK) program was developed based on U.S. Cooking with the Chefs (CWC) program, which aims to improve cooking skills and healthy eating practices of university students in Brazil. A randomized controlled trial with six months follow-up was used incorporating an intervention group (IG) and a control group (CG). The IG participated in the NCK program over a six-week period, three hours weekly, based on five hands-on cooking classes and one food market visit, while CG continued their usual activities. An online validated survey was answered, at three time points: baseline (T1), after intervention (T2) and six months after intervention (T3). The produce consumption self-efficacy (SEPC) and self-efficacy for using fruits and vegetables (SEFVS) was composed with 5-point Likert scale. Statistical analyses were conducted to evaluate changes in outcomes within and between groups. Ethical approval was obtained from the University Committee. 76 students completed the online questionnaire at the 3 time points. Findings revealed a statistically significant increase ($p < 0.05$) in all outcomes evaluated in the IG. This effect was sustained at T3 ($p < 0.001$). Results were similar to the adjusted model ($p < 0.001$), thus, indicating that IG changes, when compared to CG, were due to the intervention effect. Cooking interventions have been used to promote cooking confidence and healthy eating habits. NCK culinary intervention program demonstrated efficacy for the increased on SEPC and SEFVS with university students.

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Public health nutrition policies should stop encouraging people to focus on calorie counting to fight non-communicable diseases: a critical review

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Keywords: Energy intake; food quality; chronic diseases; menu labelling; food guidelines

Public health policies focused on calories seem to result in minor shifts toward healthier choices and might not be enough to prevent obesity and related diseases. This study discusses the relationship between calories and healthy eating and propose a shift in the focus of public policies. Critical review discussing the relationship among calorie counting, obesity, healthy eating and public health nutrition policies. Even though high caloric intake might be associated with a high body mass index, calorie reduction should be associated with an improvement in the nutritional quality of the diet for long-term weight-loss maintenance. Concentrated sources of rapidly absorbable carbohydrates and insulin can block leptin's action of suppressing appetite and promoting energy expenditure. This effect is associated with food type, not with its caloric value. Different types of a macronutrient with the same caloric value are metabolized in different ways. For instance, trans fats increase lipogenesis and the risk of heart diseases, whereas monounsaturated fats have the opposite effect. Food processing and cooking methods also influence the nutritional value of foods. It is not possible to choose a healthy diet solely based on the caloric value of foods because calories differ in nutritional quality according to their source. Foods are more than just a collection of calories and nutrients, and nutrients interact differently when presented as foods. public health nutrition policies should focus on ingredients, dietary sources, food processing and cooking methods, not on calorie counting, even to decrease obesity.

Natural Hospitableness, Gender and Hospitality Service Work: Re-addressing the gender (im)balance

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Keywords: Gender, Hospitableness, Experience, Naturalness, Food

Drawing on a PhD thesis which explored how hospitality service staff, customers and managers perform and co-create natural hospitable experiences, this paper seeks to present one key contribution to theory emerging from the PhD research. The specific focus of this paper is on the impact that gender plays on the performance of natural hospitableness by hospitality service staff. The PhD research took place across three

phases with operative staff, customers and managers. This research took place in differing food and beverage servicescapes which focus on the creation of meal experiences. In the first phase of research, an equal number of male and female operative staff were interviewed in order to explore the gendered nature of hospitality service work and more specifically, the gendered nature of hospitableness. Additionally, in each of the customer focus groups and manager interviews, there was an equal gender balance. This research reveals that the gender of the server has little impact on the co-creation and performance of natural hospitable experience. The only time that the gender of the server plays a role in performing hospitable experiences is when a customer initiate flirtation encounters towards a server of the opposite or same sex in a natural and appropriate manner. This paper therefore challenges the extant academic literature on the gendered nature of hospitality service work by arguing that gender has little or no impact on hospitality experiences that are naturally co-created between customer and server.

Impact of menu descriptions on the perceived satiety value of vegetarian dishes at the restaurant

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Keywords: perceived satiety, perceived healthiness, menu labelling, living laboratory, plant-based dishes

A potential barrier to introducing plant-based options in foodservice is that customers might perceive them as less satiating than meat-based options. Previous studies suggest that the way a dish is described on the menu influences consumers' beliefs and expectations regarding its healthiness, taste and value. How does it impact perceived satiety value? This study investigates the impact of wording on the perception of meat- and plant-based dishes. 115 Customers of a living-lab restaurant (mean age 28) were given a menu with 4 dish options: 2 meat-based (MB) and 2 plant-based (PB). The options were described using: reference wording (R), additional sensory-based information (S), or additional nutrition-based information (N). Each participant received first (R) then either (N) (n=57) or (S) (n=58), and rated, for each option: perceived satiety value, liking, economic value, perceived healthiness. In (R), PB received the lowest satiety and hedonic scores and the highest healthiness. (N) increased satiety scores except for one MB option. (S) increased satiety values of PB but not MB options. Economic value increased for all options in (N) and (S), while healthiness scores decreased for PB in (S). Hedonic ratings were unchanged in (N) and (S). The results showed that adding information on PB dishes changes consumers' beliefs about perceived satiety value. Sensory information seems more effective than directly referring to satiating properties. This effect is not consistently observed for MB options, suggesting an effect of familiarity. Therefore, enhancing menu descriptions might help consumers and professionals turn towards more plant-based choices in restaurants.

Food Safety training experiences of student dietitians in Cardiff Metropolitan University, Wales, UK

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Keywords: Food safety; Dietitians; Vulnerable patients; Knowledge; Training

Food-safety is part of the curriculum designed for training of registered-dietitians. Dietitians provide food-related information to vulnerable-patients and are recognised as credible sources for food-safety information. Delivery of food-safety advice by adequately-trained registered-dietitians can inform vulnerable-patients of increased foodborne illness (FBI) risks and enable risk-reducing food-safety practices. However, gaps in practicing registered-dietitians food-safety knowledge have been identified. Dietitians need appropriate/adequate knowledge and skills to deliver effective food-safety advice, which could be gained as student-dietitians. A questionnaire to assess the food-safety knowledge, attitudes, and training experiences regarding FBI were completed by Cardiff Met. Student-dietitians ($n=73$). The majority of student-dietitians reported awareness that immunocompromised patients had increased FBI risk and 71% reported that food-safety information provision should be standard practice. The majority (97%) indicated awareness of the common foodborne pathogen *Salmonella*, but *Campylobacter* awareness was lower at 71%. Food safety knowledge was variable with correct responses selected on average by 83% (range 50-100%). All student-dietitians reported completion of a one-day food-safety programme, however 23% reported difficulty in identification of individuals/groups at risk of FBI. When considering providing food-safety information to vulnerable-patients 48% considered training to be insufficient and 31% reported it to be clinically inapplicable. Food-safety knowledge of student-dietitians is variable and requires improvement. Given half of student-dietitians believed their food-safety training was insufficient, there is a need to explore the suitability of the training method used. Findings identify the need for targeted food-safety training to improve knowledge and enable student-dietitians to inform vulnerable-patients to reduce FBI risks.

Growing the market for local food and drink amongst the Tourism, Hospitality & Events sector: Is passion for 'local' enough?

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Keywords: Local food, THE sector, producers, skills

There has been a growing interest in food and drink traceability, fuelled by food scares and contemporary agricultural and food processing debates. The UK market for locally-sourced food is estimated to be worth £6.5 billion; therefore, sourcing local food and drink can provide sustainable competitive advantage for the tourism, hospitality and events sectors. However, there are a number of supply and demand challenges that hinder

the growth of the local food and drink market amongst the tourism, hospitality and events (THE) sector. This paper seeks to explore some of those challenges in Southeast Wales. Seven semi-structured interviews were conducted in Southeast Wales within the context of the wider Welsh Food Supply Chain sector project. The sample included four tourism/hospitality/events operators, two local authority tourism officers and one local authority rural development programme officer. There was a definite passion amongst the tourism, hospitality and events sector for Welsh food, with restaurateurs emphasising the quality of Welsh food, the recognition of the quality of Welsh produce and a desire to promote it. However, the level of passion for Welsh ingredients varied, often influenced by the different markets that tourism, hospitality and events businesses were catering for. If the food offer was not the main pull factor, the promotion and description of specific Welsh produce on menus was not a key priority. Identifying local food producers is challenging for restaurateurs, as many producers are not skilled at branding, packaging and product development. Additionally, some producers have a strong product but lack confidence and sales skills. These gaps have implications for the development of business-to-business relationships and hinder the growth of the local food and drink market amongst the THE sector. There needs to be a more co-ordinated approach to growing the market for local food and drink amongst the THE sector as extant approaches tend to focus on small-scale consumers of local food and drink, thus perpetuating the problem.

The meaning of 'fresh' in food labelling

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Keywords: Fresh, language, packaging, labelling

The purpose of this study is to review the use of the term 'fresh' in food labelling. Best practice advice recommends that the term 'fresh' should only be used where it has a clear meaning, whether used alone or qualified by other terms. Simply defined, the term 'fresh' in food labelling and packaging indicates a short time period between the production or harvesting of the product and its date of sale. However, definitions of the term are both complex and contested, blurred by technological improvements in distribution and storage. Consequently, marketers' interpretations have flourished and consumer uncertainty has increased. We reviewed the term 'fresh' in the labelling and packaging of 257 food products, in order to determine the extent to which its use conformed to best practice advice from the UK Food Standards Agency. We identified instances of the word 'fresh' and related terms (freshly, freshness) on labelling and packaging of common food types in UK supermarkets. Focusing on language use, we analysed the form and function of the word as it appeared in context, in order to determine its implied meaning. Initial results show that the language of 'fresh' varies according to the characteristics of the products. Recommended Food Standards Agency criteria associated with 'freshness' do not account for all product variables, such as distance, time and processing, which creates consumer confusion around the true value of freshness. Consequently, greater emphasis is needed in ensuring descriptions of freshness are understood for the health of society.

Cross-cultural adaptation of Cooking Skills Evaluation Questionnaire: a tool to Brazilian foodservice context

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Keywords: culinary skills, food preparation, translation, foodservice

Public health policies recommend cooking skills' evaluations aiming to achieve healthy eating habits. In Brazil, foodservice sector can improve cooking skills of their staffs to offer healthy and unprocessed food preparations. This study described the cross-cultural adaptation process of a cooking skills questionnaire from the US to Brazil. Six stages were conducted: 1) Translation (two independent translations), 2) Synthesis of Translations (discussion among translators and one researcher), 3) Back-translations (two independent translations compared with the original questionnaire, followed by a discussion among dietitians), 4) Expert Committee (consensus workshop), 5) Synthesis of final Brazilian Portuguese version, 6) Pre-test (self-administered online questionnaire by 48 participants from a public University). The original and translated questionnaires were compared for conceptual, item, semantic (idiomatic and experiential), and operational equivalences. Cooking techniques and terms were changed, such as *simmering, boiling, steaming, poaching, roasting, microwaving, healthful, vegetables* from stage II to IV to achieving semantic and conceptual equivalences. Few amendments to ease-of-use improvements were made to the online questionnaire based on discussions in stages IV and VI. In the pre-test, few participants had difficulty comprehending the questionnaire, thus supporting semantic, item and operational equivalences between the original and the Brazilian Portuguese versions. Amendments of cooking skills terms showed the complexity of cooking skills concepts and highlighted the importance of the cross-cultural adaptation process. The use of an adapted questionnaire in Brazil can adequate the evaluation of cooking skills and plan appropriated interventions in foodservice sector to provide healthy preparations.

Evaluation of nutritional and sensorial quality of grilled beef prepared in a self-service restaurant of Porto Alegre, RS, Brazil

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Keywords: meat, nutritional hazards, sensory hazards, productive process, restaurant

Evaluation of nutritional and sensorial quality in meal production – NSQE system allows the control of operational stages in the meat-based preparation in restaurants. The

objective was to evaluate the NSQ of grilled beef served at a self-service restaurant in Porto Alegre, Brazil. Two forms from the NSQE system were applied: 1) Evaluation of the characteristics (restaurant characteristics, physical area and availability of equipment) and 2) NSQE guide (conformities of the stages of the production process). The absolute and relative frequencies of conformities were obtained for each step analyzed. Inadequacies found were: lack of information transmission (75%) and human training (50%). Among the stages of the production process, inadequacies were observed in the receiving (50% - portion size and meat cut), pre-preparation (50% - time of enzymatic softening and salt use), preparation (85.71% - availability of frying pan, utensils, preparation techniques), in the dishes assembly (66.66% - selection of standardized cuts), and in the evaluation of leftovers (50% - lack of sensory evaluation and satisfaction surveys). Inadequacies detected, mainly during the preparation, can lead to the decrease in the nutritional value, juiciness and tenderness of the meat, resulting in loss of the NSQ. Instructions about how to prepare, quantify ingredients, and provide desired sensory characteristics to the production team are needed. The use of NSQE system contributed to define criteria for control points at all stages of the production process, guaranteeing NSQ of the preparations for the consumer.

Benefits and challenges of purchasing food from local family farms in a Brazilian university restaurant

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Keywords: local purchasing; food service; sustainability

University restaurants are present in more than 130 Brazilian universities and, since 2016, are required by law to purchase foods from local family farms. We analyzed the benefits and difficulties of purchasing food from local family farms for a university restaurant that serves on average 10,000 meals per day in a capital city of southern Brazil. The nutritionist and the general director of the restaurant as well as a representative of the purchasing sector and the head of administration of the university were interviewed. Interviews were recorded and analyzed qualitatively. In the opinion of the interviewees, local purchasing can improve the quality of meals by increasing the diversity of vegetables and fruits and the offer of fresh foods produced using fewer pesticides. Furthermore, a closer relationship between consumption and production could help preserve traditional food habits, and the high demand for foods by the restaurant could strengthen the economic development of family farms. However, the interviewees pointed out that, because of Brazil's political and economic status, the university cannot pay prices higher than the market value, which may hinder purchase from small, unorganized farmers. In addition, the restaurant must purchase minimally processed foods, but some small farms lack the necessary infrastructure for food processing. Respondents recognized the benefits of acquiring food from family farms; however, purchase specifications and political and economic uncertainty were reported as limitations to local purchasing from family farms.

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Difficulties in introducing underutilized plants in institutional restaurants in Brazil

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Keywords: neglected plants; food service; culture; sustainability

Modern diets rely on a few plant species, even in Brazil, where food biodiversity is high. We investigated the difficulties in the purchase and introduction of neglected and underutilized plants in public institutional restaurants in Brazil. We conducted in-person interviews with 14 nutritionists and 21 managers from 17 randomly selected institutional restaurants in 17 states from November 2016 to February 2017. Data were qualitatively analyzed using NVivo software. The restaurants served 53,000 meals per day (median = 1,000). The respondents identified several benefits of consuming neglected and underutilized plants, including higher nutrient intake, greater nutrient variety, and the reversion to more sustainable and traditional food habits. However, according to the interviewees, the lack of producers who could meet the demands of the restaurants was a barrier to the use of underutilized plants. Respondents also expressed concern about the low acceptance of the foods by customers, as the local population has lost the habit of consuming these items and may regard them with distrust in terms of food safety. Food education strategies were suggested to encourage the consumption of underutilized plants and should be an initial step in reviving traditional habits. Interviewees reported that public policies are needed to strengthen local agriculture that incentives should be given for large-scale production of underutilized plants, and that restaurant staff need training on how to prepare the foods. These actions are necessary to promote a diversified and healthy diet, stimulate sustainable production, and help conserve biodiversity.

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Generation H: Exploring the potential of school outreach programmes in Higher Educational Settings to promote hospitality as a career

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Keywords: higher education, outreach, employability, skills and hospitality

The Northern Ireland (NI) Skills Strategy has highlighted the need for both workplace ready staff; and promotion to entice young people to careers within the hospitality industry. In response to this, *Generation H* is an outreach programme introducing and engaging pupils, from Secondary Schools in Belfast, to the hospitality industry. This study therefore aims to explore the potential for utilising a school outreach programme, in a Higher Education setting, to engage those who are traditionally excluded from university and the hospitality sector. A four-week cross community outreach programme involving Y10 pupils from three Secondary schools, who will be recruited onto the programme in March 2019. A pre and post survey on students' perceptions of the hospitality industry and the outreach programme will be used to identify their understanding of and aspiration to attend university and to gain employment within the hospitality industry. This study will provide evidence on students' perceptions of university and the hospitality industry. It will further consider the influential role of school outreach programmes in making a civic contribution by promoting the employability skills gap within hospitality industry. This study will be used to highlight key learnings, for educators, to embed outreach programmes into university and to address the skills gap, which has the potential to negatively impact upon the NI economy.

From gluten-free to veganism: questioning the evolution of social representations of food and specific diets in French consumers

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Keywords: gluten, veganism, specific diet, representation

Although studies describe the importance of commensality and social practices around food for French consumers, the voluntary prohibition of certain food or ingredients (gluten, meat, lactose...) is increasing in France. Does that mean that the "commensal" pattern in France is decreasing? This question has been investigated in two phases. The first one consisted in 20 semi-structured interviews conducted with consumers who choose to reduce or exclude their consumption of gluten, without any medical requirement. The lexical analysis of these interviews has shown that there are 3 main motivations to exclude gluten: 1- as a general treatment for the body, 2- to have better performance (mainly in sport) and 3- to exchange, either with persons making the same choices and with persons who don't. These results invite us to take into account the diversity of profiles and motivation behind this practice of eating gluten-free, but also challenge the vision of eating differently as a process of "individualization" of food

practices. A second phase, started in October 2018 and finishing in March 2019, consists in an ethnographic approach (interviews and observation) of food practices of French consumers who choose to exclude something (gluten, meat, lactose) from their diets. It especially focuses on the social dimensions behind the practices. The first results are showing the great importance of the notion of *beliefs* that are underling these choices and of the social exchanges, they are building.

Hospitable or hostile? The impact of engagement with daily deal promotions upon food and beverage staff in small and medium hotels
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Keywords: daily deal promotions, food and beverage service, working environment

Daily deal (DD) websites have been embraced by the hospitality industry as a marketing and distribution channel. To date most of research concentrates on impacts of those promotions upon businesses and customers, with very little research focusing upon the employees and their role in the delivery of a successful DD promotion. Moreover, majority of hospitality-related literature to date is based upon stand-alone restaurants, thus, providing a limited insight into the effects of the practice upon employees within wider setting of the hospitality industry. This paper focuses upon the experiences of food and beverage (F&B) staff within hotel restaurants during daily deal promotions. It shows, contradicting research to date, that within a hotel setting F&B staff are least affected group of employees. Within this context, the pressures associated with the promotions, such as need to upsell, deal with negative social impressions and increased administration duties, are dealt with by the front office staff, leaving the F&B staff to be able to conduct their duties without major disruptions. This group of staff did not experience drastic increases in workloads, operational challenges or physical and emotional pressures as experienced by other staff, but was required to be more flexible in terms of hours worked, which often impacted upon work-life balance. This paper derives from a larger, qualitative study, which adopted constructionist ontology, interpretivist epistemology and hermeneutic methodology, conducted between April 2015 and September 2016. The results are based upon semi-structured interviews with three stakeholder groups taking part in the provision and receipt of hospitality DD promotions: 8 managers, 15 employees and 11 customers. All interviews were transcribed and analysed thematically.

Perception towards plant-based diets of young adults in four European countries

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Plant-based diets, that are rich in minimally processed plant-based products and limited in consumption of animal-based foods, are beneficial for both human health and the environment. To promote plant-based consumption, the term plant-based diets might be a more appealing term for consumers compared to vegetarian and vegan diets. However, the perception towards plant-based diets among consumers in different European countries has only been investigated by a limited number of studies. Therefore, the present study explored the awareness, knowledge and attitudes towards a plant-based diet of consumers in Belgium, Denmark, the Netherlands and Spain. In addition, it was investigated whether consumers consider plant-based diets equivalent and or more appealing compared to vegetarian and vegan diets. An online survey was conducted among young adults (age 18-30 years) (n = 438) in October 2018. Differences between countries were analysed by Pearson's Chi-square, Fisher's exact and Kruskal-Wallis test (alpha = 0.05). Awareness of the term plant-based diets differed significantly among the countries. Overall, respondents had a low level of knowledge of the composition of plant-based diets and had a rather neutral to slightly positive attitude. A substantial significant difference was found among the four countries in perceiving a plant-based diet equivalent and more appealing compared to a vegan diet. These results suggest that the term plant-based diet is promising for future European health promotion campaigns, provided that the lack in awareness and knowledge about plant-based diets among many consumers will be taken into account.

“Hooked on Fish? Reported Seafood Consumption among United States Adults, 2013-2014

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Keywords: fish, shellfish, seafood consumption

Seafood is a dietary staple among many cultural groups and is considered both nationally and globally to be an important part of a healthy diet. Studies show average per capita seafood intake in the United States fall below the *Dietary Guidelines* recommendations of eight or more ounces weekly. Using 2013-2014 National Health and Nutrition Examination Survey data, this paper examines the proportion of US adults who report eating fish, shellfish, or seafood and their frequency of consumption by socio-demographic and health-related characteristics. The sample (n = 3596) consists of non-pregnant adults, 20 years of age and older who reported consuming fish or shellfish during the last 30 days. Data analyses entail logistic and linear regression. Results show nearly 80% respondents indicate consuming seafood. Respondent's odds of reporting having eaten seafood increase with age and education, and for those who identify as non-

Hispanic Black, non-Hispanic Asian, and Hispanics/Latino(s). Respondents above the family monthly poverty level index are more than 1.3 times likely to report eating shellfish and seafood than those below the family monthly poverty level index. Health related variables (body mass index, sleep issues, depression, and smoking) do not affect the odds of consumption. To mitigate low consumption, recommendations include targeted efforts to educate individuals about seafood; increase exposure to it; and make seafood more readily available while considering environmental and economic sustainability.

Making sense of hospitality experiences: Enhancing the social inclusion of blind and partially sighted customers in hospitality servicescapes

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Keywords: Servicescape, communication skills, vision impairment, social interaction

Tourism has been recognised as a tool for tackling social exclusion that determines those who seek to serve and work within the sector to have an understanding and skills to provide inclusive experiences. As part of a wider study on the tourism experiences of vision-impaired people, in-depth interviews with five families over an 18-month period highlighted the challenges of hospitality servicescapes whilst on holiday. It sought to understand the impact tourism experiences can have on emotional and physical well-being, self-esteem, self-confidence, and identity. The findings of this study reveal that social interactions with the environment for vision-impaired people often require other bodies to be there and hence the importance of hospitality staff, who play a key role in creating the essence and inclusivity of that servicescape. Naturally, for sighted people, a smile, eye contact or a gesture such as waving are signals of initial contact and attention but this visual smile is often absent for vision-impaired people. In instances when a vision impaired person wishes to communicate a message, the lack of eye contact and difficulty in seeing people's faces or expressions, attracting attention or knowing the identity of personnel or other people around them, can become moments of frustration and dissatisfaction. Staff are presented with an added dimension to their role in that they require specific interpersonal skills to communicate appropriately - such as using the person's name and touching them gently on the arm. In addition, if the staff member is acting as a guide they will need to be able to describe the surroundings and be able to use the correct sighted guide technique. This study suggests that with the right skills hospitality staff can enhance the service encounter with vision-impaired customers, enabling them to easily access and enjoy the hospitality experience.

Analysis of the food procurement in a Federal University Restaurant in southern Brazil and the possibilities of family farmers to supply the demand

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Keywords: Family farming; Local purchasing; Food and Nutrition units; Food Acquisition Programme

In 2016, it became mandatory in Brazil that at least 30% of institutional purchases must be used for the direct purchase of food products from family farmers. This work analysed the demand for vegetables in a restaurant of a Federal University in Southern Brazil that serves approximately 9,000 meals a day to estimate what could be bought from local family farmers suppliers. Data on type and amount of vegetables were collected from the purchase bids which are valid for the academic year of 2019. Additionally, specificities for each product were considered. It was verified a great purchasing potential for the products studied: more than 55 tons/month considering the ten working months at the University, representing an investment of 900 thousand dollars. Due to the high volume of meals produced and the restaurant structure, all the requested vegetables required some degree of pre-processing, such as washing, peeling and cutting. From the total vegetables (557 tons), 91.2% were fresh vegetables (e.g. washed lettuce and chopped tomatoes), 6.5% were canned (e.g. sweetcorn), and 2.3% dehydrated or concentrated (e.g. oregano and tomato puree). There is a huge growth potential for family farmers. However, meeting the referred demand would require producers to have an effective plan to supply the high volume of production and pre-processing the vegetables, possibly working in collectives, and with technical and financial support from the government. Understanding the interaction between supply and demand in food supply chains is essential to create fairer and more cooperative relationships.

Acknowledgments: This work was supported by an Institutional Links grant, ID 332207684 under the Newton-Brazil Fund partnership. The grant is funded by the UK Department of Business, Energy and Industrial Strategy (BEIS) and the Foundation for Research and Innovation Support of Santa Catarina (FAPESC) and delivered by the British Council.

Vegetable consumption and positive predictors among young adults: a review

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Keywords: Early adulthood. Healthy eating. Food intake. Food behaviour. Populational studies

Rate of weight gain seems to be greater during young adulthood (18-35y) and is associated with unhealthy eating, including low intake of vegetables. However, no studies were found compiling data on vegetable intake among this age group isolated from fruits. This distinction is important since they have differences on nutrient composition and acceptability. Thus, this study aimed at summarising evidence on vegetable consumption and associated factors among young adults. Narrative review with systematic searching on the electronic databases: Cochrane Library, Scopus, Web of Science and PubMed. Selected papers were limited to those published from 2008, to get a more current data, and included all observational studies investigating vegetable consumption in young adults as a variable. As secondary outcomes, any factors associated with increased consumption of vegetables were analysed. The 13 selected papers included data from all continents, totalising a sample of 52,649 young adults. Means on vegetable intake ranged from 96 to 248g/day, and the number of servings from 0.99 to 2.5/day. Frequency of vegetable intake varied from 0.7 to 1.47/day. Main predictors of higher vegetable intake were eating with others; low frequency of fast-food eating; well-developed cooking skills, among others. Although vegetable intake of young adults varied widely among different country, the amount and frequency are still low compared to international recommendations. Vegetable intake of young adults is low worldwide, but some positive predictors could be encouraged by implementing culinary interventions with young adults and stimulating them to eat more at home and accompanied.

Acknowledgement: This work was supported by an Institutional Links grant, ID 332207684 under the Newton-Brazil Fund partnership. The grant is funded by the UK Department of Business, Energy and Industrial Strategy (BEIS) and the Foundation for Research and Innovation Support of Santa Catarina (FAPESC) and delivered by the British Council.

Acquiring taste: Wine professionals on “good” combinations of food and beverages

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Keywords: Bourdieu, gastronomy, pairing, restaurant, sommelier

In this paper we argue that, wine professionals’ cultural and social capital is making a distinction of how to understand a “good” combination. The aim of this study was to provide increased understanding of what “good” combinations mean to wine professionals in Sweden. Existing research on food and beverage pairing has in the main concentrated on sensory evaluation, but there is little research on narratives from experienced wine professionals. This study was conducted on qualitative focus group interviews with wine professionals (n=21) with different work experiences in Sweden. A thematic analysis was performed by using a hybrid approach of inductive and deductive coding and thematic development, by means of Bourdieu’s concept of taste and capitals. The result points to that wine professionals’ distinction is performed through social and cultural capital, not only does it give the understanding of what a good combination is, but also that you actually will learn to like it objectively and subjectively. This is a process of getting access to the culinary field, through the accumulation of gastronomic knowledge. Using Bourdieu’s theoretical framework, this paper contributes to the debate on how to understand socio-cultural taste and taste combinations. Having gastronomic knowledge through cultural and social capital maintains and claims social positions on how to understand “good” combinations. These findings have practical relevance in the training of wine professionals and sommeliers and for explaining the constant development of their social and cultural capital while performing their profession.

Developing residents innovative thinking with a “Breakfast Toolbox”

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Keywords: Institutional meals, nursing homes, innovative thinking, breakfast club

The growing aging population increase pressure on public welfare benefits. This challenge accommodates new welfare solutions; this includes involvement (co-creation) in meals as part of rehabilitation strategies. A three-year research project, named “The Breakfast Club” investigate residents’ involvement as hosts and guests in a breakfast club in a Danish nursing home. Based on a prop thinking, a central element of The Breakfast Club is a “Toolbox” that is to be developed. The Toolbox contains artefacts that aim to recall unique and personal memories and innovative thinking when organizing a breakfast club. Academic literature on breakfast as food cultural activity was thematically analysed. Based on a second literature study and following content-analysis; knowledge on kitchen -design, -equipment, -activities, -items, -rituals and food from each last ten decades was revealed. Artefacts from each decade were selected by considering; gender roles, age and social classes. Second hand shops and fourteen flea market were visited

and twenty-two artefacts acquired. This includes, for example, newspapers from the 1930's. Furthermore, a Toolbox idea-catalogue with hints and facts of each artefact was drafted to support health care professional's innovative thinking. The toolbox is a core element of The Breakfast Club; however, new strategies on how to develop the Toolbox continually is essential. A toolbox was developed with artefacts representing kitchen items from the last ten decades; this includes a toolbox idea-catalogue with hints, stories and facts.

Domestic cooking and Food Skills: an island of Ireland perspective

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Keywords: *cooking skills, food skills, motivation, confidence, learning*

The skills required to prepare food can impact on the choices made by consumers and the healthiness of their diet. Consumers' increasing reliance on convenience or pre-prepared food and the increase in eating outside of the home environment has led to the demise of cooking skills. This study provides an overview of cooking and food skills and their impact on consumers' diets of those living the island of Ireland. A three stage mixed methods study was implemented. Stage one included a nationally representative survey (n=1049) to measure cooking and food skills. Stage two explored the barriers and facilitators to cooking using focus groups (n=16). Stage three involved an experimental study (n=141) to explore how consumers learn cooking skills using technology. Survey results revealed that men, younger adults and those with few or no qualifications were reported to have low cooking and food skills usage and confidence. Greater perceived cooking skills and food skills were not conclusively associated with healthier dietary choices. Focus Group results revealed nine barriers and five facilitators to cooking from scratch. Cooking from scratch cooks highlighted the facilitators to outweighed the barriers. Stage three results found that video technology promoted cooking skills in a number of ways, namely: visualisation, reassurance, replication, flexibility and selectivity of the cooking process. Overall, results suggest that enjoyment and confidence are key components of learning new cooking and food skills and the intention to put the learned skills into practice in the future.

Acknowledgements: This project was funded by safeFood Ireland. The full report is available at:

<https://www.safefood.eu/SafeFood/media/SafeFoodLibrary/Documents/Publications/Market%20Research/Cooking-skills.pdf>

Identifying Potential Barriers to Food and Drink Manufacturing and Processing Businesses in Wales Obtaining Food-safety Scheme Accreditation

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Keywords: barriers, food safety, accreditation schemes, food and drink industry, manufacturing and processing;

The Welsh Government has identified that to enable growth of the food and drink industry in Wales there is a need to support manufacturing and processing businesses to obtain and maintain food-safety scheme accreditation. However, given current accreditation status in Wales, previous research has identified the need to identify the potential barriers that exists for businesses in obtaining accreditation. Focus-groups with food and drink manufacturing and processing businesses ($n=37$) and stakeholders, ($n=28$) and in-depth interviews with retail representative ($n=3$) were used to explore potential barriers to obtaining food-safety accreditation. Results identified that time needed by businesses to identify suitable accreditation-schemes, cost of scheme implementation, capital expenditure and resources to meet requirements for multiple accreditation-schemes through duplication of obligations were perceived as barriers. A shortage of technical graduates was a major discussion point, difficulties in meeting workforce training needs and the impact of senior management attitudes upon culture and commitment to schemes were identified as potential barriers. Miscommunication regarding the need of accreditation-schemes by buyers was discussed along with accessing information to select suitable schemes, the number of schemes available exasperated this, consequently discussions indicated the desire for scheme consolidation/harmonisation. Barriers identified related to three key areas: ‘time, cost and resource’; ‘knowledge and skills’ and ‘communication and information’. The research identified barriers that exists for businesses in Wales to obtain food-safety accreditation. Findings from this study can be utilised to inform the development of support mechanisms to increase accreditation-scheme uptake and accelerate food sector growth in line with Welsh Government aspirations.

Exploring the effectiveness of referring community living older adults for nutrition screening via My Aged Care

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Up to 50% of community living older adults are at risk of malnutrition. This study aimed to explore the effectiveness of using My Aged Care to refer older adults for nutrition screening and intervention via a Meals on Wheels (MOW) service. Data analysis of My Aged Care referral records and nutritional screening records from Kiama MOW between July 2016 and March 2018 was undertaken. Mini Nutrition Assessment-Short Form and Body Mass Index were determined for each person referred. Interventions and possible reasons contributing to reduced nutritional health were reviewed. Statistical analyses

included descriptive statistics, Paired t tests and Wilcoxon signed rank tests. Forty-two (25 F, 17 M) people were referred, mean age was 79.8 (+/- 8.9). Twenty-one people were nutritionally at risk based on MNA®-SF and 9 nutritionally at risk based on BMI. After reassessment, nutritional status ($p < 0.005$) had significantly improved. Main circumstances potentially compromising nutritional status included medical problems (38%), poor appetite, motivation to cook (26%), poor mobility (23%), recent falls (21%), lack of transport (21%). recent hospital visit (19%). Main interventions were education (100%), home delivered meals (78%) and social meal outings (17%). While My Aged Care assists in referrals for nutritional screening under referral is an issue, in part possibly due to a lack of understanding that people who are overweight or obese can be malnourished. Education, home delivered meals and increased social interaction improved nutrition. Areas for further development include increased nutritional training for assessors and incorporating the MNA®-SF into all of the My Aged Care assessments.

Exploring the impacts of three food and beverage packaging delivery methods on dietary intakes of hospitalised older adults

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Older adults (≥ 65 years of age) are at an increased risk of malnutrition. Previous research has shown that food and beverage packaging impedes dietary intakes in hospitalised older adults and the use of food and beverage packaging in hospitals has increased. This study aimed to investigate the effects of packaging on dietary intakes in a hospital setting through a comparison of sealed, opened, and decanted food service conditions. A mixed-methods approach was used in this pilot study to determine factors affecting dietary intakes of patients ($n=59$) in an orthopaedic ward of The Canberra Hospital. Measurements of hand function, nutritional status and dietary intakes (using plate waste) were conducted. Energy and protein intakes were estimated using FoodWorks dietary analysis software. Mealtime observations and interviews explored patient experiences and the mealtime environment. Preliminary findings indicated reduced hand function compared to normative data for age and gender. There was a trend to higher dietary intakes with the decanted condition compared to the open condition. This pilot study outlined multiple factors contributing to inadequate dietary intakes and malnutrition in hospitalised older adults. Qualitative findings suggest poor appetite, lack of mealtime assistance; menus and packaging negatively influence dietary intakes. There are many impacts on dietary intakes by older hospitalised patients, including hospital food and beverage packaging. Further investigation is planned, with a larger sample size that will incorporate a cost analysis and further intake comparisons between decanted, sealed and opened meal services.

Professional Practices in Restaurants

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Keywords: professionalism, higher education, practice theory, craftsmanship, perservance

The restaurant and hospitality industries require updated forms of professionalism to attract customers and grow in sustainable ways. This has been known for decades in the hospitality sector, as well as by its researchers, who include higher education for increase of hospitality proficiency. Hospitality workers have shared their views on professionalism in the industry in surveys and interviews, but it remains necessary to clarify understandings of the area as it appears in daily enactments and expressions among the practitioners. To deepen the understanding of how daily work shapes professionalism in hospitality organizations, practice theory was used as analytic framework in this study. Micro practices of daily activities, the sayings and doings in kitchens and dining rooms, were identified in 13 small restaurants: 8 in a tourist destination and 5 in cities, by means of interviews and observations, transcribed and sorted with an insider's interpretation. The findings were analyzed with practice theoretical concepts of knowledge and learning, communication, corporeality, and time use. The results showed that among the restaurant practitioners, professionalism is conceived to be a combination of craftsmanship, a customer orientation involving observant management, and loyal perseverance. Extensive work experience was distinguished as a presumption for accumulation of skills and service competence, rather than having higher education. These expressions of professionalism are important to understand and discuss concerning how hospitality and culinary arts education can develop to increase social and economic sustainability in the hospitality sector.

POSTER ABSTRACTS & POSTERS*

**Please note: only Posters submitted by the 26th May 2019 are included*

Cabin Crew HACCP Training: A Qualitative Study

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Cabin crew were involved in many incidences of food poisoning on-board due to malpractices of food handling. For Hazard analysis and critical control points (HACCP) to be implemented efficiently in in-flight catering, food-hygiene/safety training is required for all food-handlers. Cabin crew need be trained regarding HACCP principles to enable application/implementation of controls to minimise potential food-associated risks in ‘on-board’ food production/consumption. To-date, limited research has been undertaken in this field. This study aimed to explore the extent of HACCP training for cabin crew. Using a purposive sampling, semi-structured interviews (n=26) were conducted with cabin crew managers/supervisors from 20 airlines worldwide. Data was analysed using qualitative content analysis. Overall, inclusion of HACCP training in cabin crew food safety training was inadequate. The majority (60%) of airlines reportedly did not include HACCP training for cabin crew at any level, with some study respondents unaware of HACCP acronym meaning. A quarter (25%) of airlines included HACCP concepts such as control points and documentation which were reportedly included in training, however, procedural implementation was reportedly not included ‘I can say that it may be implicitly applied, but not in explicitly applied’. Only 15% of airlines reportedly included explicit HACCP training for cabin crew and further research is required to establish content. Cabin crew have a range of food-service related duties on-board and this is variable depending on airline, duration of flight and operating systems. However, food safety HACCP training for cabin crew appears to be lacking and reportedly not applied by many airlines. Absence of HACCP training with cabin crew may result in failure to control on-board food safety hazards required to reduce the risk of foodborne disease.

What characteristics would a Welsh ‘growth food and drink business’ demonstrate?

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Keywords: growth businesses; food and drink industry; manufacturing and processing; support; innovation

The Welsh Government aspires for the Welsh food and drink manufacturing and processing industry to grow by 30% to £7 billion by 2020. To enable this the Welsh Government via Food Innovation Wales (FIW) provides support facilitating business growth and development. However, to ensure appropriate investment and support is provided to businesses having the desire, ability and potential to grow, a tool is required to identify ‘growth businesses’. An online questionnaire to determine growth aspiration and business potential was distributed to the FIW database of Welsh manufacturing/processing businesses ($n=768$). The questionnaire was completed by 130 businesses (17% response rate). 45% demonstrated increased profit in the previous three years and 34% reported stable profits. 40% aspired to increase net-profit by 10-19% over three years, 16% to growth of 30-39% and 14% to 100% expansion. Businesses identified as ‘growth businesses’ were more likely to have a documented financial plan and a company vision plan, such companies were more likely of have a positive attitude towards innovation. Based on sales turnover, 25% of participating companies were identified as ‘growth companies’, or 35% when you based growth on net profit increases, and 12% of companies showed growth in both sales turnover and net profit. Although many perceived themselves to be growth businesses, the tool developed by this study has enabled identification of those with actual growth potential via identification of the key characteristics of ‘growth businesses’. This valuable tool will enable Welsh Government and FIW to identify companies with growth potential to enable delivery of support.

What characteristics would a Welsh food and drink 'growth business' demonstrate?

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Introduction

The Welsh Government aspires for the Welsh food and drink manufacturing and processing industry to grow by 30% to £7 billion by 2020¹, to enable this the Welsh Government via Food Innovation Wales (FIW) provides support to manufacturing and processing businesses to facilitate business growth and development.

There are a number of definitions of 'growth' in a business context. A business that simply increases profits or turnover could be considered a growth business; alternately, a business could grow in capacity, number of products or in workforce.

The Organisation for Economic Co-operation and Development (OECD) defines a "High-growth businesses" as a firm with an average employment growth rate exceeding 20% per annum over a 3-year period and with 10 or more employees at the start of the period" (Audretsch, 2012).

To ensure appropriate investment and support is provided to businesses that have the desire, ability and potential to grow, a tool is required to identify 'growth businesses'. Therefore, this study identifies the characteristics of food and drink manufacturing business 'growth businesses' in the Welsh food industry.

Purpose

The aim of this study was to identify growth parameters suitable for the food and drink industry demographic and create a tool that measures growth using these parameters to enable the Welsh Government and Wales' technical and business support networks to determine where potential growth is in Wales.

Methods

Data Collection: An online questionnaire to determine growth aspiration and business potential was distributed to the FIW database of Welsh manufacturing/processing businesses ($n=768$). The questionnaire was completed by 130 businesses (17% response rate).

For the purpose of this project, a number of factors have been taken into consideration to determine what a 'growth company' should look like in the food and drink industry in Wales. Therefore, the we ask, "what characteristics would a 'growth businesses demonstrate?"

Ethical Approval: Ethical approval for the study was obtained from the Cardiff School of Health Sciences Ethics Committee (9808).

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Results

The food and drink manufacturing industry in Wales is made up of mainly microbusinesses and SMEs, this is reflective of the UK as a whole. More than half (59%) of respondent companies had up to nine employees defining them as microbusinesses¹, 17% were small (10-49 employees), 21% medium sized (50-249 employees) and 3% large businesses with more than 250 employees.

Of the businesses completing the survey, the largest sectors were dairy (17%), bakery (16%) and alcoholic drinks (12%) accounting for 45% of the food and drink respondents answers (note that respondents could chose 1-3 sectors each).

Sales turnover

The majority of respondent companies were microbusinesses by sales turnover as well as number of employees (see table 1). A quarter (25%) of participating companies were identified as 'growth companies', or 35% when growth is based on net profit increases, and 12% of companies showed growth in both sales turnover and net profit. Table 1 shows sales turnover by company size. Size can often be an indication of potential growth and by looking at the changes in business size year-on-year, we can see if businesses are growing.

Table 1: Size of business by sales turnover ($n=123$)

Business size	Current year*	1 year ago	2 years ago
Micro	58%	59%	62%
Small	18%	18%	17%
Medium	12%	10%	8%
Large	2%	1%	1%

Figure 1 shows sales turnover, this data is used in table 1 to determine business size. Large numbers of microbusiness and small businesses could be used as evidence to demonstrate potential growth in the sector, however, businesses tend to have a low turnover, showing vulnerabilities in the sector. Small changes like losing a major contract and raw ingredient price increases could be detrimental.



Figure 1: Indication of sales turnover for the previous two financial years (1st April to 31st March) and an estimation of turnover for the current year ($n=117$) *estimated

The availability of business documents such as visions, strategies, business sales, marketing, innovation and financial plans was investigated and businesses were asked to state whether they held any of these documents.

A Chi-square test for independence is used to identify any associations between self-reported availability of specific business documents and sales turnover, where sales turnover is used as an indicator of business success. Availability (self reported) of a financial plan is significantly associated with sales turnover ($p<0.05$); however, company vision, business strategy, sales, marketing and innovation plans, are not significantly associated ($p>0.05$).

The higher the sales turnover (and size of the business) the more likely they are to have business critical documents. All of the respondents with turnover <£50m were reported to have a company vision, a strategy and a business plan.

Net profit and net profit growth

Almost half (47%) of businesses surveyed reported increased profit (a move to the next percentage group shown in figure 2) in the last three years. More than a third (34%) achieved stable profits during this period. No profit was achieved by 9% of businesses and 6% made a loss (4% 'rather not say').



Figure 2: Percentage net profit for the past two financial years (1st April to 31st March) and an estimation of net profit for the current year ($n=117$) *estimated

Figure 3 shows the plans for net profit growth in the next three years. Table 2 shows how growth was then categorised to determine how that growth can be interpreted for the purpose of this project.

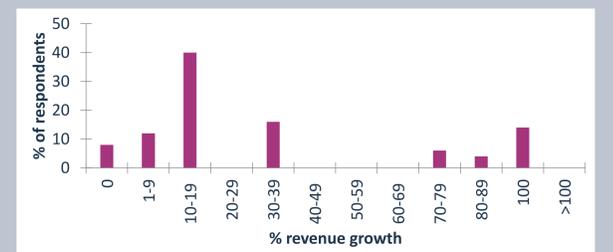


Figure 3: Plans for net profit growth: Percentage growth ($n=116$)

Table 2 shows the categories that were created to quantify business growth, based on the stated revenue growth anticipated for businesses in the next three years. Assuming an average inflation rate of 3% over the next 3 years, which would equate to a 9%, growth. Business revenue would need to increase by more than 9% to show 'compound growth' or to be considered as a high growth business. Therefore the following parameters for growth are proposed:

Table 2. Breakdown of categories used to group businesses by net profit growth (over a 3-year period)

Percentage growth	Definition
0 – 9% growth	Real terms negative growth
10 – 29% growth	Growth
30 – 100% growth	Faster growth/High growth

Summary

Overall, almost half (45%) of businesses demonstrated increased profit in the previous three years (2014-17) and 34% reported stable profits. Two fifths (40%) aspired to increase net-profit by 10-19% over three years, 16% of businesses aspire to grow by 30-39% in the time period. Some (14%) aspired to expand their business by 100%. Businesses identified as 'growth businesses' (achieved sales growth or net profit growth in the three year time period) were determined to be more likely of having a documented financial plan and a company vision plan, such companies were more likely of have a positive attitude towards innovation. Based on sales turnover, 25% of participating companies were identified as 'growth companies', or 35% when growth is based on net profit increases, and 12% of companies showed growth in both sales turnover and net profit.

Significance of study

- Although many businesses perceived themselves to be growth businesses, the tool has enabled identification of those with growth potential. Furthermore, the tool has identified key characteristics of 'growth businesses'.
- Completion of this study has developed a valuable tool to enable Welsh Government and FIW to identify companies with growth potential to enable delivery of support.
- The food and drink industry in Wales is composed of microbusinesses, which are generally quite young, have few employees and whose profit line is minimal. By identifying where the growth potential is in Wales, support, funding and policy can be directed effectively leading to a stronger economy.

Making Vegetables “cool”: Improving the Eating Habits of Wales’ Younger Generation

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Keywords: adolescents, vegetables, food, Wales, eating

The vegetable consumption of Wales’ younger generation is poor and unhealthy eating habits such as skipping meals and snacking are very common. Adolescents seek food products that are convenient to eat yet are also “cool” and allow them to fit in with their peer group. Unfortunately, HFSS (High in Fat, Salt or Sugar) foods often meet adolescents’ requirements in this respect. The aim of this research is to develop a detailed insight into young adolescents’ (aged 11 to 13 years old) behaviour concerning vegetables through experimental research. A review of relevant literature and contextual research is ongoing. The research project is taking a triangulated, mixed research methods approach. This includes data mining from school canteen purchases, Catering Manager interviews, school-based observations, family ethnographic observations and also up to nine focus groups with adolescents, parents and also catering staff. School Catering Managers proved to be extremely passionate during the interview process, providing a wealth of insight into adolescents’ eating behaviours. School-based observations have shown that adolescents are in a rush and choose items that are convenient and quick to consume. The insights derived will be used to work in collaboration with Puffin Produce to design and develop innovative branding and merchandising practices. The ultimate aim of the PhD project is to develop a new and innovative mass-manufactured vegetable-based product that will be targeted towards the younger generation in Wales, or perhaps ‘cross the border’ into the English market.

A Qualitative Study Exploring Catering Staff's Perceptions of School Meal Provision and 11-13 year olds Eating Behaviours

INTRODUCTION

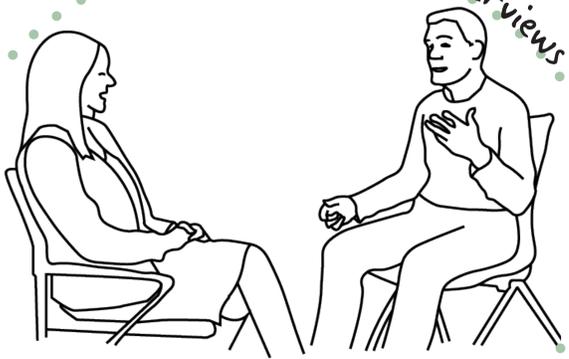
Wales' younger generation currently does not meet the Governmental recommendations of fruit and vegetable consumption, with only 52% of children consuming vegetables on a daily basis (Welsh Government, 2016). During adolescence, individuals experience increased autonomy and freedom of choice (Neumark-Sztainer, et al., 2010). Upon starting secondary school, many find the vast options available in the canteen novel and attractive (Brannen and Storey, 1998). However, individuals are vulnerable to making choices based on those in "cool" social groups that they aspire to belong to (O'Donnell and Wardlow, 2000). Consequently, individuals may conform to pervasive social norms concerning their food choice and intake (Higgs, 2015).

RESEARCH QUESTIONS

1. What foods does the school provide for pupils and what options are more popular?
2. What do catering staff perceive to be Welsh adolescents' attitudes and behaviours concerning vegetables and healthy eating?
3. What do catering staff believe are the main factors that influence what Welsh adolescents' choose to purchase and consume in the school canteen?

METHODOLOGY

Catering Manager Interviews



Informal Interview about the Catering Manager's experiences.

School Canteen Observations



Observed pupils at break time and lunch time. No interaction with pupils.

Catering Staff Focus Groups



20-30 minute Focus Groups. 3-8 participants per group.

THEMATIC ANALYSIS OF FINDINGS

Extrapolational Factors that drive Food Choice
Peers, Parents, Education, Social Media

"It's up the parent"

"They like to be seen to be eating the same as everyone else"

"I just think it's down to discipline and education"

"They didn't want the dinner no more because they had to sit there with a plate"

"They don't like their veggies"

"They have options as well, the cheapest they are going to go for..."

Intrapersonal Factors that drive Food Choice
Appearance, Convenience, Taste Preferences, Price Consciousness, Neophobia, Health Consciousness

RESEARCH IMPACT

- Design and develop a vegetable-based food product, packaging and marketing in collaboration with Puffin Produce.
- Novel findings and an understanding of how to improve the eating habits of Welsh adolescents.
- The potential to improve the health of Wales' younger generation and future generations, in line with the Future Generations Act.

Perceived Quality of School Foods
Fresh and Homemade, Choice, Popular Options, Stealth Vegetables



"Everything is fresh"

"I think they are spoilt at this school!"

"It's all freshly done and made from scratch"

"Cauliflower is good in gravy, if you blend up cauliflower in gravy, it's lovely"

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Food Talks: Using Augmented Reality to show environmental and nutritional information

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This poster investigates how augmented reality (AR) can be used to create meaningful and credible relationships between a food product and its environmental and nutritional data. Though food labels provide the dominant dialogue between product and consumer, the information is often misunderstood due to lack of relevance, poor design and over-saturation. Although attention has been paid to improving nutritional information on packaging in recent years, environmental information is seldom depicted, and when it is, tends to be both confusing and over-simplified. In addition, there is growing interest in being able to make healthier and more sustainable choices. We developed an original user-centred design research project that investigated visual, interaction and adoption principles for AR in the context of food labeling. We worked with social scientists from the Swiss National Research Programme on dietary customs and data scientists from the World Food Life Cycle Analysis Database to develop our proposal. During the first phase, we used learnings from observations and interviews with supermarket customers to develop several propositions for visual style and interaction. Tests on these propositions led us to create a prototype for an augmented reality kiosk which we evaluated in the real supermarket environment. We showed that customers do indeed read and remember environmental information about food presented with AR. In the second phase, which is now in user testing, we integrated personalisation and nutritional information into a mobile AR application. We aim to show that AR can be an impactful new media for the food industry.

Food Talks

Investigating the potential of augmented reality to link food products with their environmental and nutritional data through design research

Introduction

There is growing interest in being able to make healthier and more sustainable choices, yet existing food labels are falling short. Environmental information is seldom depicted and packaging is already overcrowded.

Research question

Is using augmented reality better (regarding learning, aesthetics & usability) than a static digital page to show environmental and nutritional information about food products?

Process

Two years of user research, prototyping and testing resulted in specific AR design principles and a mobile application that shows nutritional, environmental, provenance, and personalised information about a food product when it is scanned.

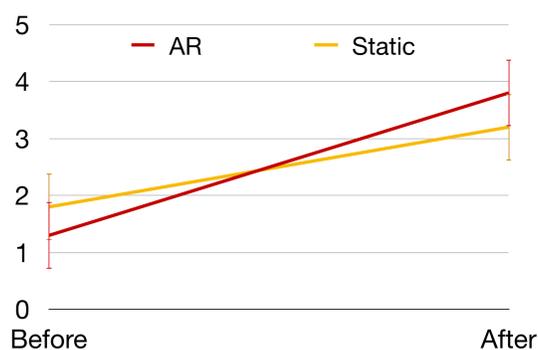
Study

- We ran a between-subjects study with 62 participants
- 1 app showed information in augmented reality (AR)
- 1 app showed the same information on static pages
- Participants answered questions about 5 food products before and after using one of the apps
- They also answered questions on usability and aesthetics

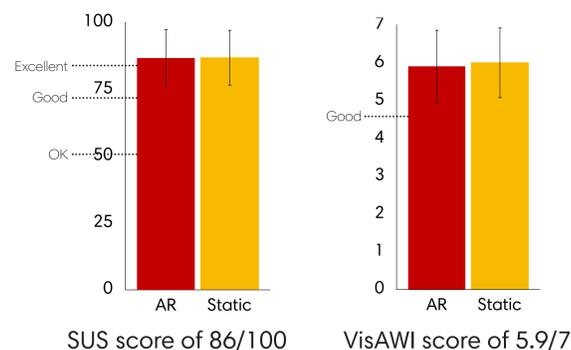


Results

1. Participants **learned more** about food products using **augmented reality**



2. **High usability & aesthetics** were preserved in AR despite technical complexity



3. Our **qualitative feedback** showed that participants valued



- But that more work needs to be done on
- The reliability of AR scanning
 - Design of environmental information

Resulting AR Design Principles

- Use icons and pictograms for quick recognition of information
- Use traffic light systems for quick understanding
- Use a visual style inspired by collages to integrate digital content with the real-world
- Define interface colours from food packaging
- Put information in modules for equal hierarchy
- Allow users to set criteria for their personal label
- Include environmental data for empowerment

Contributions

- We showed that AR can be a credible media for communicating information outside of the fields of gaming and marketing
- We showed that AR can change people's perception of food products
- Based on high scores for usability and aesthetics, we were able to develop visual and interaction design principles for digital food labels and AR

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The influence of Instagram usage on consumers' choice of restaurants and meal preparation at home

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Keywords: Instagram, consumer behavior, restaurant choice, meal preparation, observational study

To investigate whether usage of Instagram influences consumers' restaurant choice and home preparation of meals. Data was collected through an online survey distributed via Facebook by means of convenience sampling. The questionnaire included 15 questions divided into three parts; socio-demographic characteristics, food habits, and Instagram use in relation to food consumption habits. Based on their answers, respondents were segmented into one of four clusters that defined behavioral change in relation to restaurant choice and meal replication at home. The odds ratio and confidence intervals were calculated to determine which independent variables could be used to describe the different clusters. 247 respondents from 27 countries completed the survey (35% response rate) of which 67% were women. Results were based on Instagram usage for food-related content. Data analysis showed that women are more likely (OR = 2.9) to replicate meals and visit restaurants, based on pictures seen on Instagram, compared to men. Further, every additional hour spent on Instagram will result in an increased chance of replicating meals (OR = 1.21) and visiting restaurants (OR = 1.31). This study supports the theory that social media can affect consumers' behavior in relation to food choice.

Thought for Food: A research-led approach to improved Welsh food industry competitiveness

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This PhD focuses on applied retail research for application in Welsh Food Industry SMEs. It will consist of an in-depth exploration of branding, colourway, packaging and consumer psychology in food purchase decision making. The broad aim of this research is to develop deep insights into how consumers make food purchasing decisions through the use of low-cost user testing environments to aid in the design of food packaging.

High end companies such as Coca Cola, Unilever and Nestle already use expensive tools and testing methods for new products, however this is financially out of reach for Small-Medium Enterprises (SMEs). As part of the research, the Perceptual Experience Lab (PEL) will be developed to improve the effectiveness of its synthetic reality space for assessing packaging design for the Welsh food industry. The Perceptual Experience Laboratory is a low-cost, state of the art synthetic reality space, that replicates the way humans perceive and experience the physical world by immersing users in directional sound, smell, airflow, temperature, and full field of view vision. For the purposes of this research, PEL will be focused on retail applications to answer the question, can packaging design be improved through the use of low-cost user-testing simulated environments?

FOOD FOR THOUGHT:

A research-led approach to improved Welsh food industry competitiveness

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PROBLEM

Big corporations use costly tools and testing methods for new products, however this is financially out of reach for Small-Medium Enterprises (SMEs).



GOAL

Help Welsh food SMEs increase sales by improving packaging designs.



Research

Develop guidelines for the Perceptual Experience Laboratory (PEL) as a low-cost synthetic reality user-testing environment for the purposes of testing packaging designs.

WHAT IS PEL?

The Perceptual Experience Lab is a synthetic reality space that replicates real environments with controlled and monitored conditions. The sense of immersion can be manipulated with surround sound, light and temperature control, air flow, smell diffusion, and the capacity for physical props.



WHY USE PEL?

- Flexibility
- Low cost
- High levels of control
- Easy to set up
- Customisable data collection
- Ensures privacy and confidentiality

ENVIRONMENTAL SETUP: SENSORY INPUT TEST

The optimum sensory input for user testing was determined. Participants enjoyed the condition where all their senses were stimulated, and judged it to be a more immersive and believable experience of a supermarket environment than conditions that stimulated less senses.



Sound of supermarket background noises



Smell of freshly baked bread



Feel and weight of holding a shopping basket



Wrap around screen, covering full field of vision

NEXT EXPERIMENT ENVIRONMENTAL SETUP: VISUAL BELIEVABILITY TEST

The next Environmental Setup experiment will compare 4 different images to establish which is the most believable



Linear Perspective Photograph of Supermarket Shelving

Photographs of shelves look most realistic, but it is difficult to attain photographing permission on a regular basis



Fovographised* Photograph of Supermarket Shelving



Linear Perspective CAD Rendering of Supermarket Shelf

Computer Aided Design (CAD) shelves are customisable and offer complete control of scene but look less realistic



Fovographised* CAD Rendering of Supermarket Shelving

* FOVOGRAPHY is a method of capturing the full field of vision, resulting in images that appear to have much more breadth and depth than conventional images

FOVOGRAPH



Factors influencing food safety and nutrition in children's co-curricular food-preparation classes.

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Keywords: Children; Food Preparation; Food Safety; Nutrition; Education

Food safety and optimum dietary nutrition are of paramount importance for children's health/wellbeing to enable growth/immune-system development and prevention of foodborne illness (FBI). National-curriculum changes have resulted in limited nutrition/food safety education of children. This study aims to analyse the nutritional content of the products prepared in co-curricular food-preparation classes and adequacy of food safety practices/interventions delivered. Qualitative in-depth telephone interviews with UK-based food-preparation class leaders/parents (n=5) were undertaken in addition to a class website evaluation. Recipe analyses (n=45) occurred using Nutrimer software and a quantitative analysis of ingredient/required-practice frequency. Findings suggest that co-curricular cooking-classes aim to advocate safe and nutritious food-preparation/consumption. Indeed, 100% of websites evaluated, stated intention to promotion/learning about food safety and healthy eating; similarly all class leaders reported the importance of teaching food safety/nutrition. However, analysis indicated 42-62% of fat, saturates and sugar in class recipes were 'high' according to Food Standards Agency traffic light coding and not nutritionally appropriate for young children (4-6years). Parents' perceived food safety was not adequately addressed, and some class facilities were not suited to accommodate safe food production. The rise of childhood obesity and FBI prevalence among children aged <5years affirms the importance for children's nutrition/food safety education. Co-curricular children's food-preparation classes may provide a valuable opportunity to convey information about safe food-handling/storage and positive nutrition. However, findings indicate a disparity between intention to do so and current practice. Tailored and age-appropriate information development, nutritional and food safety support regarding food-preparation class recipe selection and food safety practice is required to improve and optimise this co-curricular educational opportunity.

Food Safety and Hygiene Compliance in the UK Catering Small Medium Enterprises (SMEs)

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Keywords: food hygiene; contraventions; catering; SME; regulation

Internationally, catering establishments are associated with the largest proportion of foodborne illness. SMEs account for 43% of this sector and good hygiene practices and an effective food-safety-management-system (FSMS) are essential to minimise the risk of FBI. Environmental-Health-Officers (EHOs) monitor and regulate such businesses using enforcement inspections. This study evaluated enforcement inspection reports to quantify food-hygiene contraventions in catering SMEs to identify frequently occurring violations. Twenty-percent of catering SME inspection reports were sampled (n=299) from two UK local authorities using an archival retrieval approach and predetermined inclusion/exclusion criteria. Hygiene contraventions in 19 categories were analysed using content-analysis. Analysis showed that cumulatively, 160(53%) catering SMEs reports included up to seven food-hygiene contraventions including cross contamination in 72(24%) of SMEs e.g. lack/inadequate segregation of raw and cooked items, uncovered food and dirty food contact surfaces. Stock rotation contraventions were indicated in 65(22%) of reports, concerning mainly out-of-date or non-labelling of food. Poor temperature control was recorded in 47(16%) of reports indicating high-risk food above 8°C or food stored at ambient temperature. Personal hygiene contraventions were recorded in 42(14%) of SMEs mainly associated with inadequate facilities for hand-washing and protective clothing not provided/inadequate. The results identified common hygiene contraventions implemented in UK catering SMEs associated with increased risks FBI. Reasons for violations may be multifaceted and underlying issues need to be addressed/corrected to ensure consumer safety and regulatory adherence. Targeted hygiene training/interventions for catering SMEs are required to reduce the risk of FBI. Contravention frequency data can be used to inform development of such approaches to focus/maximise impact.

Spotlighting sub-culture attitudes to food-safety in the service-industry: A small-food-business perspective on training needs

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Current food-safety research emphasises positive organisational ‘culture’ to ensure safe-food outcomes. The transient nature of food-handlers in the service-sector, limited resources and time-constraints can hinder sub-culture climate understanding and potential associated effects. Identification of food-safety attitudes across roles may prove useful to focus training and increase food-safety awareness. This study aimed to explore organisational culture among employees of a typical small-food-business including attitudes/perceptions towards food-safety to determine food-handler training opportunities. Guided interviews ($n=7$) were conducted with a purposeful sample representative of all functions/roles across the business. Data analysis identified common patterns across the dataset including hierarchical training perspectives, time barriers and training consistency. Food-safety perspectives differed between sub-culture roles/responsibilities. One chef indicated that “*because there’s always stuff going on*”, monitoring food-handler behaviour during service was difficult. Junior serving/bar staff would receive food-safety training after “*6 or 7 months*” implying that previous staff turn-over had influenced current procedures. Kitchen-staff bemoaned serving-staff who left food to “*sit for 15-20 minutes*” before service believing that all employees should be trained in “*basic standards*”. Head-chef was viewed “*like a headmaster*”, a positive role-model who “*doesn’t want us getting into any bad habits*”. Experience, inconsistent training and positive role-models emerged as factors relevant to future-training. Exploring sub-culture food-safety attitudes may identify beneficial training-needs which could contribute to safer-food-practices, enhanced food-safety management and organisational culture.

Spotlighting sub-culture attitudes to food-safety in the service-industry: A small-food-business perspective on training needs

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Introduction

Despite many positive advances in food safety management systems for the small food business, such as the Food Standards Agency 'Safer Food for Better Business' pack¹, foodborne diseases remain an important cause of illness in the United Kingdom (UK). Estimated at a cost burden of £1 billion in 2008², food related illnesses are thought to affect more than 1 million people in the UK every year³.

The Food Hygiene Rating Scheme (where food establishments following inspection are issued with a risk-based rating or 'score' by local authority officers) has also had a positive impact on driving food hygiene and food safety compliance⁴. Nevertheless, during 2017/18, in excess of 150,000 food establishments across Wales, Northern Ireland and England received written warnings or formal enforcement action relating to hygiene malpractices⁵.

Risks relating to cross-contamination (such as poor handwashing or ineffective cleaning practices) are often implicated as a root cause in food incidents or food outbreaks. Indeed, a recent study analysing the association between food hygiene ratings, microbiological assessments and foodborne illnesses highlighted the importance of understanding the food safety 'human element'. The study also called for a greater understanding of how a food business' culture may influence the way in which food-handlers acquire and apply knowledge that leads to safe food behaviours⁶.

Purpose

This pilot study explored food handler perceptions and attitudes towards food safety training practices in a small food business operation. Identifying training inconsistencies and gaps could be utilised to inform future food safety training procedures, which may contribute favourably to food safety culture.

Methods

Data Collection: In order to conduct a study representative of attitudes and perceptions across the business as a whole, a purposeful sample by job function/role was identified prior to conducting interviews. As all employees worked on a rota-system, those present during the pre-appointed interview period (1 week) who matched the identified job function or role were invited to participate ($n=7$).

Data capture: A semi-structured interview guide was developed prior to qualitative interviews being undertaken (piloted with individuals ($n=2$) from the hospitality and food industry). Informed consent was obtained from each participant before conducting the interview.

Data analysis: Thematic analysis using NVivo software identified common patterns across the data set relating to training practices at the business.

Ethical Approval: Approval was obtained from the Food and Health Sciences Ethics Panel at Cardiff Metropolitan University (reference no: 9396).

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Results

Participant job function and responsibility at the business varied with hierarchy. This included a general manager with overall responsibility for the business operation (food and drink) on a day to day basis alongside two distinct sub-cultures. The head chef, sous chef and junior chef formed one co-existing but separate culture while two assistant bar managers and one food service/bar person formed another. Bar employees were responsible for collecting and serving meals (prepared by chefs) as well as condiments and cutlery from the kitchen area. The general manager and head chef were predominantly responsible for all training at the business (in their respective areas), however, new employees were required to do most learning 'on the job'. Themes arising from the data-set were as follows:

Hierarchical perceptions

Perceptions relating to food safety matters differed between and within the sub-cultures (kitchen/bar). Figure 1 illustrates that while the general manager believed food hygiene principles should be embedded from the top down, the head chef stated that food hygiene was the responsibility of everyone at the business whether preparing food directly or not.

Most participants described the head chef as a role model (Figure 1) for food safety standards that had influenced their own behaviour despite not being a direct line manager, having responsibility for their training or ever crossing-over in function (i.e. working alongside bar staff front of house).

"It's the people at the top. The people at the top. All the managers. If the manager's are not doing it, the staff definitely won't do it." **General Manager**

"There should be a basic standard for anybody serving food... you have to be trained to do it. So why aren't bar staff, wait staff? You know, just a one-day thing..." **Head Chef**

"... head chef here is quite full on ... he knows what he wants ... like a headmaster sort of thing..." **Bar Staff 1**

"... he's very hygienic [head chef]. Yeah so you know its even more important with him." **Bar Staff 2**

Figure 1: Participant comments relating to learning perceptions

Training consistency

No formal training structure existed at the business as a whole (for kitchen or bar staff). New chefs would be shown the menu and observed preparing orders intermittently during induction until the process was completed correctly.

Staff employed in serving positions were often young (18-25 years) without any formal food safety training. As indicated by Figure 2, on-the-job training would be provided to new starters following 6 months employment. Mature employees (with formal food training) were perceived as having established attitudes to food safety which were less adaptable to new processes or ideas.

Chefs received little ongoing or additional training in relation to food hygiene. Food handlers with previous hospitality experience were assumed to possess the necessary skills and abilities (aligned with the business' food safety expectations) without any formal assessment. This occasionally caused conflict across sub-cultures, with kitchen staff frustrated by the lack of knowledge and resultant behaviours when food was being served.

"You get the 'I've been in the trade for five years'. That's fine. But have you been in the trade and been trained in it! That's the difference."

"I think the younger chef's generally, who are coming in now ... they will take things on board. The older grumpier ones are generally a bit ... we're not stuck in our ways. We have our routine. We do our thing. And that's it."

"If they last 6 or 7 months then we start bringing them to the fold then."

"Food wait staff can't be under the impression that they can bring food, a meal, back and let it sit for 15-20 minutes before going back out."

"Like I say, in that sense, because they're not trained, that switch in there, where they go 'is this going to hurt somebody?' - and that has to be the core of every kitchen."

Figure 2: Example participant comments relating to preconceived training assumptions

'Time' as a barrier to training and monitoring behaviour

Figure 3 provides examples of how 'time' was perceived as a barrier. Kitchen staff remarked that during busy service it was difficult to monitor or observe bar staff behaviour when they entered the kitchen to collect meals, condiments or when clearing down tables.

"... we don't watch them every time because there's always stuff going on... I can't see them all the time ..." **Sous Chef**

"... no-one ever reads like a bunch of papers, but I think if the head chef or head barman or manager takes the staff aside and gives 10, 15 minutes to talk to them about it, make sure they understand... I think that goes a long way." **Bar Staff 2**

"... so between the time they've put the steak on, they've got to go wash their hands, come back, garnish the plate, turn the steak, change gloves, everything ... It just won't work." **Head Chef**

Figure 3: Participant comments relating to time as a barrier

Significance of study

- It is recognised that this is a pilot study, indicative of only one small food business. However, a consistent approach to training (across front of house, kitchen and any support functions such as cleaning operatives) would ensure that employees are aware of risks relating to their specific responsibilities as well as those that are cross-functional. This study highlighted sub-culture attitudes and perceptions that may otherwise go unnoticed in a busy food service environment.
- Identifying influential 'role models' (those perceived by others as an 'expert') may enhance future training delivery, as would training mechanisms which are short, discursive and frequent to avoid overwhelming the learner.
- Time planning for future training purposes is a key consideration; allowing for monitoring, discussion, supervision, feedback and positive improvements across the business.
- The Food Standards Agency defines a 'food handler' as any person entering a kitchen environment whether preparing food directly or not⁷. Small food business operators should be clear about food safety expectations and provide adequate training provision, regardless of pre-existing experience and training. This may have a positive influence on the food safety culture at the business, demonstrating leadership and commitment to food safety standards which are adopted as the 'norm' from the outset.

Gastronomic and Cultural Fairs of the Technological Park of Federal University of Rio de Janeiro

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With the proposal to generate interactions for the community of the Federal University of Rio de Janeiro (UFRJ) Technological Park, the project was born, currently called the Gastronomic and Cultural Fair of the Park. Throughout the six editions, students have planned their business with a focus in management and hygiene and food safety, as opposed to what happens in practice, where aspects are easily ignored and are not valued in the segment. This report of experience systematizes the evolution of the participation in the six editions of the Gastronomic Fair of the Technological Park of UFRJ. With a public call is made the registration of the enterprises. Each venture chooses the category that has interest, presents its business proposal and a letter of agreement from a course teacher for orientation the work. The selected ones undergo the Gastronomic Entrepreneurs Acceleration Program, PAEG. After the event an evaluation is made with identification of strengths and weaknesses and opportunities for improvement. In all, 124 enterprises were selected to participate in the six editions of the Gastronomic Fair: 13 in the first, 23 in the second, 23 in the third, 27 in the fourth, 17 in the fifth and 21 in the sixth. Considering all the procedure mentioned, it is remarkable the positive result in relation to the experiences that the editions of the Fair Gastronomic provided. The experiences were important as data sources related the entrepreneurs ability to experience aspects related to academic learning.

EXPERIENCE REPORT GASTRONOMIC AND CULTURAL FAIRS OF THE TECHNOLOGICAL PARK OF UFRJ

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INTRODUCTION

With the proposal to generate interactions for the community of the UFRJ Technological Park, the project was born, currently called the Gastronomic and Cultural Fair of the Park.

Throughout the six editions, students have planned their business with a focus in management and hygiene and food safety, as opposed to what happens in practice, where aspects are easily ignored and are not valued in the segment (VAZ, 2006).

METHODS

This report of experience systematizes the evolution of the participation in the six editions of the Gastronomic Fair of the Technological Park of UFRJ. With a public call is made the registration of the enterprises.

Each venture chooses the category that has interest, presents its business proposal and a letter of agreement from a course teacher for orientation the work.

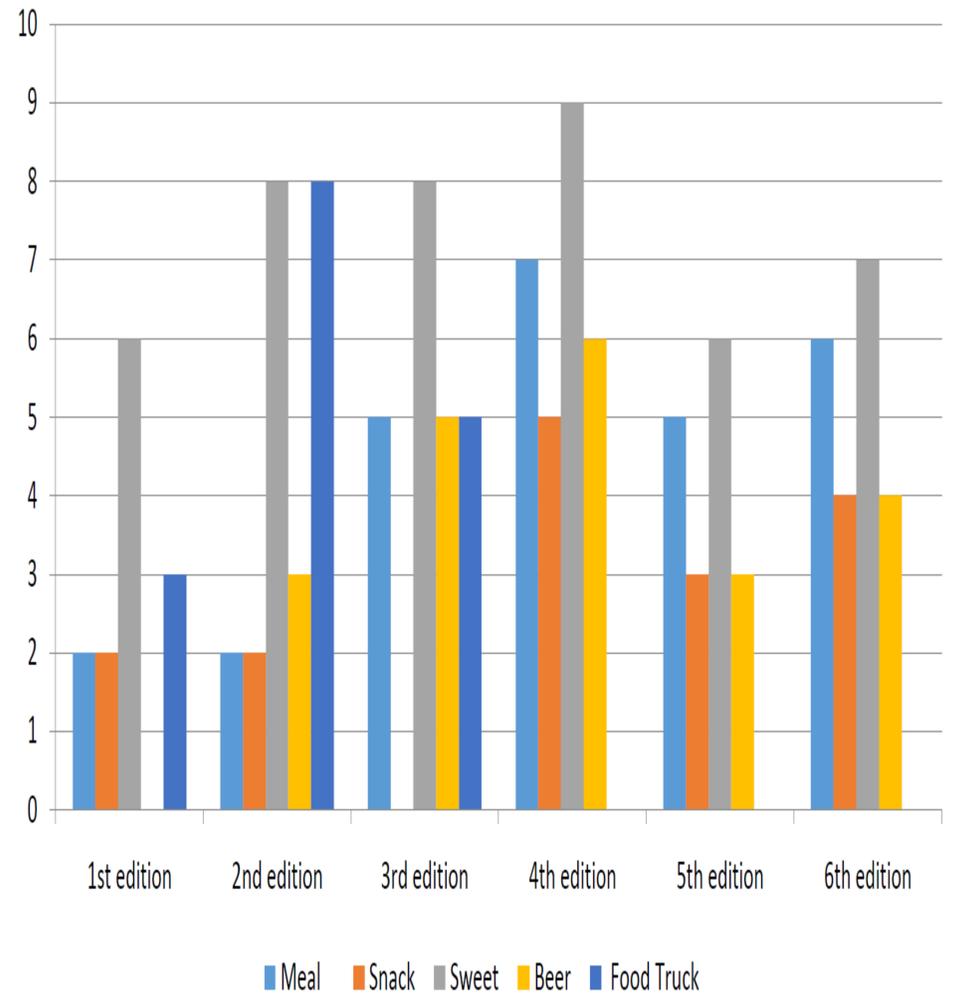
The selected ones undergo the Gastronomic Entrepreneurs Acceleration Program, PAEG.

After the event an evaluation is made with identification of strengths and weaknesses and opportunities for improvement.

RESULTS

In all, 124 enterprises were selected to participate in the six editions of the Gastronomic Fair: 13 in the first, 23 in the second, 23 in the third, 27 in the fourth, 17 in the fifth and 21 in the sixth. Considering all the procedure mentioned, it is remarkable the positive result in relation to the experiences that the editions of the Fair Gastronomic provided.

QUANTITATIVE OF ENTERPRISES BY EDITION OF
THE GASTRONOMIC AND CULTURAL FAIR OF
THE TECHNOLOGICAL PARK OF UFRJ



Enterprises participating in the fair by segment and by edition

CONCLUSION

The experiences were important as data sources related the entrepreneurs ability to experience aspects related to academic learning.

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Management diagnosis of the Community Restaurant of Quilombo do Campinho aiming at promoting a situated gastronomy

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Contemporaneously, there is so much discussion on the need to promote more sustainable relationships throughout the food production chain. Research and projects on new models of production and consumption can represent alternatives towards sustainability and in opposition to the current hegemonic models. It is in this scenario that the extension project "Convivium - Expanding the dialogue between producers and consumers" proposes to act. With the aim of strengthening and broadening the dialogue between producers and consumers with gastronomy as the focus, the project aims to: 1. Consolidate the possibilities and modes of professional performance of the gastronomist formed by UFRJ; 2. Contribute to the strengthening of the insertion of family farmers production in the gastronomic market; 3. Support community groups with an interest in the development and enhancement of their situated gastronomy; 4. To qualify and promote small producers (rural and urban) to work in gastronomic sector; and 5. Promote activities that stimulate dialogue between rural and urban actors, between producers and consumers. One of the lines of action of the project is to support the management and operation of the Community Restaurant of Quilombo do Campinho, located on the banks of BR 101 road in the city of Paraty, RJ. The aim of this poster is to present the preliminary results of the diagnosis that is being carried out in order to identify the main challenges in the operation of the restaurant, in order to propose a management system adapted to its reality, capable of transforming the community business into a non-just "beautiful" but also profitable.

Management diagnosis of the Community Restaurant of “Quilombo do Campinho “ aiming at promoting a situated gastronomy

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INTRODUCTION

At the same time, there is much discussion about the need to promote more sustainable relationships throughout the food production chain. It is in this scenario that the "Convivium - Expanding the dialogue between producers and consumers" extension project proposes to act. One of the lines of action of the project is to support the management and operation of the Community Restaurant of “Quilombo do Campinho”, a local community formed by descendants of slaves located in the city of Paraty, RJ. The objective of this work is to present the preliminary results of the diagnosis being made, identifying the main challenges in the operation of the restaurant, and propose a management system capable of transforming the community. in a business not only "beautiful" but also profitable.

METHODS

The work was developed through periodic field surveys to the Quilombo, aiming an immersion in the way the management of the establishment is realized. There were seven visits in different periods throughout 2018. Semi structured interviews were conducted with managers and restaurant staff, as well as suppliers from other traditional communities and clients. Different job demands were identified and for each of them a strategy was proposed to overcome the challenge, as presented below.

RESULTS

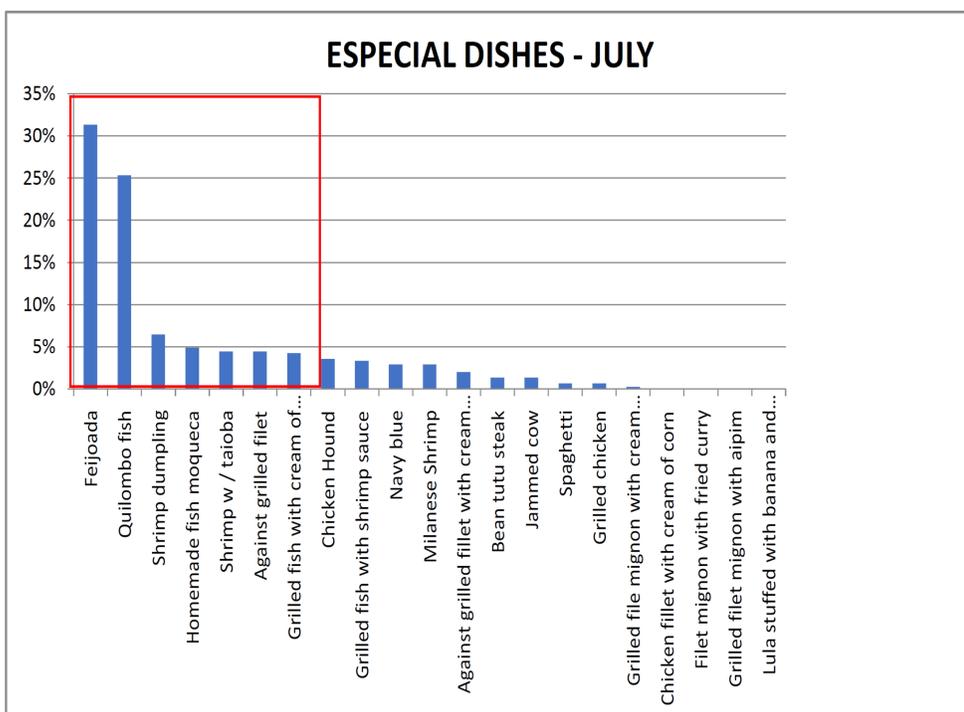


Figure 1: ABC curve of the menu according to the consumption of the dishes - Jul / 18

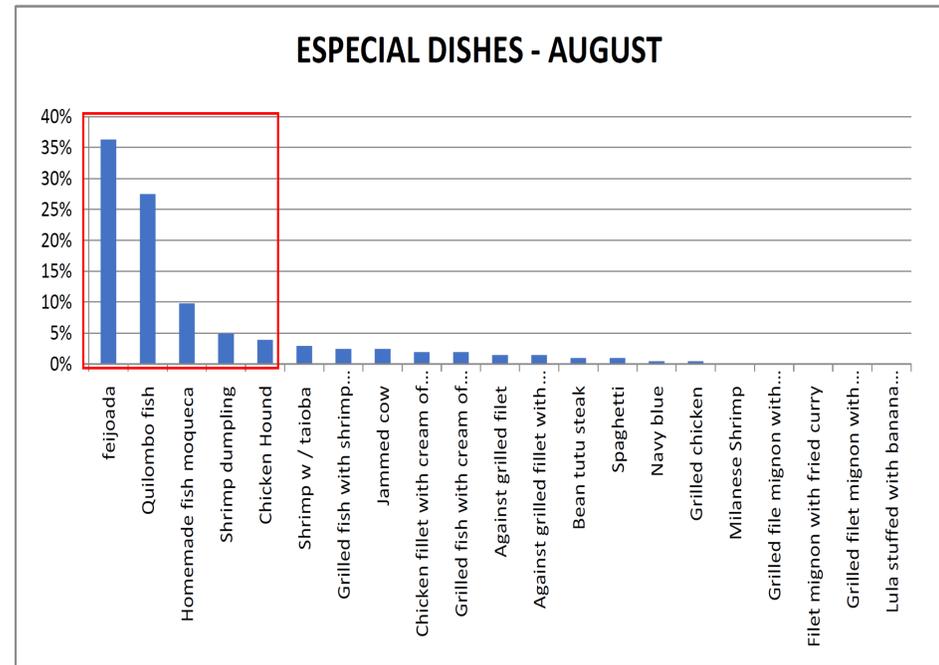


Figure 2: ABC curve of the menu according to the consumption of the dishes - Aug / 18

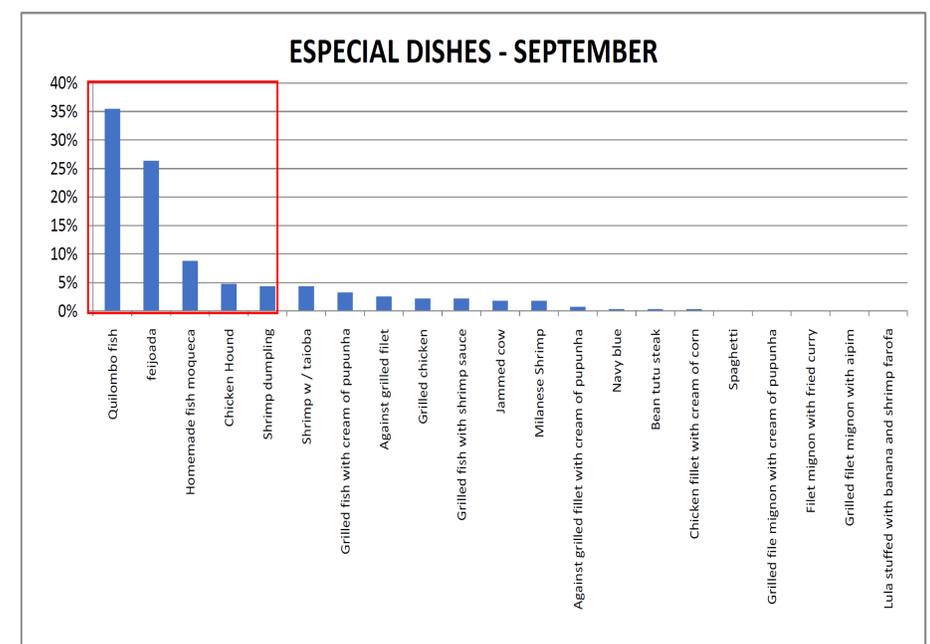


Figure 3: ABC curve of the menu according to the consumption of the dishes - Sept / 18

CONCLUSION

The restaurant presents problems in several areas, mainly in its management, logistics and hierarchical issues.

The possible solution is to begin correcting problems by area, giving workshops to give theoretical and practical knowledge to all employees of the establishment effectively, so that the restaurant can maintain and ascend as the base of community restaurants serving as a model for several communities that also wish to implement this model.

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Culinary workshops for health promotion

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Keywords:culinary workshops; health promotion; quality of life; inflammatory bowel disease; acceptability test

The culinary workshops are nutrition education and health promotion strategies. This study aimed to improve knowledge and abilities to the inflammatory bowel disease (IBD) patients for cooking their own meal. Culinary workshops were conducted for patients with IBD attended at a Federal University Hospital in the city of Rio de Janeiro. The recipes were developed by teachers and students from the gastronomy degree. From September 2014 to November 2017, in the University laboratory were conducted 28 culinary workshops of four hours duration each. After the end of the practical activities the patients performed the acceptability test of the executed recipes. A hedonic scale with five items was used ("hated", "did not like", "indifferent", "liked", "loved") to evaluate the overall appearance, texture, smell and taste. There were 28 workshops with an average participation of 13 people. There were predominant female patients (71%), Crohn's disease (54%) and the mean age was 54.8 years. 130 recipes were executed and the preparations had at least a 94.3% "liked" and "loved" response for all items evaluated. According to participants, they would make 80% of the preparations at home. No negative points were identified in the workshops. The execution of these recipes at home can contribute to promoting healthy eating of patients with inflammatory bowel disease. Furthermore, it can help the social integration and promotes the increase of life quality. The development of culinary s abilities allows patients to have more autonomy to creating healthy and tasty menus.



UFRJ



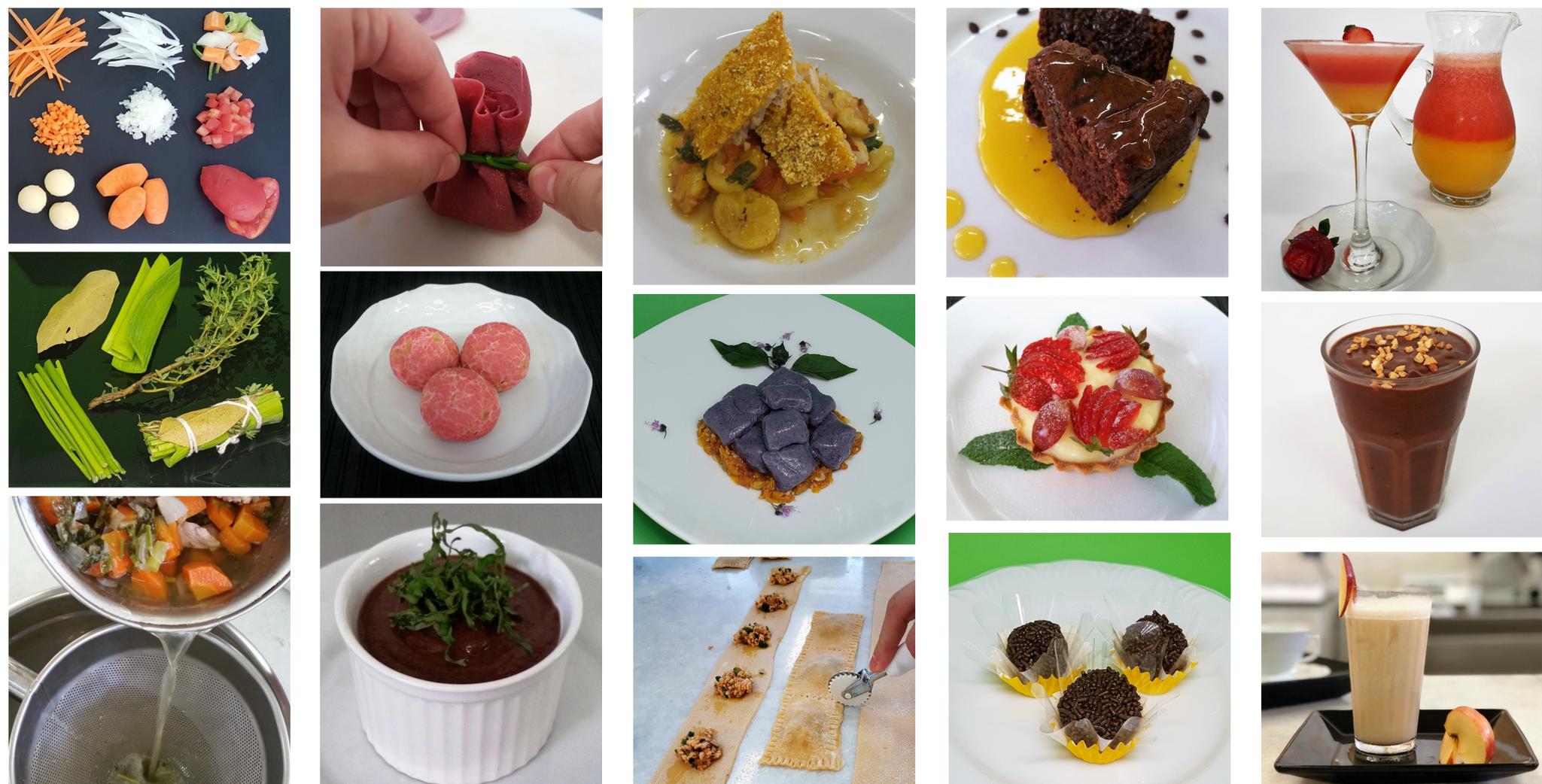
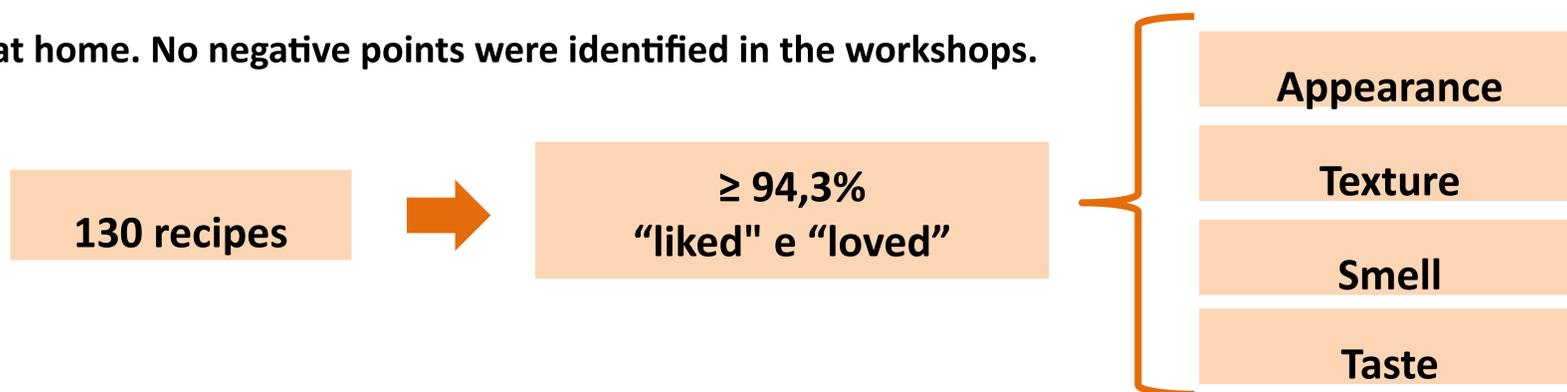
CULINARY WORKSHOPS FOR HEALTH PROMOTION

Letícia Tavares, Ana Carolina Brandão, Marianna Barbosa, Caio Marcelo Padula, Joyce Tarsia Cafiero, Laura Ide and Cyrla Zaltman
Federal University of Rio de Janeiro, Brazil

Introduction: The culinary workshops are nutrition education and health promotion strategies¹. This study aimed to improve knowledge and abilities to the inflammatory bowel disease (IBD) patients for cooking their own meal.

Methods: Culinary workshops were conducted for patients with IBD attended at a Federal University Hospital in the city of Rio de Janeiro. The recipes were developed by teachers and students from the gastronomy degree. From September 2014 to November 2017, in the University laboratory were conducted 28 culinary workshops of four hours duration each. After the end of the practical activities the patients performed the acceptability test of the executed recipes. A hedonic scale² with five items was used ("hated", "did not like", "indifferent", "liked", "loved") to evaluate the overall appearance, texture, smell and taste.

Results: There were 28 workshops with an average participation of 13 people. There were predominant female patients (71%), Crohn's disease (54%) and the mean age was 54.8 years. According to participants, they would make 80% of the preparations at home. No negative points were identified in the workshops.



Discussion: The execution of these recipes at home can contribute to promoting healthy eating of patients with inflammatory bowel disease. Furthermore, it can help the social integration and promotes the increase of life quality.

Conclusions: The development of culinary abilities allows patients to have more autonomy to creating healthy and tasty menus.

Food Environment: Characterization of Food Services at Federal University of Rio de Janeiro, Brazil

Letícia Tavares, Taciana Shikata, Isabela Tanner, Flávia Gonçalves, Maria Eliza dos Passos, Mara De Cnop, Luis Felipe Fernandes and Vinicius Villalba

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Keywords: food environment, food behavior, University, service

The food environment in universities can influence food choices and behaviours, encouraging or discouraging a healthier life style. Therefore, the university environment has been seen as opportune for promotion of healthy food and nutritional security. The aim of the study is characterize the food services environment of a federal university. Two cross-sectional studies were carried out in food services at the *Campus Cidade Universitária* of the Federal University of Rio de Janeiro (UFRJ). The first study was carried out in 2015 at 52 food service establishments and the second in 2017 at 58 establishments. Most of the food establishments are the same ones in both collections. In the second period opened some establishments at the university. A validated check list was used consisting of questions about characterization of the establishment, supply of food and beverages, price and other topics. For the construction of the indicator of characterization of the university food environment, the establishments were grouped according to the degree of extent and purpose of the processing of the predominantly commercialized foods. In both studies, foods considered healthy, according to the degree of processing, most frequently offered were raw vegetables and cooked vegetables. Among those considered unhealthy, industrialized sauces, sandwiches, candies and soda were the most available. In both surveys the supply of unhealthy foods were superior to healthy foods. There were not significant statistical difference in the food services environment of the university situation between times. As observed in other universities, the food environment don't promote healthy. Interventions must be carried out to improve the quality of food. The UFRJ food environment didn't promote healthy food and further studies should be done.

Food Environment: Characterization of Food Services at Federal University of Rio de Janeiro, Brazil

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INTRODUCTION

The food environment in universities can influence food choices and behaviors, encouraging or discouraging a healthier life style. Therefore, the university environment has been seen as opportune for promotion of healthy food and nutritional security¹. The aim of the study is characterize the food services environment of a federal university.

METHODS

Two cross-sectional studies were carried out in food services at the *Campus Cidade Universitária* of the Federal University of Rio de Janeiro (UFRJ). The first study was carried out in 2015 at 52 food service establishments and the second in 2017 at 58 establishments. Most of the food establishments are the same ones in both collections. In the second period opened some establishments at the university. A validated check list was used consisting of questions about characterization of the establishment, supply of food and beverages, price and other topics. For the construction of the indicator of characterization of the university food environment, the establishments were grouped according to the degree of extent and purpose of the processing of the predominantly commercialized foods².

RESULTS

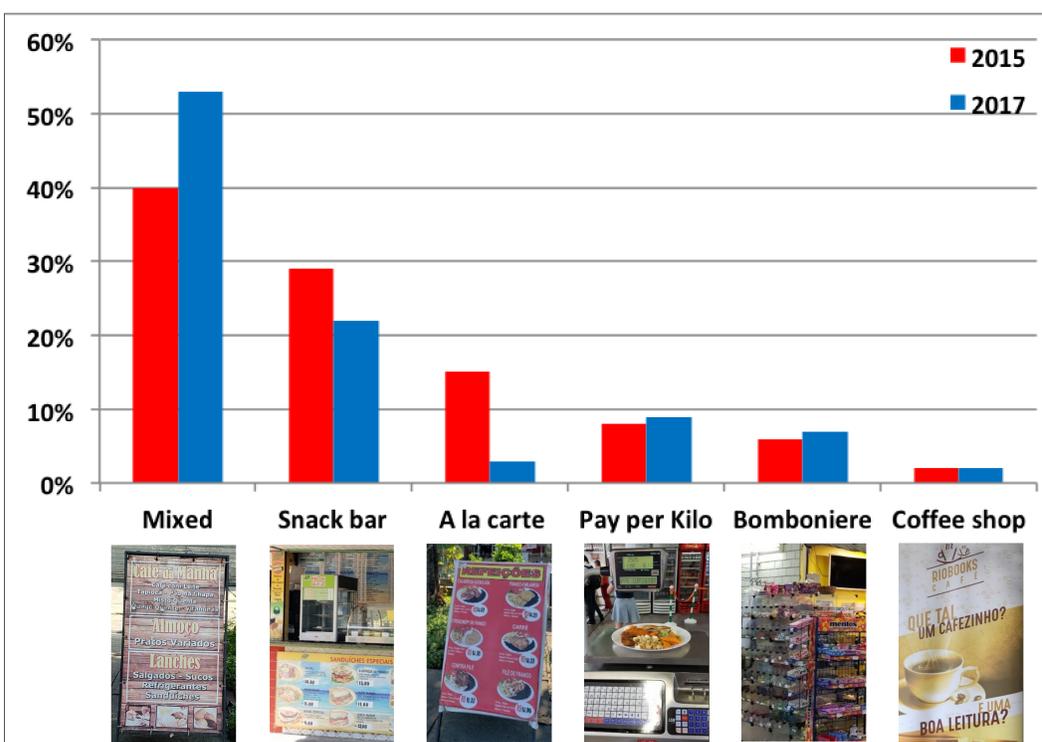


Figure 1: Services offered by food permission agencies. Federal University of Rio de Janeiro - *Campus Cidade Universitária*, 2015 and 2017.

In both studies, foods considered healthy, according to the degree of processing, most frequently offered were raw vegetables and cooked vegetables. Among those considered unhealthy, industrialized sauces, sandwiches, candies and soda were the most available.

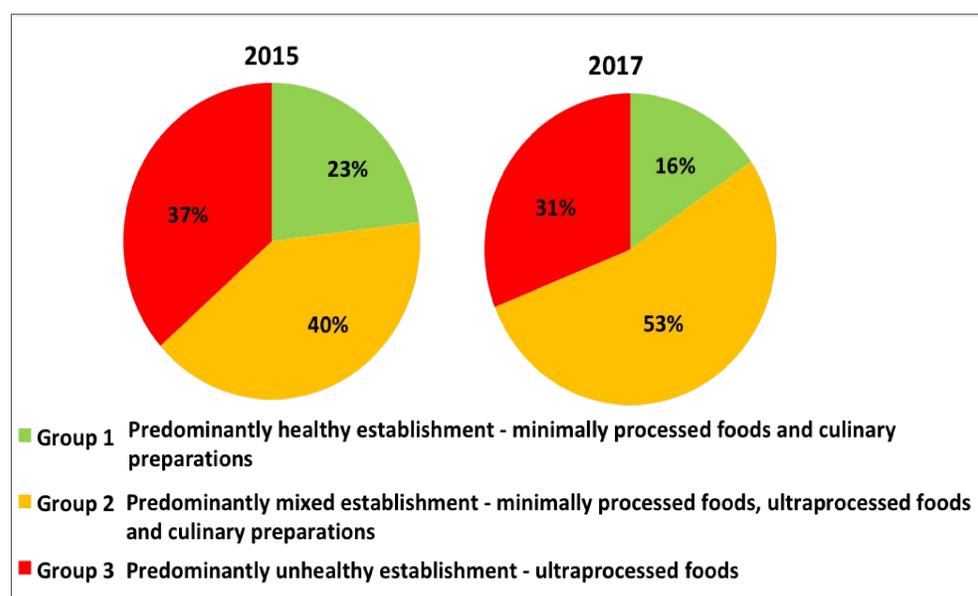


Figure 2: Classification of the establishments according to food processing predominantly marketed. Federal University of Rio de Janeiro - *Campus Cidade Universitária*, 2015 and 2017.

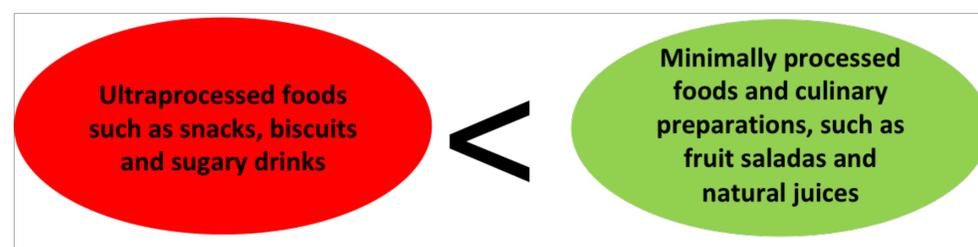


Figure 3: Evaluation of the prices of food and beverages sold by food licensee establishments. Federal University of Rio de Janeiro - *Campus Cidade Universitária*, 2015 and 2017.

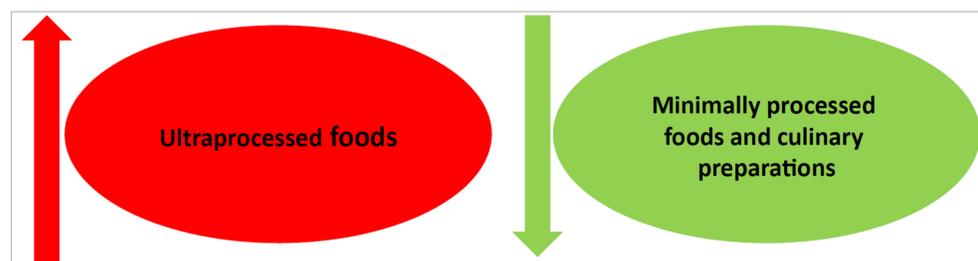


Figure 4: Evaluation of the supply / availability of food and beverages sold by food service establishments. Federal University of Rio de Janeiro - *Campus Cidade Universitária*, 2015 and 2017.

CONCLUSION

The UFRJ food environment didn't promote healthy food and further studies should be done.

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Determination of milk allergen contamination in a ready-meal sector small and medium enterprise (SME): a case study

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Keywords: allergen control; cross-contamination; cleaning optimisation; ready-meal sector SME; food industry

Food allergy prevalence has been documented to affect 10% of the global population, with UK having the highest milk allergy prevalence in Europe. Potential milk contamination risks have been identified in a ready-meal sector welsh SME and this study aims to review resultant cleaning validation data to determine if precautionary allergen labelling is required. Cleaning validation reports, product ingredient lists, external laboratory results (n=25), environmental samples (n=218) from different locations (n=89) and end-products (n=6), available from 2 cleaning validation exercises were reviewed to identify potential risk of milk contamination. Overall, rapid tests reported no positives, except for pre-cleaning samples. Laboratory results were positive for 2.6% of environmental samples with levels of >1000ng/ml for some cooling trays (n=3), 210ng/ml for a volumetric depositor head, all post-cleaning, and 2.5–3.8ppm in non-dairy based end-products (n=3). Laboratory tests were sufficiently sensitive to detect relevant contamination on surfaces cleaned using validated cleaning protocols, while rapid tests failed to detect an indicated allergen absence. The most likely source of contamination is the cooling trays, however, lower levels in the environment compared to the end-product could indicate additional contamination sources. Cumulatively, milk proteins were not detected in the lower 1-10ppm range in end-products using rapid testing methods. This is of concern, as even such low levels can provoke reactions in hypersensitive individuals, potentially requiring the inclusion of precautionary allergen labelling to decrease the liability risk for the SME and increase compliance. Further investigations are required to detect the source of contamination to provide mitigations associated with cleaning optimisation.

Determination of milk allergen contamination in a ready-meal sector small and medium enterprise (SME): a case study.

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Introduction

Food allergy prevalence has been documented to affect as much as 10% of the global population¹. With the United Kingdom being believed to have the highest milk allergy prevalence in Europe². From a food business operator's perspective, this poses a great challenge due to a number of factors such as legislative, clinical, technological and consumer-behaviour related. Legislation-wise³, food business operators are mandated to disclose and communicate to the consumer any intentionally added allergens.

Unintentional presence of trace amounts of allergens, due to cross-contamination, are at the manufacturer's voluntary discretion to be disclosed by the use of a 'precautionary allergen label', with the remark that this is done only following a risk assessment. In EU, there are no regulations to date mandating the levels of allergens that warrant the use of such label, and additionally, there are no guidelines manufacturers can follow to determine a realistic risk.

Without reliable eliciting dose data⁴, food business operators do not have the scientific basis to rely their decisions on⁵. This leads to an inconsistent use of precautionary labels across the industry, making them a less effective tool for risk communication to the consumers⁶.

Additionally, technological hurdles such as the lack of precise and practical analytical methodologies⁷, contribute further to the allergic consumer's behaviour of ignoring precautionary label's statements⁸⁻¹¹. With the prospective of an increase in the prevalence of food allergies¹², the magnitude of the issue becomes even greater.

Potential milk contamination risks have been identified during a cleaning validation in a ready-meal sector SME in Wales and this study aims to review the cleaning validation data to determine if precautionary allergen labelling is required.

Purpose

The aim of this study was to review cleaning validation data from a ready-meal manufacturer to determine if precautionary allergen labelling is required.

Methods

Company documentation including cleaning validation reports and product ingredient lists were reviewed to determine potential risk of milk contamination.

Performance documentation available from cleaning validation exercises conducted at the business ($n=2$) were reviewed to identify potential risk of milk contamination. Documentation included; external laboratory results ($n=25$), environmental samples ($n=218$) from different locations ($n=89$) and end-products ($n=6$).

Descriptive analysis were conducted using a Microsoft Excel spreadsheet created by collating the data from the available documents.

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Results and Discussion

Case study – Cleaning validation in a Welsh food manufacturing SME

The manufacturer produces over 100 food products, using only one production site belonging to the processed foods, ready-to-eat (RTE) or ready to heat category, under a 'retailer own brand' for some of the UK's leading retail chains, as well under their own label for retail and food service sector.

Milk is the most handled allergen on the site, being an intentionally added ingredient in over 50% of the products. During a cleaning validation exercise, several samples have been taken from visually clean equipment following a standard cleaning operation. The cleaning operation followed the production of the manufacturer's highest risk product in regards to milk allergens, representative for a worst-case scenario.

The sampling method and location choice has been made based on a risk assessment with considerations regarding the amount of allergens that are handled on the site on a daily basis and knowledge from previous cleaning validations. A visual inspection for equipment damage, such as cracks or scratches that could harbour traces of milk residue, have been carried out, with no reported issues. The manufacturer has to take a decision on the course of action, based on the resultant information.

Outcome of the cleaning validation

The manufacturer decided to send a selection of representative samples ($n=25$) to a UKAS accredited laboratory to validate the rapid test methods results. The results, based on a more sensitive method (ELISA) reported positive results ($n=3$) on two pieces of equipment, namely cooling trays and a depositor head. Finished products ($n=6$) made following the cleaning operation have also been sent to a UKAS accredited laboratory to assess the presence of milk allergens. A summary of the results is presented in Table 1. The decision process of the food manufacturer, including results from the cleaning validation are presented below in Figure 1.

Table 1 - Environmental 1-4 represent positive results from the environmental sampling ($n=218$). Product 1-3 represent finished product positive results ($n=3$). *AccuClean swabs have not been used for finished product testing.

Analytical method [sensitivity]	AccuClean [10 µg sample]	ELISA [0.25 ppm]	Reveal 3-D Total Milk Protein [5-10 ppm]
Environmental 1	Green - Pass	970 ng/ml	Negative
Environmental 2	Green - Pass	>1000 ng/ml	Negative
Environmental 3	Green - Pass	>1000 ng/ml	Negative
Environmental 4	Green - Pass	210 ng/ml	Negative
Product 1	Not applicable	2.5 ppm	Negative
Product 2	Not applicable	2.5 ppm	Negative
Product 3	Not applicable	3.8 ppm	Negative

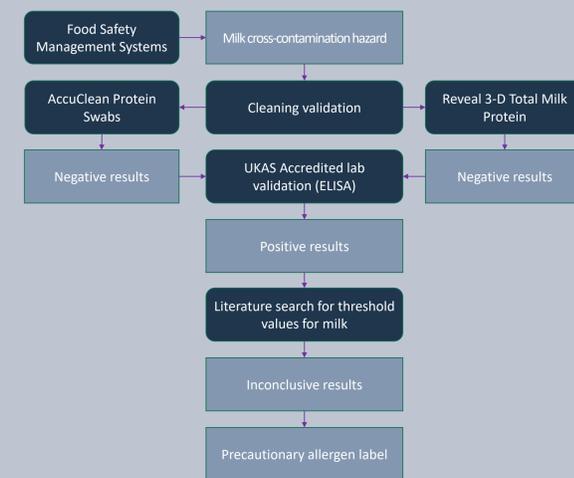


Figure 1 – Decision process taken by manufacturer to decide on the action to be taken based on the outcome of the cleaning validation results. Round boxes represent a tool or process, rectangular boxes represent the outcome.

Positive results ($n=3$) have been reported for non-dairy containing finished products with levels between 2.5 – 3.8 ppm. With higher levels for the first product on the line. The rapid test samples ($n=218$) for selected locations ($n=89$), based on nonspecific total protein assay (AccuClean Protein Swabs, Neogen) and a lateral flow device (Reveal 3-D Total Milk Protein, Neogen), reported negative results. The sensitivity of these two assays is relatively low, at 10 µg per 50 cm² sample and 5-10 ppm per sample, respectively, while only ELISA can detect below 5 ppm.

Additionally, during the cleaning validation, visual inspections for damage on equipment, such as cracks or scratches that could harbour traces of milk residue, have been carried out, with no reported issues.

Has the manufacturer made the right decision based on the outcome?

The cleaning validation resulted in the detection of levels of milk protein in the finished product that are under the detection limit of the commonly used rapid test methods.

In this situation, the food manufacturer may opt to use precautionary allergen labelling. Although the low levels of the allergen found in the finished product (2.5 – 3.8 ppm) poses a risk to a very small percentage of consumers⁴, in the unfortunate event of product-related injury to consumer's health, the food manufacturer would not be considered liable as it demonstrated due diligence to inform the consumer of the possible risks. Conversely, if the risk is considered to be unlikely, the use of precautionary allergen labelling could be considered to be misleading, even if there are currently no agreed quantitative criteria. Both scenarios could potentially affect the food manufacturer by loss of business as products containing a precautionary allergen label can be seen as less desirable, as they restrict sensitive individuals' dietary choices even further. The equipment items related to this issue are shared by all the products produced, increasing the likelihood of cross-contamination drastically.

In order to mitigate the above risks, the food manufacturer could use an allergen risk management tool such as VITAL¹³, which provides information for the necessity of a precautionary label, based on the scientific review of literature on allergen thresholds. The tool can be used to provide rationale for the inclusion of a precautionary allergen label, which can be useful to all involved stakeholders.

Conclusions

- Milk proteins were detected in the lower 1-5 ppm range in the finished product only by using more sensitive testing methods (ELISA). This is of concern, as even such low levels can provoke reactions in hypersensitive individuals⁴, potentially requiring the inclusion of precautionary allergen labelling to inform consumers of the product's allergen status, thus ensuring a reduction in liability risk for the food manufacturer.
- The lower levels in the environment could indicate contamination from food handlers during the manufacturing process, which could be mitigated using bespoke cleaning optimisation interventions based on behavioural change. Further investigations are required to detect the source of contamination in order to provide mitigations associated with cleaning optimisation, reducing the likelihood of precautionary allergen labelling being required and used.
- Until better data regarding allergen thresholds together with improvements in the analytical methods for allergen detection become accessible, food manufacturers need to thoroughly consider the need for precautionary allergen labelling for their products in order to communicate real risks to the sensitive consumers, while not burdening their choice of foods.

Educate the food and drink sector nutrition and sustainable values

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Keywords: Healthy product development, catering, nudging, students

The Food Lab HvA is a creative space within the university developing food concepts in the areas of health, sustainability and social function of nutrition. The Food Lab HvA project merges two graduation research projects in the field of product development, consumer satisfaction and nutritional values in the caterer product range. The main goal is to develop an advisory report and an implementation plan for a product range assortment in line with national dietary guidelines. Additionally, this research investigates whether consumers' purchasing behaviour could be influenced by a healthier food product range; could consumers be stimulated with a healthier assortment and purchasing behaviour. This final assortment module contains 80% (within national dietary guidelines) products assortment advice with effectively proven strategies to stimulate healthy purchasing behaviour. All the products within the research were developed by students. A combination of qualitative, quantitative and desk research was used to investigate to which extent different strategies stimulate healthier purchasing behaviour. In addition, various promotion strategies were tested by means of an intervention and the use of cash register data. The research was subdivided into three different measurement periods: T-0, T-1, T-2. At T-0, the pre-intervention sales have been mapped at T-1 new healthy products have been added and at T-2 promotion strategies have also been added to stimulate healthier purchasing behaviour. The conclusion of this research is that there is indeed demand for healthy products. This is in response to the average and above-average sales figures for the added healthy food products. Further research in order to test the effect of a larger healthy product range. This is based on the literature findings which show that a healthier product range plays a crucial role in stimulating healthy purchasing behaviour.

Performance Nutritionists Perceptions of Food Safety Risks Among Athletes: A Pilot Study

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Keywords: Food safety; sports performance; education; training; sports nutrition.

Athletes have an increased risk of infection after acute exercise. Incidence of foodborne-infection among athletes has frequently made media headlines. Sports nutritionists provide food-related advice to enable optimum nutrition for performance. However, there is a need to explore their potential role in identifying and mitigating potential risk of foodborne-infection. Sports nutritionists participated in a semi-structured discussion group (n=4) to identify food preparation/consumption habits of athletes that may increase risks associated with foodborne-infection and explored their role in ensuring food-safety. The discussion group identified food preparation/consumption habits unique to athletes that may increase the risk of foodborne-infection. Advanced preparation and prolonged storage were points of discussion, which also related to limited access to appropriate refrigeration and re-heating facilities during training. Concerns regarding food provision while travelling for competitions were raised. Consequences of foodborne-infection were identified as days lost training. Furthermore, it was discussed that Sports Nutritionists are a trusted source of food-related information for athletes; however, the focus in relation to food is upon maximum nutrition for optimum training and performance. *“One of the main objectives of the performance nutrition in the sports that we provide is to minimise days lost at training through injury and illness.”* Performance Nutritionists can potentially play a role in reducing the risk of foodborne-infection to enable athletes to achieve maximum training and competing performance. Completion of the pilot study has determined the need for further exploration of the food-safety training and education Performance Nutritionists receive to facilitate the delivery of sufficient food-safety information to athletes.

Performance Nutritionists Perceptions of Food Safety Risks Among Athletes: A Pilot Study

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Introduction

Although regular moderate exercise is associated with reduced incidence of infection, however, continuous, prolonged and high intensity training or strenuous exercise causes temporary post-exercise immune dysfunction,¹ known as the “open window” of susceptibility. This can lead to an increased susceptibility to infection.² Additional factors that impact immune function, such as exposure to new pathogens during foreign travel, lack of sleep and mental stress, can further increase risks.³ Consequently, athletes may be at an increased risk of foodborne illnesses for a number of reasons.

Gastrointestinal infections can be troublesome and debilitating to athletes.⁴ The incidence of foodborne infection at sporting events, has had a significant effect on the performance of several individual athletes and teams.⁵ Subsequently, practices such as good hygiene are essential in preventing illness; in sports, it is fundamental to maintaining team effectiveness and to assist athletes in avoiding the adverse effects of illness.⁶

The recommended food safety practices to reduce the risk of foodborne illness relate to five key areas, (cleaning, cross-contamination, cooking, refrigeration and safe choices, including the adherence of use-by dates).⁷ Although all are of importance to reduce the risk of foodborne infection among athletes, there is a need to explore the specific food safety risks that exist among athletes due to the unique relationship with food and the consumption habits adopted during training and competing to maximise nutrition.

Research aim

The purpose of the study was to identify potential food-safety risks from athletes food preparation and consumption habits.

Methods

Data collection: A semi-structured discussion group was conducted with sports nutritionists to identify the potential food-safety risks that exist from the food preparation and consumption habits of athletes

Ethics: Ethical approval for the study was obtained from the Cardiff School of Health Sciences Ethics Committee.

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Results

The group discussion explored the potential role sports nutritionists can play to reduce the risk of foodborne infection among athletes. The participating sports nutritionists ($n=4$) identified food-preparation, storage and consumption habits unique to athletes that may increase the risk of foodborne illness, these concerns related to two key areas:

- Food-preparation, storage and consumption practices during training, and
- Food safety awareness when travelling to overseas competitions.

The role of the Performance Nutritionist

The role of sports nutritionists to inform athletes of food-safety risks and enable risk-reducing behaviours were discussed. The role was predominantly nutrition and performance related, delivery of food safety information would not be the focus of sessions, but would be delivered alongside food preparation mentoring sessions (Figure 1):

“If you're lucky enough to be on a camp or a competition with them then you can [...] go and check the kitchen, go and see what the food is like being prepared and things like that. But if you're not able to go, that's where education of the athletes is key and they need to know what to look out for, what the learning signs are.”
(Participant 4)

“We often develop the themes of the session with the coach, to say 'well what things are you seeing, you know, in your athletes. What would you like to see improved? Or what areas should we focus on from a performance angle?'”
(Participant 3)

Figure 1. Role of the Performance Nutritionist with athletes

In discussions regarding methods utilised to deliver information to athletes, it was identified a variety of approaches may be adopted by sports nutritionists to provide athletes with information. Methods vary greatly depending on the sport, age and level of the athlete and often involve working with the coaches (Figure 2):

“[With] some of the sports it might just be focusing more on the coaches than the actual young athletes themselves because we know that the coach is such a big player.”
(Participant 4)

“I guess [...] quite a lot of food preparation and food information would be very practical so we might be in a supermarket with athletes making selections with them or informing them around a selection of food”
(Participant 1)

“[There's] the whole recipe side of it, and we sometimes deliver that [...] practically with them so we would do practical food cooking sessions, whether that's in the athletes houses because sometimes you've got groups of athletes based in a house.”
(Participant 3)

Figure 2. Performance Nutritionist methods of information delivery to athletes

Food preparation, storage and consumption practices during training

Potential food safety risks arising from the unique relationship of athletes with food were explored. Performance Nutritionist reported having observed practices of concern particularly when visiting shared athlete houses (Figure 3). Potential food safety risks from advanced preparation, cooking, prolonged storage and uncontrolled storage temperatures were discussed and raised points of concern relating to limited awareness of the need to ensure safe storage practices during training. Access to appropriate refrigeration/re-heating facilities when training were identified and were reported to have been addressed. However, the attitudes of athletes towards the importance of food safety may prevent athletes implementing recommended food safety practices. For example, even when refrigeration facilities are available, athletes are failing to use them (Figure 4).

“There have been times when I've gone into athlete houses and I've seen things that I would consider a risk...”
(Participant 4)

“You know, we very often see some of the food safety practices that athletes employ [...] you know whether it be the positioning of items in the fridge or something like that, will not be what we perceive [...] adhering to standard”
(Participant 1)

Figure 3. Performance Nutritionist food safety experiences with athletes

“we actually have done things like [...] managed to secure a fridge at training venues such as a swimming pool where it's a hot environment. Yet they still might not put their milk in the fridge because it's a little bit further for them to walk. So therefore maybe it isn't a priority for them.”
(Participant 3)

“I think also its once the food is cooked then what to do with it. Around whether that's freezing it, or how to store it, how long these cooked foods should be stored for, I think that's an area.”
(Participant 3)

“I think it's only if they've got ill from it that it becomes a concern, if it's affected them. I think they don't, just from my experiences what I've seen, feel it's a risk until its happened.”
(Participant 2)

“You know you quite often see them, they bring a packed lunch in they wouldn't necessarily go 'oh, can I put this in the fridge', you know [the packed lunch stays in their bag].”
(Participant 1)

Figure 4. Performance Nutritionist experiences of athletes food safety attitudes and behaviours during training

Food-safety awareness when travelling to overseas competitions.

While travelling for competing at events abroad, independence in food choices and language were identified as potential barriers to ensuring food-safety. The Performance Nutritionist had first hand experience of athletes succumbing to foodborne illness whilst travelling overseas to compete, the group shared the food safety advice they would give athletes when travelling abroad. It was identified that the food safety culture of events would be dependent on the profile and funding of the event (Figure 5).

“Something that I try to instil in the athletes is just make sure that if cold food is meant to be served cold then it actually is. And vice versa, if it's meant to be hot then it actually is hot.”
(Participant 4)

“I'm not the only one, but I've seen an athlete who didn't maybe fully check the food that he was eating while at an airport and actually got food poisoning from that.”
(Participant 4)

“At the other end of the scale is when [athletes] go to [...] a major games there will be quite a lot of food safety behind [...] the major multisport games would have a huge company behind them that has a lot of food safety measures in place.”
(Participant 3)

Figure 5. Performance Nutritionist food safety experiences with athletes travelling overseas to compete

Conclusion

- The study has determined that two key areas of risk have emerged that require further exploration with athletes, food-preparation, storage and consumption practices during training, and food-safety awareness when travelling to overseas competitions.
- There is a need for research to determine the food safety knowledge, attitudes and self-reported practices of athletes.
- Furthermore there is an identified need to explore the food safety training and education available to facilitate the delivery of food safety advice and information to athletes.



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