Food Safety Governance and Food Redistribution: A Multilevel Governance Analysis of Food Safety Policy in Urban ICT-Mediated Food Sharing

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Alan Dowdall

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Abstract

Sustainability is a major issue facing society today, posing a number of challenges to our food, water, energy and human systems. Various international and regional attempts have been made to tackle these issues (UN, 2015; EC, 2015), with the aim of creating a more sustainable and circular economy which uses resources more efficiently. Food waste is one of the most pressing issues which must be dealt with, due to growing populations and increased pressure on land use (Scanlon, *et al.,* 2017). The redistribution of surplus food has been identified as one of the most innovative and effective methods to help reduce food waste (Capodistrias, 2015), and its expansion and growth is encouraged by the EU (Vittuari, *et al.,* 2016; Vituarri, *et al.,* 2015). Food safety and hygiene regulations have been highlighted as a major barrier to this growth (Vituarri, *et al.,* 2015). This study aims to assess the place of food safety regulation in European food redistribution organisations (FRO), and elicit the views of these organisations on regulations and how they should develop in the future. This will be carried out through a multilevel governance analysis, including European food safety policy review, national policy content analysis, surveys with local FRO and a case study on the operation of public fridges, including surveys and media analysis.

This study found that food safety has an important place in European food policy, outlining the general risk-based, scientific approach to food safety management in several regulatory instruments. National food safety policy channels these principles into set standards and procedures, providing more practical regulation of food businesses. National food safety authorities provide viewpoints on the importance of food safety and its place in food redistribution. Local FRO place a high level of importance on food safety and clearly understand the risks it poses. They implement these standards and procedures in a number of ways to maintain food safety and prevent public health risks. The majority of FRO surveyed in this study believed that current regulations are restrictive and too strong, and would like to see changes to education and awareness are food waste issues, as well as guidelines on the interpretation of food safety regulations in redistributive services and the creation of a standard quality system for all actors involved in redistribution.

The novel data collected in this study highlights the complexity of food waste and food safety management and the difficultly in reconciling both of their aims. Dealing with barriers such as food safety to innovative solutions like food redistribution is important to allow for their expansion and growth in accordance with proper regulations. Tackling this issue now, thorough official guidance and interpretation, allows for the optimal performance of both food redistributors and the regulations which govern them in the future.

Keywords: food safety, food sharing, food redistribution, European policy, policy analysis.

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Abbreviations

EC = European Commission

EFSA = European Food Safety Authority

EU = European Union

FRO = Food redistribution organisation

FSA = Food Safety Authority

FSAI = Food Safety Authority of Ireland

FSAUK = Food Standards Agency UK

GFL = General food law

ICT = Information communication technology

MA = Media analysis

MS = Member State

NPO = Non-profit organisations

PF = Public fridge

SMA = Social media analysis

UN = United Nations

1.0 Introduction

1.1 Research rationale

The world today is faced with a number of growing issues, from the rate and intensity of climate change, to the difficulty of continually increasing populations and the related perfect storm of increasing demands for food, water and energy (Scanlon, *et al.,* 2017). These place extreme pressure on existing resources and call for innovative management solutions. At the same time, there are societal pressures as more people fall into poverty and hunger (Brooks, 2017). Addressing the issue of food waste can go towards alleviating many of these pressures. This produces a more circular food cycle where food which is wasted and not used at various stages is channelled into other effective uses. This reduces the pressure of food production on valuable land, and the amount of food entering the waste management system.

There have been various international attempts to combat these growing challenges. One global approach is the United Nation's Sustainable Development Goals (UN, 2015). These 17 goals tackle a wide range of issues, attempting to allow for the most sustainable global growth possible. Ensuring sustainable consumption and production patterns is one of these goals, directly contrasting the amount of food going to waste globally and the number of people going hungry (UN, 2017). At a regional scale the EU also attempts to tackle sustainability challenges through their Circular Economy Package (EC, 2015). The EU aims to increase sustainability by making product lifecycles more circular through greater recycling and reuse. On the topic of food waste the three areas of focus are; increasing research on food waste figures, increasing food donation and increasing surplus food use (EC, 2015). This will be achieved through changes in policy and regulation. Policy is defined as "a course of action, proposed or adopted by a government, intended to influence and determine coherent decisions and actions; usually with a common long-term purpose(s)" (Burgos, *et al.,* 2016). This forms the regulations which affect business operations.

One of the innovative responses to tackling sustainability challenges in Europe is food redistribution (Capodistrias, 2015). Food redistribution is the storing, processing and distribution of received food to others for human consumption (FAO, 2017a), and has long since been a feature of the food waste reduction movement across Europe, but in recent years the emergence of ICT-mediated food sharing, along with a greater awareness food waste and pressing economic situations, has allowed it to spread both in terms of scale and influence (Davies, *et al.,* 2017). Food safety has been identified as one of the major barriers to the growth of redistribution in Europe (Buksti, 2015). With this growth and formalisation of the sector, the introduction of regulation and guidance is desperately

needed. This project aims to fill this gap in the understanding of the place of food safety currently in food redistribution initiatives and how food safety regulation within this sector will develop in the future. As food safety regulations differs around the world this thesis focuses on the EU as a singular supra-national body with at least some coherence around high level regulation (Majone, 1994). The EU is also a major producer of food waste (Stenmarck, *et al.,* 2016), producing 88 million tonnes in 2012, with forecasts for a business as usual scenario of up to 126 million tonnes in 2020 (EC, 2017).

Overall this study will provide a multilevel understanding of how food safety is considered within the regulation of food redistribution organisations (FRO), ranging from a supranational to local scale. Novel research into the opinions of FRO on the regulatory framework within which they work and how they think they should change in the future will contribute to recommendations on the future direction which regulation of this sector should take. This will help form regulations which ensure maximum food safety standards and redistribution of surplus food (Gram-Hanssen, *et al.,* 2016).

This is a study of a new and emerging sector and therefore has a small sample size, but even within this it allows for trends to be examined and recommendations about the future evolution of this area to be made (Gram-Hanssen, *et al.,* 2016).

1.2 Aim and research questions

The overall aim of this project is to investigate the influence of food safety policy on the operations and activities of FRO. This will allow for a deeper and fuller understanding of European food safety policy, the influence which it has on national legislation and the ground-level interpretation in local organisations. This will be achieved by examining how current standards have been arrived at, how they are applied, how national policy deals with food safety, and ultimately, how local organisations interpret this policy in their actions of food redistribution. These different areas will be investigated through a number of research questions examining the three different levels of food safety legislation, as well as a case study to allow for an applied examination of these issues.

Table 1.1: Study research questions.

1 – European level	How has food safety policy within the EU evolved over time?
2 – Member State level	How have Ireland and Britain interpreted EU policy and formulated national policies on food safety?
3 – Local level	How do local redistribution organisations interpret national food policy? How do local redistribution organisations think food safety regulation will develop in the future?
4 – Case Study	What are the implications of food safety for public fridges?

2.0 Literature Review

2.1 Food waste and redistribution

In 2012, food waste in the 28 Member States (MS) of the EU amounted to 88 million tonnes, equalling roughly 173 kilograms per person, at an overall cost of €143 million (Stenmarck, *et al.,* 2016). These astronomically high values put into question control of the food cycle within the EU, and which factors contribute to such large amounts of food being wasted. At the same time as this, society also faces questions about those who are less well off and in need of food. A 2014 report revealed that in the EU, 55 million people (9.6%) were not able to afford a regular quality meal every second day (Eurostat, 2014). Bringing these two issues together, the redistribution of surplus food is an innovative and viable option to solve both problems simultaneously.

Food waste and food redistribution are two of the options for surplus food which is not consumed by the normal food cycle (Stenmarck, *et al.,* 2016). Food waste is food which has been discarded and cannot be used (Zukauskas, 2016), while redistributed food is that which has been donated and redistributed for human consumption (FAO, 2017a). Food safety plays a major role here due to the food being near its end-of-life date and there being a higher risk of food safety issues. Food safety policy plays a very important role in the classification of both pathways.

While the regulation of food safety in FRO is governed by the same food safety standards which cover commercial food business operations, there are currently no specific regulations about the place of food safety in food sharing (Gram-Hanssen, *et al.,* 2016). EU guidelines for food donation are expected to be finalised by the end of 2017, and these will likely contain some guidance and interpretation of EU food safety law to food redistribution (Gassin, 2017), while the proactive Finnish food safety authority (FSA) has produced national guidelines for food safety standards in food sharing (Evira, 2013). There are currently no such guidelines for Irish or British FRO. This current lack of regulation can be an issue due to food sharing being fundamentally different from a business which deals with only fresh food as there are more food safety issues and risks. This is due to the new and emerging status of ICT-mediated food sharing activities in many regions across the world. This is therefore an important point in the evolution of FRO, as they can provide an input into the formation of policy surrounding the topic of food safety in the industry.

2.2 What is food sharing?

Food sharing is the sharing of produce, knowledge, experiences, services and spaces related to food (Agyeman, *et al.,* 2013). This takes place in a variety of ways, from different organisations and using

different intermediaries (Davies, *et al.,* 2017; Davies and Legg, 2017). One common category is social enterprises which aim to create a social or environmental good through their operations (Kassen and Orsi, 2012). In the food sharing industry, these include enterprises which connect retailers with individuals or communities which are in need. This takes place by the enterprise facilitating the redistribution of surplus food from retailers to charities which then redistribute it again. ICT-mediation within the food sharing industry has emerged as a major tool in reshaping the way people share food (Chies, 2017; Davies, *et al.,* 2017). ICT-mediated food sharing is the use of technology to aid in the redistribution of food from one person to another (Davies, *et al.,* 2017). This form of food redistribution will be the main focus of this project as this is one of the most common forms of food sharing. Other forms of food sharing include the sharing of ideas and methods used in food preparation, the sharing of food preservation and storage methods, and the shared experience of eating together.

2.3 What is food safety?

Food safety is an important consideration during all stages of the food cycle and is of high consumer interest in Europe and around the world. Safe food is that which is clean and safe to eat by members of the public without fear of causing damage to human health (Codex Commission, 2001). This is an important part of European food standards as it means that food is safe to eat and will not cause harm. This generally involves food not being allowed to contain above minimum threshold concentrations of certain biological, chemical and artificial parameters. Foods which meet these standards are deemed safe to eat and can be consumed without risk to human health (Codex Commission, 2001). Foods which fail to meet these standards could result in minor to serious illness. Another major reason for food safety standards is to prevent outbreaks. These occur when part of a food chain becomes infected with an issue, and this then spreads throughout the chain (Vos, *et al.,* 2005).

The maintenance of high food safety standards comes about through strict regulations and legislation, supported by sound scientific data, as well as strict enforcement of these rules in organisations and businesses which prepare food. This is where the interaction between food redistribution and food safety occurs, as businesses which carry this out must conform to these standards (EC, 2002). Standards for food safety in the EU are set in Regulation 178/2002 (the General Food Law/GFL) and enforced by the European Food Safety Authority (EFSA). The evolution of food policy in the EU has occurred in a dynamic process from the inception of the European Community to current standards. Food safety plays a major role in all aspects of the food chain, from

food production, to processing, packaging, distribution and selling. This ensures that foods are safe to eat and free of contamination at every stage.

Food safety policy responsibility is distributed over a multilevel governance system in Europe, encompassing different levels of government and the public and private sector (Caduff and Bernauer, 2006). While some argue that this creates tension between national and European interests (Krapohl & Szawlowska, 2005), others suggest that it produces a common, and stronger regulatory framework (Lindner, 2008). Food safety also faces many pressures, being placed under scrutiny for scientific justification and economic efficiency (Henson and Caswell, 1999).

2.4 How do food sharing and food safety interact?

Food safety and food sharing are intrinsically linked. This occurs due to the broad and comprehensive nature of the current European food policy, which means that food safety standards must be met at every stage of a food products lifespan, from production, to processing, distribution, selling and redistribution (EC, 2002). Risk assessment plays a major role in this interaction, as some redistributive practices have a higher food safety risk than others and much food safety assessment and enforcement is risk-based (Demeritt, *et al.,* 2015). Food safety standards play a very important and determinant role in food redistribution as this involves food products which are usually near their best-before or use-by-dates, so food safety concerns are also at a high level. Concurrently, food is redistributed to those less well off and most in need of it. High food safety standards are important to protect this vulnerable group of people who don't have any other options for sources of food. For this reason, a discussion on the impact of food safety policy on food sharing and redistribution is important in determining exactly what we want, while also taking into account the needs of the system, and the responsibility it has for the protection of human health. There is currently a clear mismatch between food safety regulation and food sharing practices (Chies, 2017). Understanding the place of food safety in food sharing presently can help shape how these areas interact in the future to allow for the optimal performance of both.

2.5 Public fridges: A food safety controversy

Public fridges (PFs) are one of the most contentious issues in food sharing today, having been labelled unhygienic and a threat to personal and public health (Zurek, 2016). These fridges are placed in public areas, and are open for anyone to place and take food. They are a place to share leftover food rather than throwing it out (Zurek, 2016), and aim to prevent food waste by the direct sharing of food between people. This is important for produce which must be refrigerated as it can be more difficult for the formal food redistribution system due to the constant requirement for cool

conditions (the chill chain). While this is an innovative solution sharing perishable foodstuffs, without rules and regulations it poses a significant threat to the public in terms of food safety.

This is a very recent phenomenon and implementation varies greatly. Some fridges are completely public and are not monitored by people, while others have strict rules about what can be placed in the fridge with frequent checks by volunteers (Zurek, 2016).

A German network of PFs run by the organisation Foodsharing.de was among the first in Europe to open in 2012 (Rombach and Bitsch, 2015). Foodsharing.de operate a number of food redistribution activities including ICT-mediated food sharing with approximately 25 fridges currently in operation (Marshall, 2017). ICT plays a major role in the operation of the whole network with approximately 28,000 registered members sharing food through the online network (Ganglbauer, *et al.,* 2014). This is the largest PF network in Europe (and globally) and is often cited as the inspiration for similar European fridges such as Sweden, Spain, Belgium and the UK.

While PFs present clear food safety and liability issues, they also offer innovative solutions to dealing with food waste. Volunteers at Foodsharing.de have had positive relationships with regulators and city officials (Chies, 2017). This is due to the fridge organisers and the city officials sharing similar aims of encouraging food waste reduction. This offers the opportunity for the development of PFs in conjunction with city officials, dealing with many of the legal and regulatory issues at the beginning. This is also the approach which was taken with the solidarity fridge in Galdakao, Spain (Frayer, 2017).

Food safety issues have come into conflict with PFs in the past. In 2016, Foodsharing.de was ordered to close two of its PFs when food safety officials branded it as a public health hazard (Marshall, 2017). This was because European and German regulations required that all donations must be noted and overseen by a member of the food business. Foodsharing.de argued that their PFs are private exchange and sharing sites and do not fall under the European regulations for food business (Chies, 2017). This argument regarding the classification of a food business and the applicability of food safety regulations to PFs is one of the major areas of contention.

2.6 Current issues

2.6.1 Risk, safety, liability and legal issues

Food risk management plays a major part in food safety, as the role of food safety strategies is to minimise food risk to public health (FAO/WHO, 1997). Risk management is an integral part of ensuring high food safety standards as it not only considers regulations, but also other legal,

political, social and economic issues relating to food safety (van Kleef, *et al.,* 2006). This is highly important to consider in a field such as food redistribution as there are so many conflicting interests.

Using a risk-based approach to food safety, regulation tries to limit hazards which exceed acceptable limits of risk, rather than seeking to prevent all possible hazards (Demeritt, *et al.,* 2015). This has restrained European food safety policy, as it still follows historical principles which aim to ensure that all food is safe to eat, rather than just targeting certain high-risk foods for example. A risk-based approach allows for a more appropriate allocation of inspection and enforcement resources as they target only hazards with the highest risk through formal assessments of probability (OECD, 2010). Food redistribution and food safety have such a strong interaction as there is a high-risk of food safety issues occurring due to the nature of food being shared. Within the food redistribution sphere there are also certain activities which are more at risk of causing food safety issues than others, such as the serving of hot meals, and more controls should be placed on them.[1]

Consumers tend to be unconcerned about food safety and food risk issues (Berg, *et al.,* 2005; van Kleef, *et al.,* 2006), as they assume that all foodstuffs that they purchase are safe to eat. This becomes more difficult in the field of food redistribution as those which consume this food have much less choice. Food which is being redistributed is also of a much higher food risk level as it is closer to its end-of-life date. Both of these factors contribute to food risks being extremely high in food redistribution practices, and therefore food safety is of the utmost importance.

Another major issue and barrier to the sharing economy in general is legal problems. The sharing of things, outside of the normal commercial, economic framework, makes legislation and regulations more difficult to implement as there are liability and accountability issues (Kassen and Orsi, 2012; Zurek, 2016) and it is currently considered a legal grey area (Chies, 2017). This is particularly true in the case of food sharing and food safety laws as they were designed to regulate competitive economy relationships, not sharing ones (Kassen and Orsi, 2012). As the sharing economy is not a top-down policy solution, legislation and regulations don't easily fit into the framework (Kassen and Orsi, 2012). Working within the sharing economy means that traditional distinctions of actors and motivations are blurred, making the application of laws more difficult (Kassen and Orsi, 2012).

FRO have become increasingly weary of liability issues, and in May 2017 Foodsharing.de began establishing local organisations as independent and distinct operators, to protect the whole network from potential liability cases (Chies, 2017; Foodsharing, 2017). Due to the operational structure of PFs the issues of liability and legality occur frequently (Zurek, 2016). While some initiatives have

[1] For further discussion on the Risk Analysis Framework and its integration into European policy see appendix I

taken steps to ensure food safety standards through logging donations and regular checks (Spain, the UK), others have less rigorous rules (Germany). Regulators argue that the fridges should conform to the regulations of formal food businesses, having a single person responsible for food safety, making them liable for any failures to meet standards (Chies, 2017). This controversial but interesting topic is ripe for further analysis as little study has been conducted on it.

Uncertainties about legal obligations in the donation of food have been identified as a major hurdle for redistribution (Hanssen, *et al.,* 2015). This relates to both financial repercussions and damages to reputation (O'Connor *et al.,* 2014). Managing risk is one of the issues which sharing economy lawyers will have to deal with in the future. This is particularly important in a high-risk sector such food redistribution. This will involve allocating risk, waiving liability and indemnifying organisation members (Kassen and Orsi, 2012).

2.6.2 Food redistribution and ICT

The internet is one of the main sources of information for the public about food, and this is also true of food sharing and redistribution (Hilverda, *et al.,* 2017; Kuttschreuter, *et al.,* 2014). The increase in the utilisation of ICT in food redistribution has been one of the major factors which has enabled the spread of this form of food sharing.

Social media has been identified as key for non-profit organisations (NPO) such as food redistributors. It provides many benefits, including deepening their connection with followers and allowing for public education about existing and future projects (Briones, *et al.,* 2011; Waters, 2007). One study by Lovejoy and Saxton (2012) of 100 NPOs found that they mostly use social media for providing information (80%), followed by building a community (15%) and calling for action (5%).

The scale and success of Foodsharing.de's food redistribution and PF network would not be possible without their online forum and digital tools (Chies, 2017). Social networks like Facebook play a very important role in creating a sense of community on a global scale, promoting the values and narratives on reducing food waste and sharing (Ganglbauer et al., 2014).

While technology can help improve food safety and reduce food risks (van der Vorst, *et al.,* 2005), one study found that consumers are concerned that the increased use of ICT tools in food services could also lead to new risks and dangers (van Kleef, *et al.,* 2006). Given that ICT-mediated initiatives feature so heavily in the food sharing economy this is of particular interest.

2.6.3 Food redistribution and food security: A conflict of aims

FRO can work under various aims and motives. One of the most common is the reduction of food waste, but even within this there can be subdivisions of aims. People may wish to reduce food waste for economic reasons, to use food produce to its fullest value, for environmental reasons, to redistribute food and reduce the need for further production, or for social reasons, to feed those in need (Tielens and Candel 2014).

As the main visible outcome of food redistribution is the feeding of people, many see FRO as the frontline in the fight against hunger and food insecurity (Riches, 2002). Food security is when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food" (World Food Summit, 1996). Food insecurity is failing to meet these conditions. A link between reducing food waste and food insecurity is often passively implied in many statements (UN Zero Hunger Challenge, FAO's Think.Eat.Save, European Parliament Agricultural Committee) by relating the volume of food which goes to waste and the number of people in food poverty. This is a false equivalency to draw due to the complexity of food security issues, and simply redistributing food waste will not solve the problem alone (Tielens and Candel 2014).

Many studies have found that FRO have been ineffective at reducing food insecurity and food poverty (Barrett, 2002). This is due to the complex nature of food security, in both defining and reducing it (Barrett, 2002), rather than any inefficiencies in redistribution. Additionally, FRO have food waste reduction as their main aim, with increased food security as a by-product, so measuring their success by this metric is inapplicable (Riches, 2002). This conflict between the aims has led FRO to distance themselves from the claim that they reduce food insecurity and state food waste reduction as their sole aim.

2.7 Food policy

2.7.1 Food policy in Europe

Food policy in Europe is a wide and diverse topic, covering several sectors. Economic inputs and the single market have a major influence on EU food policy direction (Ansell and Vogel, 2006). Agriculture has one of the largest influences through the common agricultural policy (CAP), covering all issues relating to food production, regulating farmers and ensuring safe and environmentally sustainable farming practices (Grant, 1997). Nutrition policy aims to inform the public on their nutritional needs, nutritional information and prevent diet-related diseases (Trübswasser and Branca, 2009). Food policy in Europe is also evolving quickly, dealing with new issues in food science,

such as GMO (Lau, 2015). Recently the issue of waste has also become important in food policy, with food waste management forming a part of the Circular Economy Package (EC, 2015).

2.7.2 The evolution of European food safety policy

Table 2.1: Overview of major events in the evolution of European food safety policy.

Period	Major Events	Details
Origin of European standards (1962 – 1985)	• Formation of first European food policy • Cassis de Dijon judgement	•The main objective of this period of policy making, was the creation of a single market for foodstuffs within the EU. •This also saw the Cassis de Dijon judgement from the European Court of Justice which established the mutual recognition principle, which would later form a major part of EU food policy.
Harmonisation of standards (1985 – 1995)	• 1985 – Launching of new approach to harmonisation of standards	• Following the failure to create a single market using existing standards, the EU using the mutual recognition principle to enact horizontal legislation which was applicable in all Member States, creating European standards for food, such as hygiene and labels.
The food risk crises (1995 – 1999)	• 1996 – BSE outbreak • 1997 – Green Paper on the General Principles of Food Law • Introduction of food risk analysis	•This period marks a major shift in the focus of food policy within the EU. Several food risk crises highlighted the lack of food safety regulation within the EU and this quickly resulted in the publishing of a Green Paper on food safety. •The introduction of a food risk analysis system made scientific data the heart of decision making in the food sector.
Globalisation of standards and introduction of EFSA (1999 – present)	• 1999 – White Paper on Food Safety • 2002 – General Food Law Regulation • 2002 – Establishment of EFSA	•This period formed the European food safety system which we have today. •A White Paper on food safety was published and following consultation the first, central EU policy on food safety was enacted in 2002. This laid down general food safety standards for all foods sold within the EU, as well as establishing the EFSA.

Food safety legislation has evolved greatly over recent decades in the EU (Ansell and Vogel, 2006). This is due to both technological advances, making the detection of food safety issues much easier, and a number of high profile food safety crises (Ansell and Vogel, 2006; Knowles, *et al.,* 2007), highlighting the need for further control of the European food cycle. Understanding the evolution of European food safety policy, and how it got to its current form, is an important part of understanding how it is transposed, and ultimately implemented, at national and local levels. Highlighting the dynamic nature of supranational food policy is also important as it shows that it can adapt to ideas within the food world (Alemanno, 2006; Paul, 2012). This is important when discussing a practice as new as food sharing which doesn't yet have strict and defined regulation in European food policy.

A detailed discussion on the evolution of European food safety policy and structure of regulatory bodies can be found in appendix II.

3.0 Methods

A mixed methods approach is used to answer the research questions under investigation in this study. This involves both quantitative and qualitative approaches (Bergmann, 2008), drawing on the strengths of some methods and minimising the weaknesses of others, allowing for optimal analysis of a wide range of data sources (Johnson and Onwueguzie, 2004). Strengths and weaknesses of methods employed are displayed in Table 3.1. Literature reviews of key policy and academic papers provide background knowledge and context, while novel analysis of an existing database and original collected data provides unique results for interpretation and discussion.

3.1 European scale

3.1.1 Documentary policy review

Identification of the European legislation and policies that pertain to food safety management in food businesses was conducted through the EUR-Lex database, conducting a keyword search for 'food safety'. All policy titles were read and those relating to food safety were selected and the key points and effects were reviewed. Policies were analysed for the impact which they would have on the operation of FRO using a classification scheme to investigate who the policy related to, how it affected food safety, what new measures it introduced, and how these affected FRO. These results are compiled in Table 4.2.

The emergence and evolution of these regulatory instruments were plotted along a timeline and summary of the evolution of European food safety policy. These demonstrated the evolution of policy through instruments, for example the White Paper, Green Paper and Regulation on GFL. These data were combined with a literature review of current European food policy. This provides a context for the understanding of current policy and also highlights important aspects of European food policy, for example the central place of food risk management.

3.2 National scale

3.2.1 Policy content analysis

Content analysis is a family of techniques which involve the identification of key words or phrases in a text through structured and systematic coding, allowing for conclusions to be drawn about the message of the piece (Rose, *et al.,* 2014), and new insights to be made from existing communications (Hewitt, 2009). This was carried out on national and European food safety policies.

Policy documents were loaded in the content analysis software package (Nvivo 11) (Neuendorf, 2016) as PDFs. For the most frequent words, each source was selected individually and a query was run, selecting word frequency with parameters of the 10 most frequent words (to give a reasonable number for discussion), minimum length of 4 letters (to avoid the repetition of common words) and a grouping of stemmed words (providing the most representative grouping of common words).

Following this, quantitative analysis was carried out, noting the word, its count and weighted frequency for that document. Qualitative analysis was conducted by examining the context in which the word occurred, by reading the sentences before and after the phrase to determine the context of its use. This was used to determine if all the occurrences were in the same context.

A keyword search was performed by carrying out a text search under the query function. A single document source was selected and the predefined keyword was entered into the search field (as seen in Tables 4.3 and 4.4), selecting a spread of none and grouping of stemmed words. Quantitative analysis was performed by noting the count of the word and percentage coverage in the entire document. Qualitative analysis was carried out by examining the context of the placement of the keyword, reading the surrounding paragraph.

Qualitative and quantitative analyses were carried out on all policy documents and the results were compiled into an Excel spreadsheet. The count and frequency of the top-10 words and keywords were compiled in tables. These were then analysed, discussing why these words occurred at these frequencies, using word frequency as a proxy for how important it is in the document.

3.3 Local scale

3.3.1 Surveys and analysis

Surveys were chosen to gather information from organisations as they allow for contact with a wide and disparate population, and collection of both quantitative and qualitative results. Surveys were carried out from 6th June 2017 to 3rd July 2017.

In total, 18 FRO, 4 PF operations and 2 FSA were contacted, providing response rates of 44%, 50% and 100%, respectively. Response rates reported in the literature for email surveys vary from low to moderately-high (15% – 58% (Schaefer and Dillman, 1998; Comley, 2000), making it an appealing choice. The response rates in this study occur within and above this range so are deemed to be acceptable. A list of all the organisations contacted can be found in appendix III.

Surveys were designed to be short, easy to respond to, and encourage maximum interaction and responses (Galesic and Bosnjak, 2009). Most questions were formed based on the Likert-scale of

responses to allow for selection of a given answer. This makes it easier for the respondent to reply and for the results to be analysed as there are a finite number of responses (Allen and Seaman, 2007). Answers were limited to between 2 and 5 to allow for the maximum validity of the results (Matell and Jacoby, 1971). Other questions are based on open-ended questions to allow for the respondents to expand on their views on issues and provide a deeper level of detail (Reja, *et al.,* 2003). Responses were therefore more varied and were coded based on their theme to allow for some overlap in results (MacQueen, *et al.,* 1998). While this allowed for a more generalised presentation of the results, further analysis was carried out on the individual responses. Survey templates can be found in appendix III.

Graphs were prepared for all relevant results. These data were analysed, using the number of organisations which provided a response as an indication of the sectors opinion towards a certain topic, and analysing individual results from the open-ended questions. Results from FRO and FSA were analysed and discussed under similar themes comparing and contrasting responses.

3.4 Case study: Public fridges

Case studies are a flexible research method which allow for examination of various aspects of a topic under one common aim (Yin, 1984). Here, a case study was chosen to examine this emerging and contemporary issue through a variety of sources of evidence (Yin, 1984).

3.4.1 Media analysis

MA is an interpretative analytical approach to determine the ways selected topics are reported on in online news media articles (Berger, 2013). Media content analysis also determines the main message of a media piece (Macnamara, 2005).

A search was conducted for the term 'public community solidarity fridges' in Google News on 10th July 2017. All article headlines were analysed for their relevance to the topic, and any recurring themes which did not relate to PF were removed using the exclusion function (-[excluded]). All remaining, relevant articles were saved as PDFs for content analysis. The article's title, author, location of fridge, date published, type of media and URL were noted in Excel. A line graph was plotted in Excel to show the time the articles were published, and a map was produced in Tableau 10.3 of the number of articles published about each PF operation to show their geographical spread.

The line graph was analysed to show the change in number of articles published over time. Peaks in publication numbers were then analysed to examine what was occurring at that time. The number of fridges covered annually was also recorded to show the trend in the overall topic. The map

allowed for an analysis of the spread of PFs globally. These were analysed based on where the fridges were located and how this could be related to that region.

Articles were analysed thematically using the coding function in Nvivo (Neuendorf, 2016). This involved reading through each article and analysing its theme and several other qualities. A list of themes which were expected to appear in the articles was drawn up and nodes (folders of occurrences) were created in Nvivo (descriptive coding (Welsh, 2002)). New themes which were identified as relevant throughout the coding process (emergent coding) were also included and coded in all articles (Neuendorf, 2016). Qualitative and quantitative analyses were carried out on the node results, noting the number of sources and references, and the overall context in which they were used. This helped determine how important each topic was to the media portrayal of PFs. Informal sentiment analysis was also conducted after reading, determining the overall sentiment of the piece (Liu, 2012).

Google News is a computer-generated news site that aggregates articles from more than 4,500 sources worldwide (Weaver and Bimber, 2008), ranging from major news outlets to local newspapers (Carlson, 2007), grouping similar stories together and displaying them according to each reader's personalized interests and is one of the most popular online news websites in the worlds (Das, *et al.,* 2007). MA by archives such as Google News is good for researching agenda-setting on particular topics as well as analysing public opinion (Weaver and Bimber, 2008).

The issue of meaning and context is difficult to overcome in MA due to the wide range of journalistic techniques (Berger, 2013) and this has resulted in the use of media articles as a form of acquiring public opinion on issues becoming extremely contested (Hansen, 1991).

3.5 Reflections

The methods employed in this study were successful in answering the research questions posed above, but further refinements would allow more accurate and contextual data to be gathered.

With more time, a documentary analysis of European food waste policy, as well as food safety, would have added a greater understanding of the place of food waste management within the EU. This would have allowed for a greater comparison between the aims of food waste reduction and food safety legislation, highlighting any points of conflict at a higher level.

At a national level, with more time, interviews with organisations and individuals involved in the implementation of national food safety policy could have been conducted. This would provide a much greater insight into the ground-level implementation of food safety policy.

In the surveys, with hindsight, greater preparation may have led to better results. More personalisation of the emails and explanation of the purpose and the importance of the study may have increased engagement and response rates (Dillman, 2000). Providing examples for certain questions may also have led to more standard and expected responses.

With more resources a more established method would have been employed for the SMA[2], to record all posts about PFs and provide a greater degree of sentiment analysis towards PFs. A stronger SMA, combined with a formal MA would provide a much better overview of PF operations.

Table 3.1: Strengths and weaknesses of methodologies employed.

Method	Strengths	Weaknesses
Documentary policy review	•EUR-Lex database provides a comprehensive and up to date source of regulatory instruments, giving the analysis the most current results.	•EUR-Lex database returns a large number of results, which must be distilled to the most applicable and important using appropriate classification schemes for impact on FRO operations.
Policy content analysis	•Flexible methodology which can be applied to different documents and topics. •Its simplicity results in a robust method, increasing its trustworthiness (Wesley, 2009).	•Only provides an analysis of document contents, with no real insight into how it is implemented & interpreted (Bowen, 2009). •Lacks any context of the political situation of the policy-making process. •Results for the same word under keyword and most frequent differed, suggesting different measures of frequency, causing issues with interpretation.
Email surveys	•Fast speed of data collection (Ilieva, *et al.,* 2002). •Allows for contact with a much wider population, including international comparisons (Ilieva, *et al.,* 2002).	•Only provides one point of contact with the respondent, so further clarification on questions cannot be provided, possibly leading to misinterpretation, affecting overall results.
Media analysis	•Allows for a general and comprehensive overview of an entire topic, with geographical, temporal, thematic and sentiment analysis. •Systematic method which can deal with large volumes of data.	•Reliance on published articles as source, so influenced by media factors. •Superficial overview of topic in media, and not exhaustive analysis of all possible occurrences. •Algorithmic search engines can exclude articles which don't match current parameters. •Limited to articles in English.

[2] Methodology used for social media analysis outlined in appendix IV

4.0 Results and Discussion

In this section the results of the multi-scalar study of the place of food safety in redistribution are presented. First, the EU analysis of food policy instruments is analysed and discussed. An assessment of British and Irish national food safety policy follows. Surveys with local FRO and national FSA on their opinions about food safety regulations and future changes are then examined. A case study on PFs is presented to investigate food safety in redistribution more closely. All results are discussed in light of current literature, placing the results in line with existing research on the topic.

4.1 European scale

4.1.1 Analysis of European food policy instruments

Table 4.1: EU policy instruments definitions.

Policy Instrument	Definition
Regulation	A Regulation is a legislative act which is immediately and simultaneously enforceable as law in all EU Member States. A Regulation supersedes national laws dealing with the same topic, and national legislation reflecting it must be drafted by all Member States (Vittuari, *et al.,* 2015). There are 8 EU Regulations which directly affect food safety standards in European businesses.
Directive	A Directive is a legislative act of the EU that is not directly applicable but needs to be transposed into national law. The objectives are outlined by the EU and the Member State chooses the methods to achieve these. Directives are implemented in Member States by changing national laws (Vittuari, *et al.,* 2015). Directives are commonly used to harmonise legislation across the EU.
Decision	A Decision is a legal act that is binding upon those to which it is addressed. Not every EU Decision generates new national laws (Vittuari, *et al.,* 2015).
Communication	Communication Documents are proposals and other acts used in the legislative procedure. Preparatory acts can take the form of communications, recommendations, reports, white papers and green papers (Vittuari, *et al.,* 2015).
Institutional Change	Institutional changes are changes to the structure, form, function or powers of EU institutions (Randall, 2007).

Table 4.2: EU policy instruments relating to food safety regulation.

Date	Title	Details
EU Regulation		
2011	Regulation (EU) 1169/2011 on the provision of food information to consumers	This determines the level of information required for consumer health protection. It considers the health, environmental and ethical issues surrounding food.
2006	Commission Regulation (EC) 1664/2006 implementing measures for certain products of animal origin intended for human consumption & repealing certain implementing measures.	This strengthens food safety controls on animal products which enter the European consumer market.
2006	Commission Regulation (EC) 1881/2006 setting maximum levels for certain contaminants in foodstuffs.	This lays down the protection of public health from food contaminants. It defines tolerance limits for contaminants not to be exceeded for sale on the market.
2004	Regulation (EC) 852/2004 on the hygiene of foodstuffs.	This ensures the hygiene of foodstuffs at all stages of production. It outlines hygiene provisions which food businesses must adhere to and suggests hygiene protection methods.
2004	Regulation (EC) 882/2004 on official controls for verification of compliance with feed and food law, animal health, animal welfare rules.	This outlines the procedures carried out to verify compliance with food safety and hygiene regulations.
2002	Regulation (EC) 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety	This is the main food law in Europe and establishes the EFSA. This allows for the free movement of foodstuffs within the EU by laying down universal standards. This aimed to prevent unsafe foods from entering the European market and established a high level of public health protection
1997	Regulation (EC) 258/97 concerning novel foods and novel food ingredients	This outlines new foods and ingredients which are approved for sale on the European market.
1993	Council Regulation (EEC) 315/93 laying down Community procedures for contaminants in food	This sets maximum tolerance levels for substances which are not intentionally added to foods.
EU Directive		
2002	Council Directive 2002/99/EC laying down the animal health rules governing the production, processing, distribution and introduction of products of animal origin for human consumption	This outlines the strict hygiene standards which must be observed at all stages of food production.

2000	Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community	This improves food safety by preventing the entry of dangerous invasive species into the market. This includes the destruction of batches of foodstuffs if a single product is contaminated.
EU Decision		
2013	Decision No 1386/2013/EU on a General Union Environment Action Programme to 2020 "Living well, within the limits of our planet".	This outlined the European objectives of a green, resource efficient economy. This addresses a number of environmental issues, including food safety and sustainability. It aims to reduce the lifecycle of foodstuffs.
EU Communication		
2010	COM (2010) 235 final. Communication on future steps in bio-waste management in the European Union.	This outlines the steps necessary to optimise bio-waste management, including food waste. It outlines the prevention, treatment and research in the area of bio-waste.
1997	COM (1997) 176 final. The General Principles of Food Law in the European Union, Commission Green Paper	This green paper provided the framework for the development of an official European food safety policy.
Institutional Change		
2002	Formation of European Food Safety Authority	The establishment of the EFSA created a single institution which oversaw food safety within the EU and shifted assessment towards a scientific risk assessment based procedure.

A variety of different EU regulatory instruments are used to control food safety management in food businesses, including FRO. Each regulatory instrument results in a different change in the operation of food businesses, so examining each is important to understand the variety of different regulations which FRO operate under. Examining these temporally also provides an understanding of the evolution of food safety policy in Europe. Selected instruments are discussed below.

COM 176 is the GFL Green Paper which was formed due to numerous food crises in the 1990s (Vos, *et al.,* 2005). This outlined a much wider number of food safety issues than ever discussed before (Regattieri, *et al.,* 2007), stating that current legislation was not meeting the "needs of consumers, producers, and manufacturers of food products" (Leibovitch, 2007). While this document did not enforce any regulations on FRO, it led to Regulation 178/2002, which is enforced.

Directive 2002/99/EC outlined hygiene standards which must be met at every stage of the food production cycle, ensuring that it is safe and uncontaminated (Ndraha, *et al.,* 2017). This provided

more concrete standards and sets limits for various substances. Once transposed into national legislation these were directly applicable to FRO.

Regulation 178/2002 provides the basis for the GFL and is one of the most important pieces of EU legislation relating to food policy (van der Meulen, 2013). This sets down general principles, defines what safe food is, outlines the importance of food risk management and assigns responsibility for food safety (van der Meulen, 2013). This acts as a guide for food safety legislation, without specifying set standards (Gomes-Neves, *et al.,* 2007).

The EFSA was established in 2002, marking a major shift towards a new form of food safety governance, spurred by institutional failure and lack of public confidence in food safety at the time (Klintman and Kronsell, 2010). This changed the regulation of food safety at national scales as the EFSA was designed to be a model for the implementation of FSA in MS. The establishment of the EFSA also signalled a shift towards a more scientific and performance-based approach in the identification of food safety issues, with the EFSA providing decision support (Klintman and Kronsell, 2010; Henson and Caswell, 1999). It also introduced the risk management framework to food safety management within the EU (Henson and Caswell, 1999). This, along with the subsequent national FSA provided greater support and information for smaller food businesses such as FRO.

Regulation 852/2004 provides general hygiene rules for the entire EU. This focuses on the controls needed to ensure food safety standards are met, and clarifies the responsibilities of food businesses in food safety (Veiros, *et al.,* 2009). It outlines the legislative requirement for food safety management systems based on HACCP in all food businesses (Taylor, 2008), and national legislators to aid in the production of guidelines for its implementation in different food sectors (Egan, *et al.,* 2007). This is important for FRO which operate a variety of different food safety management systems due to their informal structures. While previous regulations controlled the production of safe food, this ensured that they demonstrate how they make sure food is safe (Veiros, *et al.,* 2009).

Decision 1386/2013/EU is a document which aimed to encourage a more sustainable and circular use of products within the EU, including food. It called for a coherent and joined-up approach to many issues from various policy areas, such as food safety and food waste (Čavoški, 2015). This had no direct effect on FRO.

While this analysis provides a basic overview of the types of regulatory instruments which influence EU food safety, a further examination of individual documents will provide greater assessment of the importance of food safety. For this reason, a content analysis of Regulation 178/2002 is carried out below.

4.1.2 Content analysis

A content analysis of the main piece of European food policy (Regulation 178/2002) provides an account of the place of food safety and related issues in EU food policy. Keywords show the importance of selected topics, while the most frequent words demonstrate the most commonly discussed topics. This leads to a greater insight into this important piece of legislation.

Table 4.3: Content analysis of European food safety policy. Keyword and most frequent word search results, showing count number and percentage frequency.

Keywords	Count	Frequency (%)		**Top 10 words**	Count	Frequency (%)
European						
Sharing	1	0.01		Food	270	2.71
Redistribution	0	0		Authority	218	2.19
Distribution	22	0.12		Scientific	182	1.83
Safety	62	0.17		Feed	156	1.57
Hygiene	0	0		Community	155	1.56
Risk	105	1.05		Member	144	1.45
Waste	0	0		Article	119	1.2
Security	3	0.01		Risk	105	1.05
				Commission	101	1.01
				States	97	0.97

From Table 4.3 it is clear the ideas of food sharing/redistribution are not covered in this policy. This shows, as has been discussed, that there is no formal regulation of food redistribution within the EU's main food safety policy (Gram-Hanssen, *et al.,* 2016). This Regulation can apply to food redistribution activities indirectly through regulation of food safety in food businesses, as this covers all businesses which serve food, without having to state each sector (Henson and Caswell, 1999).

The keyword 'distribution' provides a more general reflection of the regulations on the distribution (and therefore redistribution) of food. This is mentioned 22 times with references to the coverage of this law to the entire food chain, including "the production, manufacture, transport and distribution of foodstuffs" As food redistribution is a form of distribution, this policy applies to it (Midgely, 2014).

'Safety' is a relatively common word in the European document with 62 occurrences (0.17%). These mainly address food safety issues within the food chain and ensuring that food safety standards are maintained at high levels, as well as references to the establishment of the EFSA. Food safety has such a high relative frequency as the main aim of this policy is the setting down of general principles and regulations for food safety standards (van der Meulen, 2013). As there were few other regulations relating to food safety prior to this, it features quite heavily in this document.

'Risk' is the most common keyword in this document, occurring 105 times with a frequency of 1.05%. This has such a high frequency due to the importance of risk in the new food safety management system, as well as the high number of mentions of risk analysis, assessment and management (Demeritt, *et al.,* 2015). After this Regulation, the overall management of food safety in Europe became more scientifically-focussed, using data to measure the risk to human health posed by certain scenarios (Klintman and Kronsell, 2010). This policy also outlines the methods for risk analysis, assessment and management (as discussed in appendix I).

The top-10 most frequent words show the main policy themes. 'Food' is the most common term in the policy, accounting for 2.71%. This is unsurprising given the topic of the policy. Other common words which occur, occur mainly due to the formal language of EU policy documents (Radaelli, 2000) (Community, 155/1.56%, Member, 144/1.45%, Article, 119/1.2%, Commission, 101/1.01% and States, 97/0.97%) or through repeated use (Authority, 2.18/2.19%). The remaining words show that the policy also focuses on feed (156/1.57%) as well as foodstuffs sold within the EU and once again highlights the importance of the risk assessment framework in the new vision for European food safety (Risk, 105/1.05%). Overall these words show that this policy focuses on the scientific risk assessment of food and feed (Houghton, *et al.,* 2008).

While European policy and regulations are important and provide a major influence on national policy, they often simply outline the principles under which regulations should be formed. To understand a more contextual and practical implementation of these principles, national food safety policy must be examined.

4.2 National scale

4.2.1 Content analysis

A content analysis of Irish and British national food safety policies will provide a more focussed understanding of the regulations which FRO must work within, examining the main themes discussed within them.

Table 4.4: Content analysis of Irish and British food safety policy (keyword). Keyword search results showing count number and percentage frequency. The policies examined are European Communities (GFL) Regulations (2007) [Ireland] and The Food Safety and Hygiene (England) Regulations (2013) [England].

Keywords	Count	Frequency (%)		**Keywords**	Count	Frequency (%)
Ireland				England		
Sharing	0	0		Sharing	0	0
Redistribution	0	0		Redistribution	0	0
Distribution	4	0.07		Distribution	8	0.04
Safety	10	0.09		Safety	32	0.08
Hygiene	3	0.03		Hygiene	113	0.34
Risk	2	0.01		Risk	17	0.03
Waste	0	0		Waste	0	0
Security	0	0		Security	4	0.01

As with the European Regulation, food sharing/redistribution do not feature in the policy of either MS. This only shows that there is no direct regulation of food sharing. Similar to the policy on which they are based, the term 'distribution' is more common, occurring 4 time in Irish policy and 8 in English, both having similar contexts of the "production, processing or distribution of food".

Food safety is also a very common keyword in both policies, with 10 (0.09%) in Irish and 32 (0.08%) in English, with references to the maintenance of food safety standards, and policy and institution names (FSAI, FSAUK). This shows that food safety management is the main focus of both these policies. Similar to safety, food hygiene is a common theme (Irish, 3/0.03%, English, 113/0.34%), but this is mainly due to their frequency in other policy titles (Food and Feed Hygiene Regulations), as well as outlining food hygiene rules and procedures (Egan, *et al.,* 2007).

'Risk' is also a topic in both policies, occurring twice in the Irish (0.01%) and 17 times in the English (0.03%). Both highlight the need to avoid or reduce the risk posed by food to the final consumer (Demeritt, *et al.,* 2015). This is different from European policy which focusses mainly on risk management in food (Houghton, *et al.,* 2008), indicating that the intricacies of food risk management are left to European policy, while both national policies are more concerned with food safety and hygiene standards (Yapp, *et al.,* 2005).

Table 4.5: Content analysis of Irish and British food safety policy (most frequent words). Most frequent word search results showing count number and percentage frequency.

Top 10 words	Count	Frequency (%)		**Top 10 words**	Count	Frequency (%)
Ireland				England		
Food	144	4.76		Regulations	506	4.51
Regulations	126	4.17		Food	313	2.79
Business	50	1.65		Paragraph	154	1.37
Operator	46	1.52		2004	140	1.25
Officer	41	1.36		Requirements	136	1.21
Person	38	1.26		Operators	129	1.15
Official	34	1.12		Business	122	1.09
Authorised	33	1.09		Hygiene	113	1.01
Sample	32	1.06		Authority	93	0.83
Authority	31	1.03		Person	86	0.77

6 of the top-10 words occur in both policies. 'Food' and 'regulations' are the top-two terms in each national policy, with 144/4.76% and 126/4.17% respectively in the Irish policy and 313/2.79% and 506/4.51% in the English. Both of these occur significantly more often than the other words, because the objective of both policies is the regulation of foodstuffs (Yapp, *et al.,* 2005).

Another common theme in both documents is the organisations to which these regulations apply, food businesses/operators. 'Business' occurs 50 times/1.65% in the Irish policy and 122 times/1.09% in the English, with operator(s) occurring 46/1.52% and 129/1.15%, respectively. While European policy is more general and outlines principles of food safety, national policies are more focussed on implementation, and as such must specify and define who these regulations apply to. The responsibilities and requirements for food businesses in relation to food safety are outlined in these documents (Mensah and Julien, 2011; Bolton, *et al.,* 2008).

Overall, both of these policy documents show a more applied regulatory approach to food safety, with less references to scientific bases and risk management, focusing more so on who the regulations apply to and what requirements they must meet.

Further analysis has been carried out on specific issues surrounding the evolution of both European (Alemanno, 2006; Ansell and Vogel, 2006) and Irish and British food safety policy (Devaney, 2016; (Yapp, *et al.,* 2005), but the area would benefit from additional in-depth research relating to food sharing and redistribution practices. In this study, eliciting the views of those working within FRO has been taken as a first step towards furthering this area of study.

4.3 Local scale

4.3.1 Survey results

Surveys with FRO and national FSA provide information on the place of food safety within the redistribution sector. Methods which they use to ensure food safety standards and their views on future changes to regulations are also elicited. FRO and FSA were both surveyed to gather the opinions of both the regulator and regulated operations on this topic. These results show trends and indications of the opinions of FRO towards the topic of food safety. Full survey results can be found in appendix V.

Table 4.6: Survey respondents in study. Name of organisations which responded to surveys, including their locations and the services they provide.

Organisation Name	Location	Redistribution Service[3]
Food Redistribution Organisation (FRO)		
Foodcloud	Ireland	General redistribution
Best Before Project	UK	Fresh food redistribution
Community Shop	UK	General redistribution
Olio App	UK	General food sharing
The People's Kitchen	UK	Hot meals
Plan Zheroes	UK	General redistribution
Neighbourly	UK	General food sharing
North London Action for the Homeless	UK	General redistribution
Food Safety Authority (FSA)		
Food Safety Authority of Ireland (FSAI)	Ireland	National FSA
The Food Standards Agency (FSAUK)	UK	National FSA

[3] A detailed analysis of the redistribution services of surveyed FRO can be found in appendix VI

Table 4.7: Food safety authority survey response. Responses from FSA to survey questions outlining their views on food safety in food redistribution, in the EU and future changes to regulations.

Survey Question	Food Safety Authority of Ireland (FSAI)	Food Standards Agency UK (FSAUK)
Why is food safety so important in food redistribution?	• People are entitled to safe food, whether purchased or donated • There is a particularly high risk of donated food causing a food safety issue as it is close to the end of its shelf life. Food may also be donated due to labelling or packaging issues and this may alter the storage condition and result in spoilage. The donation of hot food causes particular safety concerns as it is difficult to manage.	• The underlying principle of food law is that food placed on the market for human consumption must be safe to eat, and this cannot be undermined, even in food redistribution. • The people which use this redistributed food are also often vulnerable groups who may not have access to medical services, so they are at a higher level of risk.
How would you like to see food safety regulations deal with food redistribution in the future?	• There is sufficient provision and flexibility within current food safety legislation to cover food redistribution. • Guidance on interpretation of legislation and feedback between regulators and redistributors is important for the future • EU guidelines will help both parties and are currently being drafted. • FSAI are developing guidelines for Irish food donors, recipients & distributors.	• A more pragmatic approach to food redistribution should be developed, identifying the points in the food chain where food can be safely redistributed. • Guidance from the EU and national governments would be preferable to regulations. • More feedback and partnerships between redistributors and regulators.
Do you think national or European standards and regulations would be better, and why?	• Clarification from current European policy and guidance and communication from the EU would be useful to guide this emerging sector, but national policy and interaction with national food redistributors is also important.	• Harmonised food safety and hygiene regulations is useful across the EU and this is beneficial as many food businesses operate across Europe. • Allowing for national legislation is also important for issues on which Member States have differing opinions.
Any further comments?	• There are many challenges with food redistribution from the current system. Food businesses will need to manage the act of donation through their current food safety management systems. • There are also many practical problems in certain sectors, e.g. traceability and record keeping in retail and catering. • Smaller food redistributors may also not see themselves as food businesses and not have sufficient food safety training of knowledge.	• This is a growing area and regulation and control is actively being developed • There is much good work being carried out at a local level which could be efficiently up scaled and rolled out further, but this is difficult at a national level as there are a large number of different sized charities working in this area in an ad hoc basis.

4.3.2 Why is food safety so important?

FRO placed food safety as one of their highest concerns, with all respondents stating that they saw it as a very important consideration in their operations. This shows the high level of awareness which they have about it and high level of concern which they place on it.

50% of FRO stated that current food safety regulations which they must abide by had not been stated to them by the relevant authority, while 50% said they had. This is similar to a Gram-Hanssen, *et al.* (2016) study where 67% of Scandinavian FRO responded that regulations were explained to them. This indicates some degree of interaction between food redistributors and regulators in order to explain how the regulations apply to their operations. Clear explanation from relevant FSA will allow for the correct interpretation of regulations and compliance. This is why communication between regulators and regulated organisations is important (Gram-Hanssen, *et al.,* 2016).

The higher degree of explanation of regulations in the Gram-Hanssen, *et al.* (2016) study could be due to the greater number of FRO in those jurisdictions, meaning FSA are more experienced in dealing with the issue of food redistribution. The Finnish FSA in particular is proactive in relation to food redistribution regulations and is among the first EU MS to have specific guidelines (Evira, 2015).

In spite of this, all organisations stated that they are very knowledgeable about food safety within their operations. This shows an understanding of the importance of food safety within their activities as they have a high level of knowledge and interest in its status. This is a self-assessment of their own knowledge which may be inaccurate, but this does show the importance which they place on food safety.

Unsurprisingly, both FSA stated that they thought food safety is very important in redistribution services, highlighting both the general need for food safety control, and within a sector with high-risks such as food redistribution. Both organisations identified that food safety is a universal right, stating that everyone has a right to food which is safe to consume (Codex Commission, 2001). FSAI identified the high-risk nature of donated food as a reason for the high importance of food safety in redistribution (Zurek, 2016). This is because food safety issues are more likely when a product is near its end-of-life date. FSAUK also identified the vulnerable and high-risk nature of those receiving the food (Garthwaite, *et al.,* 2015). These are people which have little or no choice in receiving this food and who require it for sustenance, whether it is safe to consume or not. This shows the risk-based approach used by European FSAs (Koutsoumanis and Aspridou, 2016). The analysis of varying risks within redistribution services (high-risk status of hot meals) also highlights their acute assessment of food safety within this sector.

4.3.3 Strength of regulations

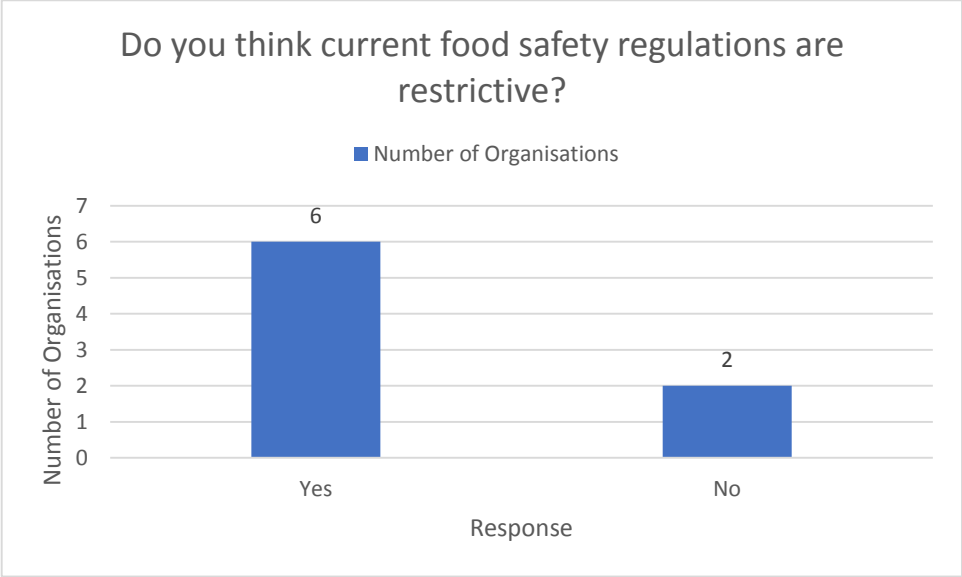

Figure 4.1: FRO survey response on restrictiveness of food safety regulations. Most respondents stated that they believe regulations are too restrictive.

The majority of organisations surveyed stated that they believed that current food safety regulations (and the interpretation of) are too strict. This shows that they believe that food safety regulations restrict the amount of food they are able to redistribute, thus restricting their activities. Regulated organisations will always suggest for less regulation (Henson and Caswell, 1999), but this shows that a very high percentage of redistributors are concerned with how restrictive the regulations are. It is clear that redistributors see and understand the important place of food safety in redistribution, and support regulations to protect public health, but this question indicates that they believe that these regulations go too far, are too cautious and encourage more food waste.

In this study, 75% of FRO stated that they feel food safety regulations are too strict and restrictive, while a similar (but larger) survey of Scandinavian FRO found that only 12% felt regulations were restrictive (Gram-Hanssen, *et al.,* 2016). As all European countries have similar regulations (Gram-Hanssen, *et al.,* 2016) the variation could not be due to this. Here, further explanation on how they found these regulations to be restrictive was not sought, so exactly how restrictive they found them cannot be ascertained, therefore these results are not as well supported.

Another question found that 7 out of 8 organisations surveyed described the current regulations which affects their operations as strong. Strong regulations ensure a high standard of food safety and protect public health.

4.3.4 Governance frameworks

Figure 4.2: FRO survey response on food safety management systems. A variety of different food safety management systems are used in these organisations, with internal checks being the most common.

Different food safety procedures are used in the different organisations. 7 organisations use internal checks as part of their procedures, which involves manually checking food to judge if it is suitable for redistribution (Mensah and Julien, 2011). A study on the implementation of food safety management strategies in general food businesses found that a similarly high percentage of operators (77%) use internally developed systems (Mensah and Julien, 2011). This allows for the system to be developed and adapted to the specific operation, which is useful in FRO as they often vary in shape and size. 3 organisations use external audits, which involve a third-party checking the food to ensure it is safe to consume (Nychas, *et al.,* 2016). 4 organisations only accept food from registered donators and 2 require the signing in of food. These introduce responsibility to donation as any unsafe food can be traced back to its source.

Table 4.8: Regulatory frameworks surveyed FRO adhere to.

Title	Regulation Type	Details
European		
Regulation (EC) 178/2002 laying down the general principles and requirements of food law, establishing the EFSA and laying down procedures in matters of food safety	Regulation	This is the general food law in Europe which establishes food safety standards and the EFSA.
Regulation (EC) No 852/2004 on the hygiene of foodstuffs.	Regulation	This outlines the hygiene standards which businesses must adhere to and the procedures which they must follow to ensure food safety.
Regulation (EU) No 1169/2011 on the provision of food information to consumers	Regulation	This outlines the information which must be made available to the consumer on a food label.
Ireland		
European Communities (General Food Law) Regulations (2007)	Regulation	Irish implementation of EU Regulation (178/2002) and general food safety policy for businesses in Ireland.
Health (Country of Origin of Beef) Regulations (307/2006)	Regulation	This provides information on the origin of beef to consumers.
Food Safety Authority of Ireland Act (1998)	Regulation	This act established the FSAI in Ireland.
Hygiene in the Catering Sector (IS 340/2007)	Standards	This provides standards for the hygienic preparation of food in businesses.
Hygiene in Food Retailing and Wholesaling (IS 341/2007)	Standards	This provides standards for the hygienic handling of food in retail and wholesale.
England		
Food Safety Act (1990)	Regulation	This is the GFL in the UK and lays down food safety standards for food business.
General Food Regulations (2004)	Regulation	UK implementation of EU Food Law Regulations (178/2002).
The Food Safety and Hygiene (England) Regulations (2013)	Regulation	This is the general food safety policy for businesses in England.
Guidance on the Application of Date Labels to Food (2011)	Guidance notes	These are DEFRA guidelines on the use of best before and use by dates.
Guidance Notes for Food Business Operators on Food Safety, Traceability, Product Withdrawal and Recall (2007)	Guidance notes	These are FSAUK guidelines to ensure compliance with certain articles in EU Food Law Regulations (178/2002).
General		
Occupational Health and Safety Management (OHS) BS 18001	Certification	This is a series of standards and best practice procedures to ensure health and safety in all parts of a business.
Hazard Analysis and Critical Control Points (HACCP)	Certification	This is a set of procedures which ensures the safety of food produced by businesses.

The different multilevel governance frameworks which these organisations operate within impose different standards to ensure food safety. European regulations provide strict standards to ensure the safety of all food sold within the EU (Koutsoumanis and Aspridou, 2016; van der Meulen, 2013). They also ensure a minimum level of information which should be included on food labels to inform the consumer of its safety status (Trienekens and Beulens, 2001).

Ireland has several regulations which set out the standards for food safety and the information which must be provided to ensure consumers do not consume unsafe food (Devaney, 2016). Ireland also ensures food safety through Irish standards for levels of hygiene which must be adhered to in Irish food businesses (Rahman, 2017). These set out more practical standards which a business can achieve accreditation for meeting.

The UK also has its own regulations to implement food safety standards for food businesses which operate within the country. DEFRA provide guidance notes to British businesses on the implementation of certain UK and EU policies to ensure they are compliant and upkeeping high levels of food safety (Mensah and Julien, 2011).

In general, all food businesses can also receive certification for meeting food safety and hygiene standards, both business-wide and in hazard and risk identification and reduction. Certification is a form of private food safety regulation, involving product quality standards which are set, monitored and certified by third-parties (Henson and Caswell, 1999). This may be voluntarily sought by a business, or required to do business with other companies (Henson and Caswell, 1999).

4.3.5 Changes to future policy

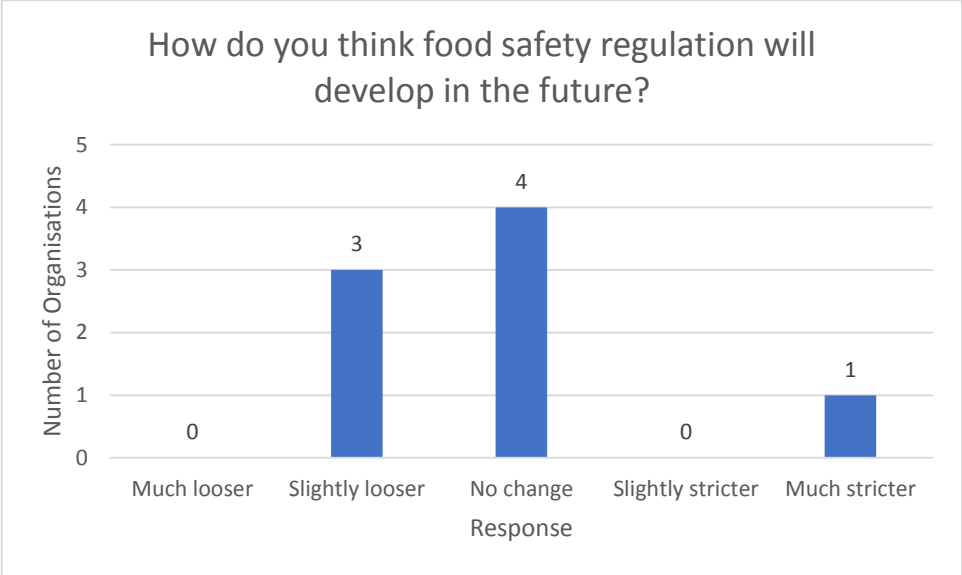

Figure 4.3: FRO survey response on future development of food safety regulations. This outlines the direction FRO think regulations will take in the future, with the majority predicting no change.

The majority of organisations surveyed responded that they think there will be no change in regulations in the future, with 3 of the 8 respondents suggesting that they think regulations will become slightly looser in the coming years, with less regulations but some more food safety standards. 1 organisation (Foodcloud, the only Irish respondent) replied that they think regulations will become much stricter in the future, with more regulations and restrictive measures to food redistribution.

The large number of organisations which responded that they think there will be no change in regulations indicates that that they are unclear or unsure how regulations will develop in the future and that there is a general lack of feedback between regulators and redistributors. This lack of communication has been highlighted in several studies (Gram-Hanssen, *et al.,* 2016; Buksti, *et al.,* 2015), and is also reflected in the suggestions from this study. More communications between these two actors would lead to more streamlined policy and standards. 3 of the respondents replied that they predict slightly looser regulations. This reflects suggestions by both national FSA that future changes to regulations should be in the form of European guidelines on the interpretation of food safety regulations for the redistribution sector (Gassin, 2017). This would result in only the correct regulations being applied to these organisations, thus possibly resulting in less regulations. It is also possible that more regulation of food redistribution could occur in the future, as predicted by Foodcloud, as this is such a new sector which currently lacks formal regulation (Gram-Hanssen, *et*

al., 2016). As European officials become more aware of this practice they may form new regulations which would be directly applicable and may be stricter.

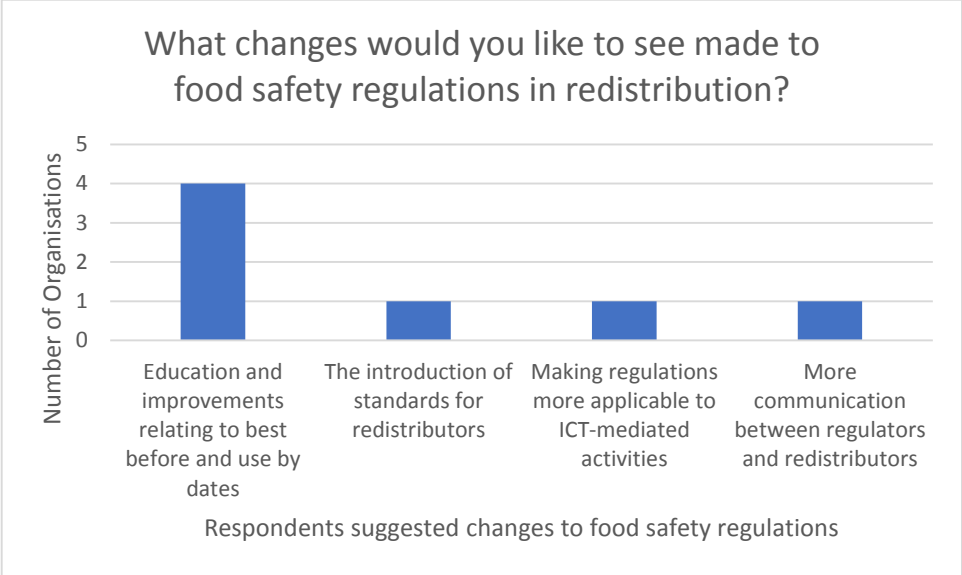

Figure 4.4: FRO survey response on changes to food safety regulations. The clustered results from the open-ended questions show a variety of suggested changes, with improvements to best-before dates the most popular.

The majority of respondents suggested that there be more education and improvements to the current best-before and use-by dates system for denoting food spoilage. This is suggested for all actors involved in food safety, food producers, policy makers, consumers and redistributors. Date labelling is the largest policy-related driver of food waste at a retail and household level (Canali, *et al.,* 2014), and in the EU (Vituarri, *et al.,* 2015). Greater guidance to help consumers interpret the two dates is required (Canali, *et al.,* 2014). In Norway, a systematic change from 'use-by' to 'best-before' dates reduced the amount of "expired" food waste at a household level from 34% in 2010 to 23% in 2014 (Gram-Hanssen, *et al.,* 2016). This provided households with a greater understanding of how the dates work (Canali, *et al.,* 2014), and also provides a more standard labelling system, benefitting redistributors.

One organisation suggested the introduction of standards for food redistributors, so that food businesses could consider donating more food. A similar standard quality system is suggested in Hanssen, *et al.* (2015) which would outline standards for all organisations involved in redistribution to make the process more efficient. These standards could also lead to the recognition of redistributors as a part of the food cycle and help streamline the donation of foodstuffs. Certification of donors would make donations and food safety checks easier and quicker (Hanssen, *et al.,* 2015).

Standards would also reduce liability for donators (Vittuari, *et al.,* 2016). They also suggest making the regulations more general and practical, with the introduction of designated and set standards which are more easily measurable.

Another organisation suggested better communication between food redistributors and food safety regulators, to allow for the alteration of regulations from feedback. This communication could lead to less (but more applicable) regulation, favouring both regulators and the regulated. This would involve more connections and debates between organisations which redistribute food, leading to a single voice representing the sector and developing common guidelines. The development of similar regional platforms is suggested in Gram-Hanssen, *et al.* (2016). This notes that many FRO function very efficiently as smaller operations, but a regional platform would allow for more integration and sharing of knowledge and support (Gram-Hanssen, *et al.,* 2016).

Recognition of the increasing place of ICT-mediated operations within this sector is also suggested. The promotion of ICT as a means of improving public communication and access to information is highlighted by the EU (Vittuari, *et al.,* 2016) and ICT also forms a major part of several European FRO, so this is an issue which regulation will have to address in the near future (Buksti, 2015). This suggestion highlights the increasing place of ICT in food redistribution and the difficultly in regulating it. ICT is also used increasingly in food safety management systems (van der Vorst, *et al.,* 2005), so proper recognition and regulation is required.

Both FSA stated that they see no change in the regulation of food safety in food redistribution in the near future, but the FSAUK stated that the medium-long term trend in policy is difficult to predict.

The FSAI states that current food safety regulations are flexible enough to cover the case of food redistribution as they are distributing food to people (Midgely, 2014), and official guidance and guidelines will provide more clarity on the interpretation of legislation in the future, both at a European and national level (Gassin, 2017; Gram-Hanssen, *et al.,* 2016). Communication and feedback between redistributors and regulators is also highlighted as an important step for the future. The FSAUK makes similar points about communication between all parties and guidelines from the EU and MS. This allows for harmonised control of food redistribution across Europe, but also provides the flexibility for national governments to deal with individual issues (Vituarri, *et al.,* 2016). They also suggest that points of redistribution should be identified and guidance provided to the relevant parts of the food cycle (Vituarri, *et al.,* 2016).

4.3.6 Further Comments

Both FSAs identified further issues which make food safety regulation of food redistribution difficult. The FSAI acknowledges that many food redistributors are small charities who do not view themselves as food businesses, and as such do not follow the rules and regulations which govern the handling of food (Gram-Hanssen, *et al.,* 2016). This lack of awareness of food safety issues and the associated lack of food safety training can cause risks to the possibility of unsafe food in the redistribution sector. The FSAUK also makes a note on the many small charities which typically carry out this work. This makes enforcement of regulations more difficult as there are so many organisations.

Food safety regulations have been designed to manage mainstream food practices, but recently new models and approaches have emerged mediated by developments in ICT and other issues such as rising environmental awareness. While food redistribution has been dealt with in some ways, more innovative practices are unlikely to be explicitly addressed in policy and raise important test cases for consideration by food risk regulation. One controversial example which has garnered much media attention recently is public fridges (PFs). These offer a more direct, and less formal way to share and redistribute food, and for this reason regulation is difficult. A case study on food safety in PFs was conducted by carrying out surveys with PF operations to assess the place of food safety in their activities. A media analysis (MA) was also carried out on the topic to analyse how it is reported on in the media.

4.4 Case study: Public fridges

The case study on PFs consisted of two sources of evidence. Firstly, a MA to gain an insight into the coverage (temporally and geographically) of PFs in the media. Secondly, surveys were conducted with PF initiatives to examine the place of food safety within their operations.

4.4.1 Media analysis

The results from the MA on PFs is presented below. The coverage of PFs on the online media archive Google News was analysed geographically, temporally and thematically to understand the coverage and spread of PF operations. Content analysis examines the themes and topics covered in the articles, highlighting many issues about the topic of food safety in PFs.

Table 4.9: List of public fridges from media analysis. This shows the local location of each fridge mentioned in media articles, its name and the number of articles which mention it.

Location of Fridge	Public Fridge Name	Number of Articles
Buenos Aires, Argentina	Tucuman Social Fridge	2
Brussels, Belgium	Corvia Community Frdige	4
Montreal, Canada	BonApp Community Fridge	2
Shanghai, China	Puxiong Community Fridge	1
Prague, Czech Republic	Prague Public Fridges	2
Gori, Georgia	DROA Public Fridge	1
Berlin, Germany	Foodsharing.de Public Fridges	7
Delhi, India	Mar Gregorios Food ATM	1
Kerala, India	Pappadavada Community Fridge	2
Galdakao, Spain	Galdakao Solidarity Fridge	14
Dubai, UAE	Better Deeds Public Fridge	3
Derbyshire, UK	Derbyshire Community Fridge	1
Frome, UK	Frome Community Fridge	1
London, UK	The People's Fridge	2
Milton Keynes, UK	MK Community Fridge	2
Oxford, UK	Botley Community Fridge	1
California, US	Free.Go	2
Auckland, New Zealand	Auckland Community Fridge	1

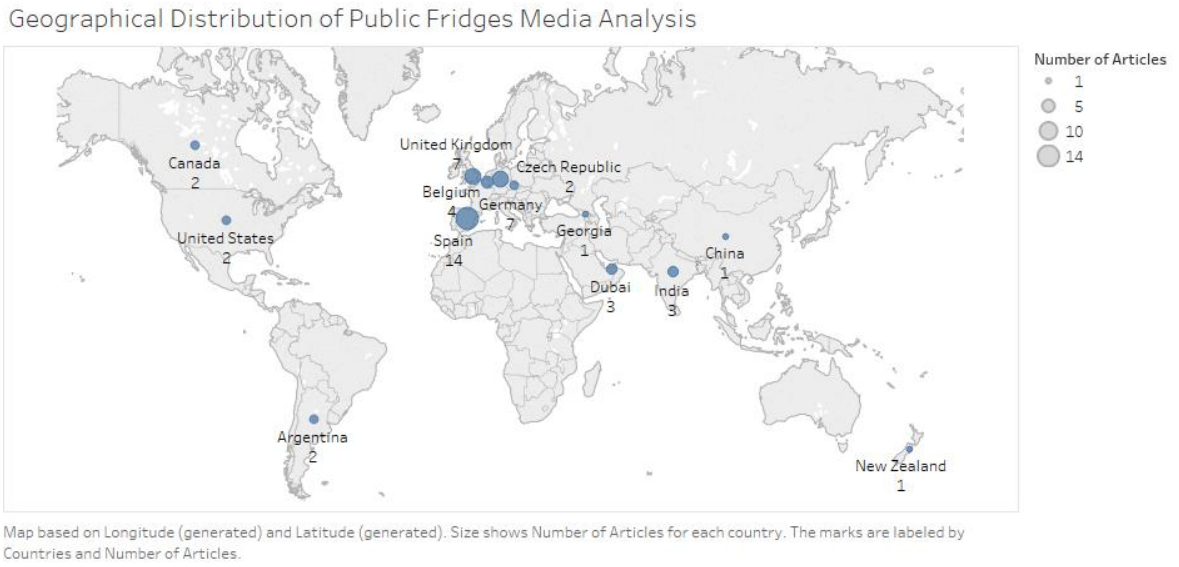

Figure 4.5: Geographical distribution of public fridge articles in media analysis. Marks are labelled with the country and number of articles about fridges in that country. Size indicates the number of articles about each country.

This shows a high media coverage of PF in Europe with 34 of the 49 articles being about 18 different European PF initiatives[4]. The first PF covered in this MA (27-06-14) was the German network of PFs operated by Foodsharing.de. This long period over which they have been operating has shown many of the controversial problems which can occur, such as health and safety officials declaring them a public health hazard (Chies, 2017). The Spanish fridge in Galdakao provides the most articles, with a total of 14. This is due to the successful and established nature of this operation, which is an ideal model to report on (Parikh and Fagan, 2015). There is also a large coverage of fridges in the UK. Unlike many other countries, the media coverage of this country is from several different fridges.

The wide geographical spread, along with the small number of articles in many locations indicates that media outlets report on the opening of new PFs and then provide no further coverage. Novelty has been identified as one of the most important values in news articles, particularly online news (Prati and Lima Junior, 2016). This alters the public perception of fridges as they are only shown in a positive light, as a method to reduce food waste, but there is very little follow-up about any issues which may occur over their time of operation. Further and deeper media coverage would be necessary for MA to provide a full picture of the operation of PFs.

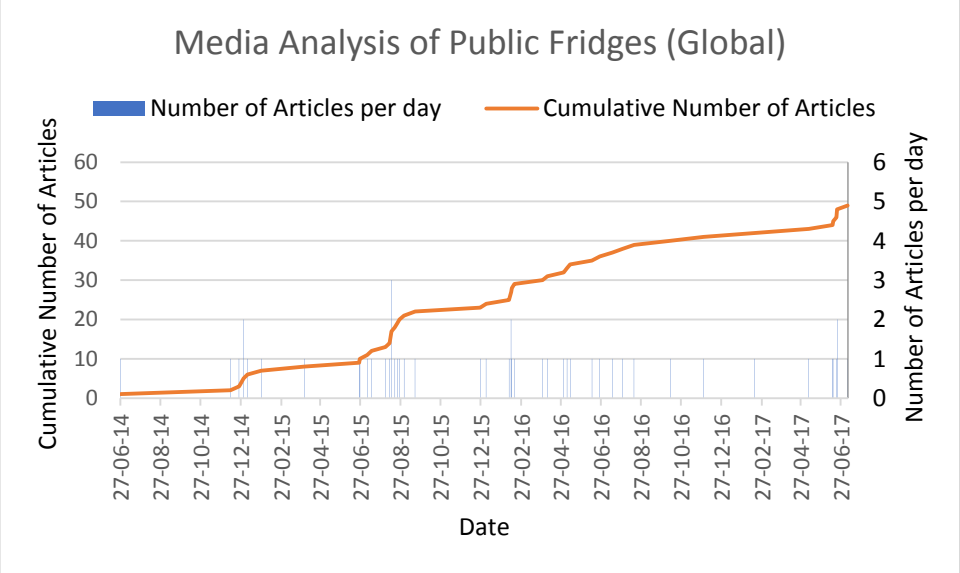

Figure 4.6: Temporal distribution of public fridge articles in media analysis. This shows the number of articles per day (blue bar chart, right axis) and cumulative number of articles (orange line graph, left axis), indicating a steady rise in media coverage of public fridges over recent years.

The earliest articles relating to PFs found during this MA relate to the German PF network (27-06-14). This is often cited as the inspiration for many of the other PFs in Europe (Chies, 2017).

[4] For a detailed MA of European public fridges see appendix VII

The first major rise in articles about PFs occurred in December 2015 and is associated with the introduction of the first Belgian PF, with 5 articles occurring over a two-week period. The next major rise occurs over a longer period in summer 2016 and relates to articles about the Galdakao Solidarity Fridge. This is the most significant increase in the number of articles with a total of 14 occurring over a three-month period. The next significant rise occurs in January 2016 and is associated with articles about the closure of several German PFs due to concerns of health officials, with 4 articles over 2 days.

Following this there is a steady increase in the number of articles about PFs, covering initiatives such as English, Indian, Argentinian and Chinese. The most recent spike in articles in early summer 2017 is a combination of articles about the opening of new PFs in England (Oxford and Milton Keynes) and the use of PFs during Ramadan in Dubai, with a combined total of 7 articles over 2 months.

Table 4.10: Number of articles and number of fridges covered per year in media analysis. This shows that the number of articles on public fridges has increased over recent years.

Year	Number of Articles	Number of Fridges Covered
2014	5	2
2015	18	4
2016	18	11
2017	8	5

Table 4.10 indicates that PFs are an emergent phenomenon. Further in-depth work on PFs is required to explore whether they will continue to grow in number and what role they will play in the future of food redistribution.

Table 4.11: Topics of articles on public fridges in media analysis. This shows that most articles in this analysis were about the opening of new fridges.

Topic of Article	Number of Articles
Opening	34
Health concerns	4
Food waste	11

Table 4.11 shows that the most popular topic covered in the PF MA is the opening of new fridges and this can be linked to the random distribution of articles through time. Articles about food safety officials' public health concerns with the PFs in Germany are the only ones which raise major issues of concern with the operation of PFs. The Foodshaing.de PF network was the first major network of its kind to be established (Chies, 2017). For this reason, they were operating in a very new space,

without any former examples to base their activities on. This may be one reason why they ran into food safety concerns. Later operations learned from the issues raised in previous PFs, and this could be why there are less articles about closures of fridges.

The novelty of topics and the issue of risk are two of the most important factors in media articles (Parikh and Fagan, 2015). Further critical analysis of the operation of PFs and how successful they are in achieving their aims is lacking in most media coverage. They provide very little follow-up on issues relating to public health concerns and safety, and assessments of how successful they are in achieving their goals of food waste reduction are limited.

Geographical and temporal analysis of articles on PFs provides an overview of how they have emerged. Content analysis of the articles will provide a further, in-depth assessment of the topics and themes which are important in this topic.

4.4.2 Media content analysis

Content analysis of the media articles analysed in this study allows for an examination of the main messages and topics which are raised in them. First, a content analysis is presented and the word frequencies are interpreted and discussed. This is followed by a thematic analysis of the articles and the topics they cover.

Table 4.12: Content analysis of articles on public fridges in media analysis. Most frequent word search results, showing count number and percentage frequency.

Word	Count	Frequency (%)
Food	704	3.88
Fridge	531	2.93
Wasting	217	1.2
People	175	0.96
Community	168	0.93
Sharing	151	0.83
City	101	0.56
Public	101	0.56
Solidarity	101	0.56
Refrigerator	98	0.54

The most common word in the selected articles on PFs was ‘food’ (3.88%). This is unsurprising as the topic of food comes up in various parts, food waste, food security, foods which can be shared. The second most common word was ‘fridge’ (2.93%), and once again this is because the articles are about PFs. Similarly, the 10th most frequent word was ‘refrigerator’.

The topic of wasting had a frequency of 1.2%, showing the importance of food waste and highlighting the amount of food which is wasted as a key objective of these initiatives (Tielens and Candel 2014). The terms community (0.93%), public (0.56%) and solidarity (0.56%) can all be used to describe the fridges. Community also occurs in the context of the food sharing community. For this reason, people (0.96%) is also a common term. The working together of people in the community is important to allow for PFs to function properly, as they must donate the food to the fridge (Ganglbauer et al., 2014). The involvement of the community is also important to allow for food safety. The topic of the sharing of food is also common, accounting for 0.83% of the words.

Figure 4.7: Word cloud of most frequent words search results from public fridge articles in media analysis. The size of the word indicates its frequency, highlighting food, fridge and wasting as the most common phrases.

Table 4.13: Thematic content analysis of public fridge articles in media analysis. This shows the themes coded for, the sources (number of articles they appeared in), percentage of the total sources

and references (number of times they appeared within all the articles). This can help show the importance and prevalence of a theme when discussing the topic of PFs in the media.

Theme	Sources	% of Articles	References
	Global		
Sentiment			
Positive	28	58	37
Negative	6	13	12
Primary Definers			
Academic	1	2	1
Business Owner	6	13	6
City Official	5	10	7
Food Safety Official	4	8	4
Organiser/Founder	27	56	27
Volunteer	6	13	6
Themes			
Accepted Foods	11	23	11
Food Safety	24	50	37
Food Security	11	23	15
Food Waste	34	70	64
Grassroots/community	24	50	30
ICT-mediated	14	29	16
Liability	12	23	13
Not Accepted Foods	23	48	23
Not ICT-mediated	5	10	5
Public Health	8	17	12
Regulation	15	31	20
Risk	10	21	15
Rules	29	60	42
Sharing Economy	7	15	8
Urban	14	29	14

Analysis of topics relating directly to food safety regulation in PFs is presented below. Further detailed analysis of additional themes identified in articles can be found in appendix VIII.

The second most common topic occurring in the articles is rules which apply to the operation of these fridges (29 sources, 60%). This is important when examining food safety as these rules define what foods can and cannot be shared help to maintain food safety (Midgely, 2014). The rules which are discussed in the articles include, only registered organisations being allowed to donate food, rules about labelling of donated foods, accepted and unacceptable foods, and how frequently the fridge must be cleared out and checked. The high frequency of the mention of rules in media articles about PFs conveys the high importance of food safety, as well as the public demand for information on food safety practices (Röhr, *et al.,* 2005). Similarly, the theme of food safety (24 sources, 50%)

occurs quite often, highlighting the importance which the media place on food safety in PFs and food sharing (Chies, 2017; Parikh and Fagan, 2015; Röhr, *et al.,* 2005). This is both raising potential issues of food safety and concerns which people have, and stating procedures which are in place to maintain standards. This major concern of food safety issues in food sharing initiatives is the main drive and cause for this study. This theme is also related to the topic of public health (8 sources, 17%) where they state the risks of unsafe food to the public.

Regulation is another common theme which is discussed (15 sources, 31%). It frequently references food safety regulations which led to the closure of German fridges (Chies, 2017). The topic of regulation is also discussed in articles about the Spanish fridge, with the carrying out of a health and safety study to help meet regulations. More general articles also discuss the rise of food redistribution and PFs and the approaching rise in regulation in the area.

While formal regulation of PFs is less frequent than rules to maintain food safety, it is still a very important theme for this study. It shows the lack of regulation and the variation between different initiatives. Coverage of the topic of regulation shows the effects which it can have in the closure of fridges, and the precautionary approach which many organisers take to regulation, with both the German and Spanish fridges consulting legislation and regulations before beginning their operations.

The topic of risk occurs surprisingly rarely considering how important it is in food safety matters (10 articles, 21%), but this is because risk is a very scientific approach to food safety management, while in media articles this is dealt with in more general terms of rules and regulations, hence their higher frequency. References to risk in all its forms are common because environmental risk is a very frequent factor in the media (Hansen, 1991), as there is a high level of public interest in the topic (Röhr, *et al.,* 2005). Specific references to risk in these articles occur mainly in relation to the closure of German fridges and this highlights that negativity is another topic which has been identified as an important factor for news articles (Prati and Lima Junior, 2016). This also relates to public concern and the identification of negative outcomes which may pose a risk.

While media and SMA provide an overview of how PFs are portrayed in the media and the themes which commonly occur, as well as their geographical and temporal spreads, they are fundamentally limited by their sources. Surveys with organisations which carry out PF operations provide a more in-depth and direct form of analysis on the place of food safety in their activities.

4.4.3 Survey results

Surveys with PF operations provide an overview of how they carry out their activities, how they manage food safety in this high-risk area and their opinions on both present and future regulations. This allows for a more fine-tuned assessment of food safety in this high-risk form of redistribution.

Table 4.14: Public fridge operations survey responses. This outlines questions posed to public fridge operations during the survey and their responses.

Survey Question	Frome Community Fridge	Nevera Solidarity Fridge
What are your views on food safety in the operation of public fridges?	Food safety is as important in the operation of a public fridge as it is with any other food business. We would not be able to operate our fridge without maintaining our high standards.	Food safety is very important and rules must be adhered to in order to reduce risk. This is even more important in the case of fridges which are publicly accessible.
What mechanisms do you have in place to deal with food safety?	• Internal checks/ External audits/ Signing in of food • Rigorous cleaning - The fridge is cleaned and the temperature is checked daily and all food is disposed of if it is not within the correct temperature range. The fridge undergoes a deep clean once a week • There are numerous signs stating the rules for those donating and taking food • Food hygiene certificate and training for manager	• Internal checks •External audits •Signing in of food •Donators must be registered
What regulations and governing frameworks do you have to work within?	• Health and safety manual	• Health service • City hall/ public streets service
What are your views on the food safety governing framework you have to work within?	• Food safety compliance is necessary when the fridge is open to the general public. While we ask donators to make sure their food is suitable this is not always the case and these regulations require those responsible for the operation of the fridge to ensure that it is done so safely and for general public health. • These regulations also mean that food hygiene standards are kept at a very good level. • The high food safety standards of the fridge reduce risk and uphold the high reputation of the fridge.	• Compliance with governing public institutions is important as they determine whether the project goes ahead. Compliance with health and safety regulations makes acceptance easier.
What changes would you like to	• Stricter regulation around food waste, insisting that food must be repurposed	None

see made to food safety regulations of food redistribution/public fridges?	in some form, e.g. donation or compost. • As public fridges are a new innovation, health and safety regulations should adapt and change to include how they operate.	

The importance of food safety management

Both PFs stated that they see food safety as very important. Frome Community Fridge believes as they provide food to the public, the safety and quality of the food offered must be good. Nevera Solidarity Fridge similarly believes that food safety is very important in services which are offered to the public. Food safety regulations also help reduce food risk and the potential of causing harm to people (Demeritt, *et al.,* 2015).

Both operations identify the likelihood of food safety issues occurring within their activities as likely. This is symptomatic of the risky nature of their activities which are open to public donations, include foods near their end-of-life and requires set storage conditions.

Each organisation has a variety of different mechanisms to ensure these food safety standards are met. Both organisations use internal checks to check the quality and safety of foodstuffs in the fridge. External audits are also used in both, where a third-party checks the food safety conditions and procedures in place (Nychas, *et al.,* 2016). Both fridges also use the method of requiring their donators to sign in when they donate food so they can track donations. Nevera requires that the donators are registered with them, which allows them to only permit reputable food businesses to donate. Frome has rigorous cleaning regimes to ensure that the fridge itself is clean, the food inside is within date and that they are stored at the correct temperature.

Regulations and governing frameworks

Frome notes that food safety regulations are required because as operators of the fridge, they are responsible for the safety of those which use it and must ensure that the food which they offer is safe to consumable. Regulations maintain high standards of food safety and reduces the risk to those which take the food (Henson and Caswell, 1999). Nevera states that compliance with regulations is important to allow for the operation and acceptance of projects.

Such strict regulations are necessary because PFs offer food to the public. Personal judgement of food safety is highlighted as being particularly important in PFs. While personal judgement is acceptable at home, in a public service all food offered must be safe to consume (Meysenburg, *et al.,* 2014). A loose system involving personal judgement would pose many food safety risks, but

would result in more food being redistributed to those in need. This highlights the conflict between loosening regulations to channel more food towards redistribution, and sacrificing food safety concerns. The best model would be the most efficient system with optimal redistribution while maintaining as high food safety standards as possible.

Future changes to regulations

Frome wish to see stronger food waste regulations which require the reuse and repurposing of food to reduce overall food wastage. They also suggest that regulations adapt to this new approach to combating food waste, and that this emergent status be acknowledged when enforcing food safety standards.

This call for flexibility in regulations and enforcement is common in many aspects of the sharing economy, as the application of traditional regulations is difficult to reconcile with these new approaches (Haase and Pick, 2017), and creative interpretation of legislation is required (Kassen and Orsi, 2012). This highlights another important aspect for the future of food redistribution, and the sharing economy in general, that it will require the collaboration of redistributors, regulators and legal experts (Kassen and Orsi, 2012).

PFs are a new and emerging form of food redistribution which highlight many of the concerns about the place of food safety in this sector. This is a high-risk form of food redistribution due to the nature of the food shared, the way in which is shared and the vulnerability of those which consume it. A MA provides an overview of the spread of this emergent practice and surveys give a deeper insight into how they operate within food safety regulations and their views on future regulation change.

While analysis of food safety regulations and their interpretations at a scalar level provide an insight into how they are dealt with at European, national and local levels, a multi-scalar analysis of how these levels interact is also required to examine the issue in a wider way.

4.5 Multi-scalar analysis

There are a variety of issues which occur within European food safety regulation which affect multiple levels. Currently there is a gap between local organisations carrying out food redistribution and those forming regulations (Caduff and Bernauer, 2006). This can mean that the concerns of those being regulated are not always heard. In the case of food redistribution there is also a lack of interpretation at a national level, so much regulation comes directly from the EU, making the gap even larger. The different levels over which food safety regulation must work has been identified has a major issue in dealing with food waste (Vituarri, *et al.,* 2015).

The EU has acknowledged the scalar nature of this issue and aims to take a top-down approach to regulating food redistribution, with changes led at a European level, and alteration of national policies to follow (Vittuari, *et al.,* 2016). This allows for a comprehensive assessment of all scales and spheres which influence food redistribution. The EU is currently aiming to identify food safety, fiscal and logistical legislation which impact on the amount of food being redistributed (Vittuari, *et al.,* 2016). This adds further complexity to solving the issue of food waste.

Changes to the regulation of food safety in the food redistribution sector must occur over several scales to allow for proper functioning of this emergent sector. While European regulations provide strong food safety standards, guidelines must be drawn up for its application to food redistribution. National guidelines will also be necessary to account for the specific mix of FRO in that country. The identification of best practice in food safety management at a local level is important due to the variety in the structure and activities of FRO. Further assessments of specific forms of redistribution is also required due to the various degrees of risk. Overall, a multi-scalar approach to food safety regulation in food redistribution is required.

4.6 General Discussion

The form and structure of many FRO which have been identified through the surveys and MA in this study varies greatly, from large national organisations serving hundreds of people, to smaller, local initiatives providing food to tens of people. This inconsistency in the organisation of FRO, and particularly the large number of small organisations, makes regulation difficult (Gram-Hanssen, *et al.,* 2016). Many FRO do not classify themselves as food businesses and do not conform to food safety regulations (Chies, 2017). Applying food safety regulations to such a diverse group of organisations can cause problems. The small size of many FRO cause many issues, such as a lack of awareness about donations (Gram-Hanssen, *et al.,* 2016). A communication network would allow for sharing redistribution experiences (Gram-Hanssen, *et al.,* 2016).

Reducing food insecurity and poverty isn't the main aim of food redistribution and therefore isn't a metric which should be used to measure its success (Barrett, 2002). As food waste reduction is often cited as the primary objective of redistribution (Riches, 2002), this is a better measure of performance. Food waste statistics in general are lacking (Vituarri, *et al.,* 2015), as are measurements of how redistribution affects these. An assessment of the effectiveness of redistribution in food waste reduction is presented in Gram-Hanssen, *et al.* (2016). The various operational structures of FRO mean that some food still goes to waste, as some organisations do not have the ability to adapt to incoming produce and it goes to waste (Gram-Hanssen, *et al.,* 2016).

Alexander and Smaje (2008) studied two UK FRO and found that only 68% of the donated food was served to people, with the remaining parts (mainly fruit and vegetables) still became food waste. This conflicts with Capodistrias (2015) (interviews with FRO), which found that 'very little' food goes to waste. This raises the question as to whether food is wasted because it isn't used (lack of demand), or because it has passed its expiration date (food safety concerns). As food waste reduction is the main aim of many FRO, an assessment of how successful they are in meeting this aim is necessary and would greatly inform the literature.

Communication between food donors and charities has been highlighted as a major issue in this area, leading to an ad hoc approach to food donation (Buksti, *et al.,* 2015). Communication between FRO could also help surplus food be redistributed more appropriately over a region so that there is less food waste (Capodistrias, 2015).

5.0 Conclusions

Goal 12.3 of the UN's SDGs aims to halve food waste at the retail and consumer level by 2030 (UN, 2015). At a European level, the Circular Economy package states that MS should take measures to encourage the prevention of food waste (EC, 2015). This creates an increasing need to find innovative and creative ways to use food more effectively. One of the most sustainable ways to do this is through food redistribution (Capodistrias, 2015). Many authors have identified this as the most favourable method of food waste management, considering the various environmental, economic and social issues (Capodistrias, 2015; Papargyropoulou, *et al.,* 2014). In spite of its many advantages, food redistribution faces a number of issues to a spread in its influence. One of the most important of these, and the topic of this study, is food safety.

Food safety standards must be maintained throughout the food cycle, and food redistribution is no exception (EC, 2002). In fact, it is particularly important in this sector due to the high-risk nature of the food being shared and the people receiving it. Regulations are the traditional form of enforcing these food safety standards, but this is difficult in an evolving sector such as the sharing economy (Kassen and Orsi, 2012). A multilevel assessment of food safety in food redistribution allows for a greater insight into what it entails, how it is carried out and how it should change in the future. This study aimed to contribute to the literature by answering the following research questions:

5.1 Key findings and academic contribution

1. European level – how has food safety policy within the EU evolved over time?

EU food safety policy evolution has been long and fragmented, but the creation of a central food safety policy and formation of a relevant authority has helped create a focussed and directed European approach to food safety regulation (Abel and Kobusch, 2010; Alemanno, 2006).

European food policy has shifted its objectives throughout its evolution due to a variety of major events. For the first 30 years it was driven by purely economic concerns, focusing on the formation of the single market, until a number of major food risk crises in the 1990s highlighted the lack of food safety regulations in the European Community (Vos, *et al.,* 2005). This resulted in a policy shift towards consumer health and protection. Today, through a variety of different policy instruments European food safety has been strengthened greatly and provides comprehensive and complete regulation of food safety in European food businesses.

2. Member State level – how have Ireland and Britain interpreted EU policy and formulated national policies on food safety?

Irish and British national food safety policy have interpreted the EU Regulation in similar ways, providing a more practical approach to food safety management than that of European policy by focusing on set standards for defined food businesses. Most of Irish food safety policy is based on the EU Regulation, while more specific rules and enforcement procedures are outlined by Irish regulations and orders (Devaney, 2016). British food safety policy outlined many of the objectives to food not being 'injurious to health', before the formation of the European Regulation (Demeritt, *et al.,* 2015), while EU policy reinforces this and states that food must not be unsafe.

In the case of both national policies they are influenced heavily by the risk-based approach of the EU Regulation, and much of the legislation is formulated around the use of risk analysis to determine food safety (Demeritt, *et al.,* 2015), hence the high frequency of risk and hygiene in policy documents. National policies were also formulated applying the general themes of food safety risk management in a more practical way, outlining standards for food businesses operations. This is highlighted by the high frequency of businesses and operators in the documents.

3. Local level – how do local redistribution organisations interpret national food safety policy? How do local redistribution organisations think food safety regulation will develop in the future?

Local FRO are knowledgeable and well informed on national food safety policy. They interpret this in a variety of ways, following different regulatory instruments, from national food safety policies (Irish and British GFLs) to hygiene procedures (Irish Standards) as well as industry certification (HACCP). These are a number of ways to meet the requirements and standards set out in the national policies (Henson and Caswell, 1999).

Most local FRO think there will be little or no change in food safety regulation in the short-term future. They have differing opinions on how they think regulations should develop in the future, with most suggesting more guidance on the interpretation of legislation and the creation of more practical standards to be met. More organisation and communication between different FRO is also suggested. National FSA also suggest more guidance on the interpretation of food safety legislation in the future (Gassin, 2017).

4. Case study: PFs – what are the implications of food safety for public fridges?

Food safety has a major role to play in PFs due to their high-risk nature (Zurek, 2016). PFs deal with food safety in a variety of ways, using a number of rules which must be followed to contribute to the fridge. These rules aim to provide information to those taking the food, remove spoiled food and allow for follow-up for any donations which are incorrect.

Media coverage shows the gradual growth and spread of PFs over time. Articles cover a wide range of issues including the objectives of fridges, how food safety standards are maintained and how the process of the fridge works. MA shows food safety, risk, rules, regulations and public health as major topics relating to PFs, highlighting their importance.

5.2 Research implications

This study will aid any further and deeper analysis on the topic of food safety in food redistribution, at European, national or local levels. The European policy review provides a contextualised understanding of the evolution of food safety policy within Europe, highlighting specific events which resulted in major changes in policy direction. The distillation of major food safety policy instruments provides a more detailed analysis of European policy.

The survey results from both the FRO and FSA provide novel data on the variety of food safety management systems used in this sector. This also outlines their opinions about the regulatory framework which they must operate within, changes they would like to see in the future and suggestions which they make. This aids any further research as this provides a stated position for these issues, and forms the basis of recommendations from this study.

The research on PFs is novel and provides information on the views and opinions of those operating the fridges which will be useful for further analysis. Assessments of the place of food safety within this particularly high-risk form of redistribution can allow for a further and deeper analysis (Zurek, 2016). The MA on PFs provides a basis of any further analysis on the topic, allowing for comparisons between future and past media coverage on PFs. It also highlights the importance of social media as a form of communication, encouraging its inclusion in any further research.

5.3 Limitations and further research

The findings of this preliminary study will inform the structure of further research, highlighting topics which should be examined in this field.

While a content analysis of national food safety policy documents provides an overview of the place of food safety in the legislation, and how it is targeted at business operators, it lacks any real understanding of how it is implemented on the ground (Bowen. 2009). This limitation can be

overcome with interviews with food safety enforcement officers on the real-world implementation of these policies.

Another general limitation of research in this sector is the wide variety of structures and sizes of organisations. This meant that people involved had differing levels of expertise and knowledge on food safety, and this was visible in the variation in the detail of responses. While they demonstrated knowledge of the legislation and the measures used to meet these standards, they often lacked context as to why.

Due to the lack of adequate resources only a brief SMA was conducted in this study. This was to gain an insight into the use of social media by FRO, and also provide further data on their geographical range (Ganglbauer, *et al.,* 2014). These initial findings highlight SMA of FRO and PFs to be an area of interest for further study due to the wealth of data and key insights it will provide into the place of ICT in this emerging sector.

5.4 Recommendations

From the collection of novel data, an analysis of the trends within it and the examination of these in light of published literature, recommendations about the future direction of food safety policy in this sector are presented below.

The main recommendation from this study is for increased guidance for, and interaction with, organisations working in the food redistribution sector (Gram-Hanssen, *et al.,* 2016). Applying formal legislation to the sharing economy is often difficult, but current food safety legislation is flexible enough to deal with differing food business structures, so guidance on its relevance and applicability to food redistribution is required (Kassen and Orsi, 2012). This sector can be regulated through existing policy instruments, only clarification and guidance on how to interpret it is necessary, with additional regulation not required. A softer interpretation of the current legal framework has been identified as one way to significantly increase food redistribution (O'Connor *et al.,* 2014).

Increased communication between food safety regulators and redistributors is also recommended to allow for streamlining of regulations so they are as practical and applicable as possible, while also maintaining high food safety standards (Gram-Hanssen, *et al.,* 2016). Feedback during the guidance and policy-making process is key in an emerging sector such as this, to allow for optimal performance of the regulations and regulated organisations. The different structures and objectives of the many FRO must also be acknowledged.

Better inclusion in regulations, both the sharing economy and wider regulations, of ICT-mediated initiatives is required due to the growth in popularity of this form of operation (Davies, *et al.,* 2017). Guidance on applicability to businesses which operate through apps, etc. is necessary, as well as an examination of the impact which the use of ICT has on various parts of FRO operations, such as food safety.

5.5 Concluding remarks

This study aimed to determine the place of food safety in the operation of FRO. Through a review of European and national food safety policy and surveys with FRO to determine how they interpret these regulations, several conclusions can be drawn. Today, food safety has a very important place in European policy and this is followed through to national legislation. Surveys highlight that FRO also view food safety as important and use a number of procedures to ensure high standards. Through their opinions on current regulations and suggestions for future changes, key recommendations to food safety regulations have been made in this study. These seek to ensure the joint optimal functioning of the redistribution of food waste, and the maintenance of high food safety standards.

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7.0 Appendices

Appendix I – Risk Analysis Framework

The Risk Analysis framework is an important topic to consider when discussing food risk issues as it forms the basis through which food risk is classified. This is the framework used to analyse food risks in the EFSA and most of Europe (Houghton, *et al.,* 2008). It consists of three distinct parts, risk assessment, risk management and risk communication. Risk assessment in food risks has been established by the global food safety standards body, the Codex Alimentarius Commission, and involves hazard identification and characterisations, exposure assessment and risk characterisation (Houghton, *et al.,* 2008). Risk management then involves the formation of policy from the results of this risk assessment which implement appropriate controls and regulations (Houghton, *et al.,* 2008). Risk communication is then finally the exchange of information about risks and their management between risk managers, the public and all parties involved (Houghton, *et al.,* 2008). For the efficient functioning of this system all three parts of this framework must be fully integrated and work together (FAO/WHO, 1998), and this requires regular risk assessments in food businesses, the alteration of policy to suit current conditions and effective communication between all parties involved in food use. This is even more important in food redistribution practices due to the high-risk nature of the activities. This means there should be regular checks to ensure the highest food safety standards and policy should be altered to reflect current practices in food distribution.

As well as changes in the scope and objectives of European food safety policy over the period of its evolution, there have been major changes in food risk management at EU and MS levels (Vos, *et al.,* 2005). This occurred mainly through the set-up of the EFSA, encompassing changes in institutional structures and adapting legislative frameworks (Houghton, *et al.,* 2008). This shift toward food risk management as a method of food safety control can be placed in the context of the overall evolution of food safety legislation within the EU. The focus on food risk management occurred at the same time as the major overhaul of European food safety policy in the early 2000s. The first cause was as a result of the major food crises during this period, which called into question the food risk management systems of the time and how effective they were.

The second major impetus for the change in the risk management system in Europe was the extension of risk management to the consumer level, instead of ending consumer protection at the point of sale (Houghton, *et al.,* 2008). At this time there was also a global movement to ensure consumer safety through the extension of Food Safety Objectives to the point of consumption by the consumer, as opposed to just the point of purchase (WHO, 2004). This tied in with the shift towards consumer protection as the main of food safety policy. This is important for food redistribution also

as these objectives cover all forms of consumer, including charitable, and ensure that food should be safe to eat at time of consumption.

Appendix II – European food safety policy evolution and food safety authority establishment

II.I Evolution of European food safety policy

Figure II.I: Timeline of European food safety policy evolution.

II.I.I The origin of European standards (1962 – 1985)

The genesis of European food policy in 1962, like many other policy areas, was to help create a single market within the European Union to allow for the free movement of foodstuffs (Ansell and Vogel, 2006). Due to this, the main focus and objective of food policy within the EU at this time was economic concerns. This was aided by the fact that early food policy was very fragmented, occurring in many smaller policy documents (Alemanno, 2006). This meant that there was no unified aim of food policy at this time, and this left it open to influence from larger, European objectives such as the creation of a single market, and also a direct influence from the Common Agricultural Policy (CAP). For this reason, food safety was seen as a minor factor when constructing policy in the area of food.

One of the main functions of this early legislation was to enable the creation of the internal market. This was carried out using fifty vertical directives, specifying certain foodstuffs which were permissible ingredients, and prohibiting others (van der Meulen, 2013). This ultimately failed as it required unanimous acceptance, and also because it didn't account for wide variety of culinary cultures and traditions within Europe, which made the decision-making process very long (Leibovitch, 2007). This difficulty in harmonising quality for all foodstuffs at an individual scale lead the Commission to consider a new approach.

II.I.II The harmonisation of standards (1985 – 1995)

In 1985 the Commission launched a new approach to the harmonisation of national legislation of foodstuffs (Communication 1985a; Communication 1985b). This came about due to a decision in the European Court of Justice, the 1979 Cassis de Dijon judgment. This was the mutual recognition principle, which stated that a MS should allow the free movement within its borders of goods which have been produced to meet the standards of another MS, if these standards are of an equivalent

level of protection to that of their own (van der Meulen, 2013). This allowed for the protection of the culinary diversity within Europe, while also allowing for the formation of an internal foodstuffs market, without the need for individual directives for each product.

With the creation of the internal market taking place, the aim of European food legislation shirted towards the protection of public health and consumer interests, such as the right to information on food origin (Leibovitch, 2007). The formation of the single market was also aided by the Single European Act which removed the requirement for unanimous MS agreement, replacing it with a qualified majority (Leibovitch, 2007).

This led the EC to develop several 'New Approach' horizontal directives which laid out essential requirements for several fields, including food labels and hygiene. While these aimed to shift the focus on the policy away from economic objectives, they were often neglected and only aided in the creation of the single market. This was mainly due to the fragmented approach to food law in the Community with still no unifying common food policy.

II.I.III The food risk crises (1995 – 1999)

The objective of the free movement of foodstuffs remained the primary focus of European food policy until the mid-1990s, when several food outbreaks and scares raised the issue of the severe lack of food safety controls (Vos, 2000; Knowles, *et al.,* 2007). These highlighted the need for increased regulation for the protection of human health and consumer interests, but also allowed for the proper functioning of the internal market and the free movement of foodstuffs.

The BSE outbreak in 1996 in particular highlighted the current lack of regulatory regime to deal with food risks with the Union and is often cited as the main impetus for the major change in the regulatory regime which occurred at this time (Vos, 2000). This began the long and extensive process of reformulating European food policy, putting safety at its heart. The evolution of food safety policy in the EU which followed this is an example of best practise in policy making as it was a comprehensive and inclusive process (Alemanno, 2006). This began in 1997 with the Green Paper on the General Principles of Food Law in the EU (European Commission, 1997) which encouraged the participation of the public in the debate on the form of future European food policy, leading to a much stronger and more robust piece of legislation. This also eased the transition from the previous policy form as it maintained the structure of the importance of the internal market, but now placed the safety of food and human health at the heart.

The food safety crises of the 1990s undermined the credibility of the EU's food safety legislation, but also provided the pressure for reformation of the policy to be able to better deal with these issues.

This resulted in a shift away from the economic concerns of the previous policy, towards a more consumer protection and food safety lead policy development process (Alemanno, 2006).

The importance of these crises in altering food law in Europe to include food safety as a main focus is shown in the objectives of the Paper which state that the policy should be "centred on the requirement that *only foodstuffs which are safe*, wholesome and fit for consumption be placed on the market. Health protection in relation with consumption of foodstuffs is to be an absolute priority at any time and not only something to be looked at in emergency situations" (EC, 1997).

At this time, public health and consumer protection objectives spread beyond that of food policy and into the general European integration process with the new agreement in the Amsterdam Treaty of 1997.

The introduction of a new food risk analysis system at this time was also key. This broke it down into two separate components; risk assessment and risk management. This aimed to place scientific data and informed decision making at the centre of the process. This promoted a shift toward protecting consumer health through robust scientific advice, comprehensive risk analysis and a strong system of control and inspection, which would later become the defining features of the EFSA. The formation of the body was agreed upon by the European Parliament in 1999, but began to face resistance from MS. Several other major food crises (BSE, concerns over GM foods, dioxin contamination) over following years counteracted this and highlighted further the need for an independent European food governance authority.

II.I.IV The globalisation of standards and introduction of the EFSA (1999 – present)

Following consultation with the public and MS' governments, a White Paper was proposed in 1999, suggesting a radical redesign of European food regulation through institutional reform, along with the establishment of a Europe-wide authority (EC, 1999). This was accepted into European law as Regulation (EC) No 178/2002 on the 28th of January 2002 "laying down the general principles and requirements of food law, establishing the EFSA and laying down procedures in matters of food safety" (EC, 2002). This document took a new look at food safety, and after being excluded from European food policy for decades it was highly integrated, across the food chain, in every sector, between MS and also on all international trade. It was hoped that a comprehensive, integrated policy would lead to a more effective and dynamic implementation. This became the first central and common policy on food in the EU and as such provided much more strength and power for the area of food safety.

This introduced several new concepts to European food policy. Traceability and the 'farm to fork' approach now became a major focus in the food chain, ensuring the safety of foodstuffs through a chain of accountability. This also lead to a stronger and clearer definition of food safety responsibility in food businesses and also promoted a much stronger role for the public in the food safety policy making process (Halkier and Holm, 2009).

Another important stage in the development of European governance of food safety occurred at this time, with the transference of responsibility for food safety from the Directorate General (DG) for Agriculture to the DG for Health and Consumers. This moved the focus of food safety away from the agricultural and industrial process of food production and towards human health and protection (Abels and Kobusch, 2010).

Arguably the most important step in the entire evolution of European food safety is the establishment of the EFSA. This created another major shift in the focus of food safety policy, placing sound scientific data at the core of any decision. This also highlighted the importance of risk in food safety, placing risk assessment, management and communication at the heart of EU food policy. This created an important link between the legislative body and the FSA as the EFSA was given responsibility for risk assessment and communication, while the Commission (DG Health and Consumers), Parliament and individual MS were charged with food risk management (EFSA, 2017). This separation of the enforcement of food safety policy by the EFSA from food safety policy making in the legislative branch has allowed for more defined and focused roles.

The new focus on food safety regulation in the EU is achieved through the new centralised and comprehensive GFL, as well as the creation of the EFSA. This is a major component of the new European policy and radically changed the way food safety was regulated in the EU. The main objectives of the EFSA are to provide scientific data about food to MS, to promote standard risk assessment methods, to commission scientific studies about food, to identify and act against emerging risks

II.II Food safety authority establishment

II.II.I The European Food Safety Authority (EFSA)

One of the largest changes in European food safety policy was the establishment of the EFSA in 2002. This oversees food safety in all 27 EU MS. The overall aim of the EFSA is to provide a guiding framework and support to national food safety authorities (FSA) in each European MS, but this is particularly difficult in Europe due to the challenge of applying one model to countries with differing political, administrative and value systems. The EFSA was to act as an umbrella organisation, with

each MS encouraged to establish their own FSA in a similar structure (Abels and Kobusch, 2010; Garcia and Jukes, 2004), creating a clear chain of control for food safety at European and national scales. While some countries had no FSA and a new organisation could be set up under the EFSA model, most countries already had existing bodies which had to be reformed, and this was not always carried out successfully (Abel and Kobusch, 2010; Halkier and Holm, 2006). The different value systems in the EU in relation to food safety also mean that the interests behind national FSAs and their objectives differ, making common integration under the EFSA difficult (Federal Institute for Risk Assessment, 2017).

The EFSA also plays a major role in the European food risk management framework. In the EU, this is spread out over several institutional bodies, but still ensuring the same overall goal and objective of consumer protection. The EFSA takes responsibility for risk assessment and communication, while the European General Directorate for Health and Consumer Protection deals with risk management. Even though the parts of the Risk Analysis framework are separated, streamlined functioning is still ensured as their goals come from the same regulations (Houghton, *et al.,* 2008).

II.II.II The United Kingdom: The Food Standards Agency (FSAUK)

The Food Standards Agency (FSAUK) was established through the Food Standards Act (1999), in the wake of the BSE/cCJD crisis (Houghton, *et al.,* 2008). This was set up to unify British food safety management, while still functionally separating food risk assessment and management under the EFSA model (Yapp, *et al.,* 2005).

For most of the 20th century food safety policy was overseen between the Ministry of Agriculture, Fisheries and Food and the Department of Health, showing the clear interest of both areas in the topic of food safety. Following the food crises of the 1990s a report on a new organisation to oversee food policy was produced by Professor Philip James (1997), and this proposed establishing the Food Standards Agency as an independent, non-ministerial department which would take sole responsibility for food safety policy in the UK (Demeritt, *et al.,* 2015).

The FSAUK is a fundamentally weak organisation as it was accompanied with no change to food safety law, and is a public body, consisting of a board of publicly appointed individuals (Demeritt, *et al.,* 2015). Initially it was also only given limited powers over food safety inspection and enforcement, making its position even weaker. Through the introduction of risk-based management systems into food safety regulation much of this has changed and the FSAUK now has much greater power. Inspection frequency is now organised according to risk and enforcement sanctions are now

calculated according to the risk posed by the violation, creating a much more formal approach (Demeritt, *et al.,* 2015).

II.II.III Ireland: The Food Safety Authority of Ireland (FSAI)

One of the most significant points in the development of Irish food policy was Ireland's accession to the EU in 1973. As with many other policy areas, much of the legislation relating to food therefore now comes from EU level (O'Sullivan, 2007), but with strong negotiation and enforcement responsibilities still remaining at a national level (FSAI, 2017). Therefore, as well as several EU Directives and regulations governing food safety practices in Ireland, there are also many national policies which govern the food chain.

The FSAI is a semi-state body, with ties to the Department of Health, but also working with several other organisations to carry out their surveillance and inspection operations and was set up in 1999 (Devaney, 2016). While the FSAI is the main focal point of food safety governance in Ireland, there are a large number of additional organisations which are also involved in food risk, including the Health Service Executive (environmental health officers), County Councils, the Department of Agriculture, Teagasc and Safefood (Devaney, 2016). The FSAI mainly cooperates with these bodies to aid in food safety research and improve food risk communication. Adding another layer of complexity to the interactions of the FSAI in governing food safety in Ireland, they cooperate with the EFSA at a European level and the Codex Alimentarius Commission on a global scale. This all means that food risk and safety governance in Ireland involves a large number of actors, across a number of scales and sectors (Devaney, 2016).

Appendix III – Survey – contacts and templates

III.I Survey contacts

Table III.I: Organisations contacted for study survey. List of all organisations to which surveys were sent, including their name, location, type of organisation, service provided and whether they completed the survey.

Organisation Name	Location	Redistribution Service	Complete Survey?
Food Redistribution Organisations			
Foodcloud	Ireland	General redistribution	Yes
Best Before Project	UK	Fresh food redistribution	Yes
Calthorpe Project	UK	Fresh food redistribution; Hot meals	No
ChicP	UK	Processed foods	No
City Harvest London	UK	General redistribution	No
Community Shop	UK	General redistribution	Yes
DayOld	UK	Baked goods redistribution	No
FareShare	UK	General redistribution	No
Olio App	UK	General food sharing	Yes
The People's Kitchen	UK	Hot meals	Yes
Plan Zheroes	UK	General redistribution	Yes
The Real Junk Food Project	UK	Hot meals	No
Too Good to Waste	UK	General redistribution	No
Community Food Enterprise	UK	General redistribution	No
The Felix Project	UK	General redistribution	No
London Street Food Bank	UK	General redistribution	No
Neighbourly	UK	General food sharing	Yes
North London Action for the Homeless	UK	General redistribution	Yes
Public Fridge Operations			
Foodsharing.de	Germany		No
Nevera Solidaria	Spain		Yes
The People's Fridge	London, UK		No
Frome Community Fridge	Frome, UK		Yes
Food Safety Authorities			
Food Safety Authority of Ireland (FSAI)	Ireland		Yes
The Food Standards Agency (FSAUK)	UK		Yes

III.II Survey templates

Food Redistribution Initiative Survey

Why is the survey being carried out?

To gather information about food safety risk perception at a local level in Ireland and the UK, to investigate implementation of food safety policy in food sharing operations and to discover how initiatives think policy will change in the future.

I would be grateful if you could fill out this quick survey to help with my thesis. This is a vital part of my project and your input would be greatly appreciated. If you have any issues, or any questions need clarification contact me at adowdal@tcd.ie. Thanks a million - Alan

Instructions: For the multiple choice questions, please embolden your chosen response.
For the opinion questions, please provide as much detail as possible.

Question 1:

What type of food redistribution services do you provide?				
Fruit and veg	Meat and dairy	Canned/tinned/preserved foods	Hot meals	Other, please specify below

Question 2:

How important is food safety to your operation?				
Unimportant	Slightly unimportant	Neutral	Slightly important	Very important

Question 3:

How do you view the potential for food safety risks in your operation?				
Impossible	Unlikely	Neutral	Likely	Very possible

Question 4:

How do you deal with food safety in your operation?				
Internal checks	External audits	Signing in of food	Donators must be registered with you	Other, please specify below

Question 5:

Have food safety regulations been clearly stated to you by the relevant authority?	
Yes	No

Question 6:

How knowledgeable do you feel about food safety in your operation?		
Uncertain	Neutral	Well informed

Question 7:

What regulations and governing frameworks do you have to work within?

Question 8:

How strong do you think these regulations are?		
Weak	Neutral	Strong

Question 9:

How concerned are you about the level of regulation affecting your activities?		
Not concerned	Unconcerned	Concerned

Question 10:

Do you think food safety regulations are restrictive?	
Yes	No

Question 11:

How often do you receive checks/controls from the relevant food safety authority?				
Never	Rarely	Occasionally	Regularly	Constantly

Question 12:

What are your views on the food safety governing framework you have to work within?

Question 13:

How do you think food safety policy will develop within your area in the future?				
Much looser; much less regulation	Slightly looser; less regulations, some more food safety controls	No change	Slightly stricter; more controls for food safety, but not as restrictive	Much stricter; more regulations and much more restrictive

Question 14:

What changes would you like to see made to food safety regulations of food redistribution?

Question 15:

Any other comments about food safety regulations in food redistribution?

Thank you very much for completing this survey, your input and opinions are greatly appreciated. Please return your completed version to me by email at adowdal@tcd.ie

Food Safety Organisation Survey

Why is this survey being carried out?

To explore the implications of food safety regulation in a growing food redistribution landscape, the strength of food safety policy in food sharing and how it is envisaged to change in the future.

I would be grateful if you could fill out this quick survey to help with my thesis. This is a vital part of my project and your input would be greatly appreciated. If you have any issues, or any questions need clarification contact me at adowdal@tcd.ie. Thanks a million - Alan

Instructions: For the multiple choice questions, please embolden your chosen response.
For the opinion questions, please provide as much detail as possible.

Question 1:

How important is food safety in food redistribution?				
Unimportant	Slightly unimportant	Neutral	Slightly important	Very important

Question 2:

Why is food safety so important in food redistribution? / Why do you think this?

Question 3:

How do you think food safety policy will develop within food redistribution in the future?				
Much looser; much less regulation	Slightly looser; less regulations, some more food safety controls	No change	Slightly stricter; more controls for food safety, but not as restrictive	Much stricter; more regulations and much more restrictive

Question 4:

How would you like to see food safety regulations deal with food redistribution in the future?

Question 5:

Do you think national or European standards and regulations would be better, and why?

Question 6:

Any other comments about food safety regulation in food redistribution?

Thank you very much for completing this survey, your input and opinions are greatly appreciated. Please return your completed version to me by email at adowdal@tcd.ie

Public Fridges Operation Survey

Why is this survey being carried out?

To determine the place of food safety in public fridges, how it is dealt with and how food safety and regulation of this process will change in the future. This will form part of a case study in my thesis, providing an applied example of food safety in food sharing operations.

I would be grateful if you could fill out this quick survey to help with my thesis. This is a vital part of my project and your input would be greatly appreciated. If you have any issues, or any questions need clarification contact me at adowdal@tcd.ie. Thanks a million - Alan

Instructions: For the multiple choice questions, please embolden your chosen response.
For the opinion questions, please provide as much detail as possible.

Question 1:

How important is food safety in public fridges?				
Unimportant	Slightly unimportant	Neutral	Slightly important	Very important

Question 2:

What are your views on food safety in the operation of public fridges?

Question 3:

How do you view the potential for food safety risks in your operation?				
Impossible	Unlikely	Neutral	Likely	Very possible

Question 4:

What mechanisms do you have in place to deal with food safety?				
Internal checks	External audits	Signing in of food	Donators must be registered with you	Other, please specify below

Question 5:

Have food safety regulations been clearly stated to you by the relevant authority?	
Yes	No

Question 6:

How knowledgeable do you feel about food safety in your operation?				
Uncertain	Some knowledge	Neutral	Knowledgeable	Well informed

Question 7:

What regulations and governing frameworks do you have to work within?

Question 8:

What are your views on the food safety governing framework you have to work within?

Question 9:

What changes would you like to see made to food safety regulations of food redistribution/public fridges?

Question 10:

Any other comments about food safety regulations in food redistribution/public fridges?

Thank you very much for completing this survey, your input and opinions are greatly appreciated. Please return your completed version to me by email at adowdal@tcd.ie

Appendix IV – Social media analysis – methods and results

IV.I Social media analysis methodology

A small SMA was carried out to determine the rise in mentions through this form of media. The same search term was used to allow for comparisons. A search for the terms was conducted in each social media site individually on the 17th of July 2017. Posts in the results which were not related to the topic of PFs were ignored. The site on which the post originated, the author, type of media shared and comment were noted in an Excel spreadsheet. The social media sites chosen for this search were Facebook, Twitter and Instagram as these are among the most commonly used by NPO to communicate (Lovejoy and Saxton, 2012).

A line graph was plotted in Excel to show the time of the posts and a map was produced in Tableau 10.3 to show geographical spread. These were analysed to show the trend in posts about PFs over time and the geographical spread of posts about fridges.

The benefits of SMA are that it provides a greater overview of information about PFs due to them being free to use, and makes engaging with the correct community easier.

The disadvantages of SMA are that is it a less established technique, so is more difficult to carry out. The large number of social media posts and platforms over which they occur also make data collection more difficult.

IV.II Social media analysis results and discussion

Social media is a vital form of communication for NPO as it allows for direct communication, has a wider reach and provides a space to form a community and hold discussions (Lovejoy and Saxton, 2012). These are particularly important in a topic such as food redistribution and PFs, which is a community-driven project. For this reason, an analysis of social media coverage of PF operations provides an important insight into their perception and topics under discussion. A list of the locations of PFs covered in this SMA are listed below.

Table IV.I: List of public fridges from social media analysis. This shows the local location of each fridge mentioned in social media posts, its name and the number of posts which mention it.

Location	Public Fridge Name	Number of Posts
Kanata, Canada	Kanata Public Fridge	1
Montreal, Canada	Fatimah Community Fridge	2
Wasaga Beach, Canada	Wasaga Community Fridge	1
Quebec, Canada	Quebec Public Fridge	1
Tampines, China	Tampines Community Fridge	1
Kerala, India	Pappadavada Community Fridge	7
Mangaluru, India	The Public Fridge	2
Auckland, New Zealand	Auckland Community Fridge	2
Saudi Arabia	Community Fridge	1
Galdakao, Spain	Galdakao Solidarity Fridge	11
Bern, Switzerland	Bern Public Fridge	2
Dubai, UAE	Prism Tower Community Fridge	1
Frome, UK	Frome Community Fridge	1
Leytonstone, UK	Leytonstone's People's Fridge	1
London, UK	The People's Fridge	12
Surrey, UK	The Vineyard Community Centre Fridge	1
Swindon, UK	Swindon Night Shelter Community Fridge	1
California, US	Free.Go	2
Long Beach, US	The People's Café Fridge	3

Figure IV.I: Geographical distribution of public fridge posts in social media analysis. Marks are labelled with the country and number of posts about fridges in that country. Size indicates the number of posts about each country.

The coverage of social media posts about PFs is similar to that of the formal MA, with the majority being located in Europe, but with a greater number of social media posts at a global scale than traditional media articles. In this SMA 29 of the 54 posts were about European fridges, with 10 in

North America, 12 in Asia and 2 is Oceania. This means that there are fewer social media posts than formal media articles in Europe and South America, and more in North America, Asia and Oceania. This shows the importance of social media for raising awareness and coverage about other initiatives (Rotman, 2011).

Social media posts cover a greater number of fridges, focusing less on the popular fridges in Spain and Germany. In total, 13 of the fridges covered on social media weren't found in the formal MA, highlighting it as an alternative platform for raising awareness about their existence and promoting their services (Lovejoy and Saxton, 2012; Meraz, 2009).

The fridges highlighted in orange in Table IV.I show those which did not appear in the MA. This shows the importance of also conducting a SMA in a sector as new as PFs (Nah and Saxton, 2013). Some fridges may only be covered in social media due to their small size as they may not have gathered significant public and media attention. One of the major flaws of this MA is that it only searched for articles in English, not covering those in local, native-language media sources. Social media is conducted mainly in English (Internet World Stats, 2017), so a search for 'PFs' on a social media site will return more results than a formal media search.

One important comparison to traditional media is that the content of the posts varies greatly from media articles. Most social media posts are about raising awareness about food waste and promoting fridges, but they offer very little insight or analysis into their operation. None mention concerns or issues with PFs such as food safety. This shows that it is important to consider social media as a platform for raising awareness and promoting initiatives such as this, but not for critiquing and analysing them.

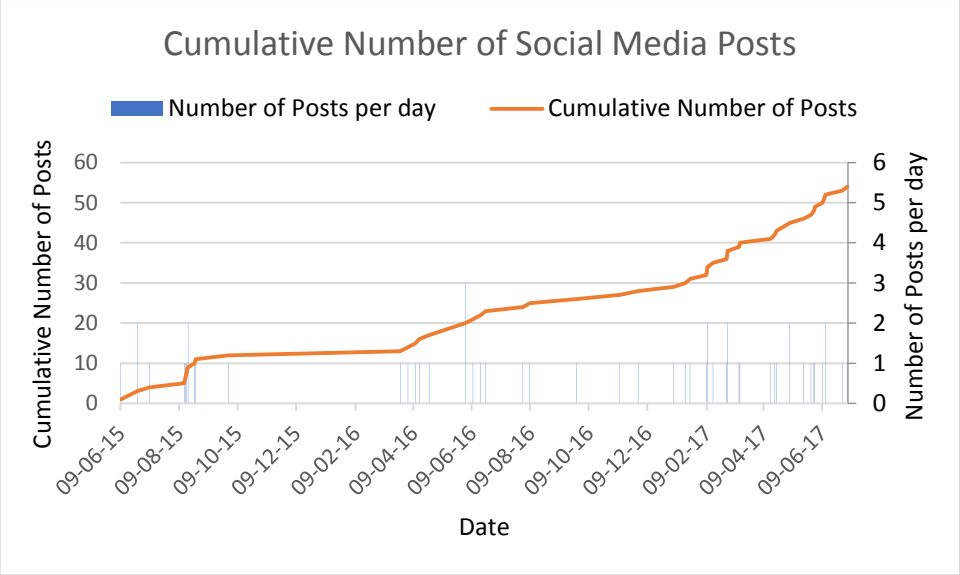

Figure IV.II: Temporal distribution of public fridge posts in social media analysis. This shows the number of posts per day (blue bar chart, right axis) and cumulative number of posts (orange line graph, left axis), indicating a steady rise in social media coverage of public fridges over recent years.

The trend graph shows that social media posts have been occurring for a shorter time than formal media articles (09-06-15), but that they have followed a similar steady upward trend. While posts about specific events occur closely together, posts raising awareness of food waste are more random. Distilling trends associated with peaks is more therefore difficult for social media posts. The rise in posts in summer 2015 is associated with the Spanish fridge with 6 posts over 2 months. The steady rise over the summer of 2016 is related to advertising posts about a new fridge in California, with 3 posts on 1 day. The staggered increase over the start of 2017 is linked to many different fridges, with 12 posts over 3 months about new fridges in England, 3 over 2 weeks about new Canadian fridges and 3 over 2 weeks about PFs in India.

While some event-based posts occur in a cluster (Veil, *et al.,* 2011), those which are issue-based tend to occur at sporadic times, making interpretation more difficult. The overall trend in posts though does show that is an increased interest in PFs online (Hilverda, *et al.,* 2017), both in terms of sharing information in articles and raising awareness about their services. The nature of the posts is also different as most of the media articles related to the opening of new fridges, which social media posts were sharing the objectives of food waste reduction through PFs. While media articles show what information the public are receiving on the topic of PFs, social media posts give a greater indication of their feelings and opinions on the issue (Stieglitz and Dang-Xuan, 2013).

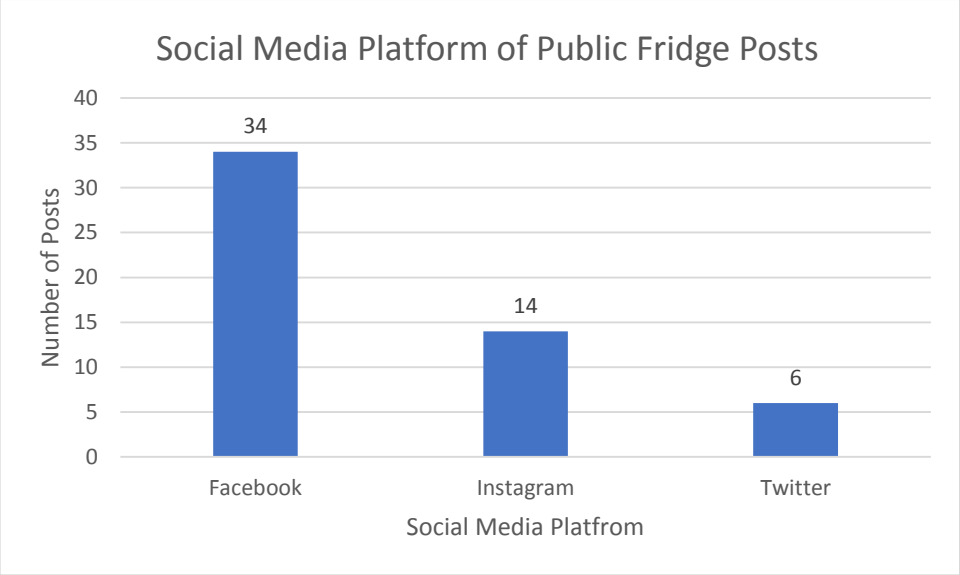

Figure IV.III: Platform distribution of public fridge posts in social media analysis. This shows the distribution of posts in the social media analysis over the three social media platforms used, with Facebook providing the most posts.

This graph shows the social media platforms on which the social media posts about PFs were found. The lowest number (6) occurred on Twitter, while there were 14 posts on Instagram and 34 posts analysed from Facebook for this study. This shows the major trend towards the sharing of both visual information about PFs on social media and also sharing information in a longer form (Kaplan and Haenlein, 2010). The ability to share both these forms of media, as well as the wider reach, mean Facebook is the dominant platform for not only PFs, but most NPO (Waters, *et al.,* 2009).

This sharing of both detailed information and visual images shows a shift towards increased accessibility of information (Kaplan and Haenlein, 2010) in an easy to digest form with the sharing of statistics about food waste, or videos about how PFs operate (Mangold and Faulds, 2009). Longer form pieces provide a deeper insight into the topics of food waste and PFs. This differs greatly from formal media which is much longer form, text-based and usually has some narrative. Proper use of social media allows for information and awareness about issues such as food waste to be spread much quicker (Mangold and Faulds, 2009).

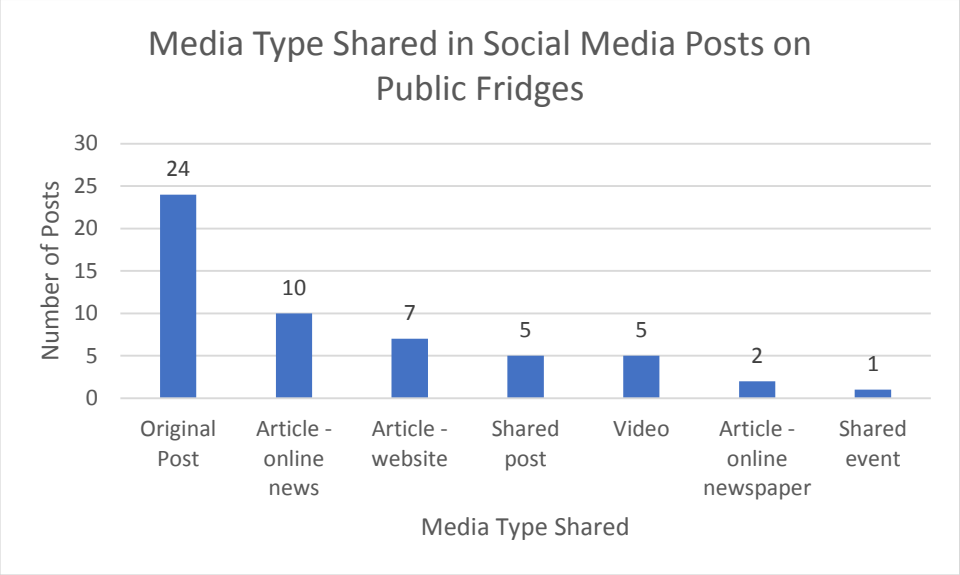

Figure IV.IV: Media type of public fridge posts in social media analysis. This shows the type of media which was shared in social media posts about public fridges, with original content posts being the most popular.

The type of post made gives a greater insight into the way information about PFs is shared on social media (Kaplan and Haenlein, 2010). The largest proportion of posts (24) were original posts made by the poster making some form of comment about PFs. This shows the opinionated stance of people on this topic (Halpern and Gibbs, 2013). 17 posts were shared articles from online news sources or websites, while 5 each were shared original posts by another user and video content about PFs. These other forms of posts are important as they show the community-based nature of PFs on social media with the sharing of similar ideas (Ganglbauer et al., 2014).

Appendix V – Food redistribution organisation survey results

Table V.I: Food redistribution organisation survey results. For types of service; F&V = fruit and vegetables, M&D = meat and dairy.

Initiative/ Question	Olio	Neighbourly	Community Shop	North London Action for Homeless	Plan Zheroes	Best Before	People's Kitchen	Foodcloud
Type of Service	F&V, M&D, canned Ready to eat	F&V, M&D, canned	F&V, M&D, canned, ready to eat	F&V	F&V, M&D, canned, ready to eat	Canned	Hot meals	F&V, M&D, canned
How important is food safety	Very	Very	Very	Very	Very	Very	Very	Very
Potential for food safety risk	Neutral	Impossible	Impossible	Unlikely	Neutral	Unlikely	Unlikely	Unlikely
Safety procedures	See section 4.3.4							
Regulations explained?	No	Yes	Yes	No	Yes	No	No	Yes
How knowledgeable	Well informed	Well informed	Well informed	Well informed	Well informed	Well informed	Well informed	Well informed
What regulations do you adhere to?	See section 4.3.4							
Strength of regulations	Strong	Strong	Strong	Strong	Strong	Strong	Neutral	Strong
How concerned are you about regs?	Concerned	Not concerned	Not concerned	Unconcerned	Concerned	Unconcerned	Unconcerned	Concerned
Are regs restrivtive?	Yes	No	No	Yes	Yes	Yes	Yes	Yes
How frequently do you receive food safety checks?	Rarely	N/A	Constantly	Occasionally	N/A	Never	Rarely	Regularly
Views on governance framework	See section 4.3.4							
Future development	No change	No change	Slightly looser	No change	Slightly looser	No change	Slightly looser	Much stricter
Future changes	See section 4.3.5							

Appendix VI – Extended food redistribution organisation analysis

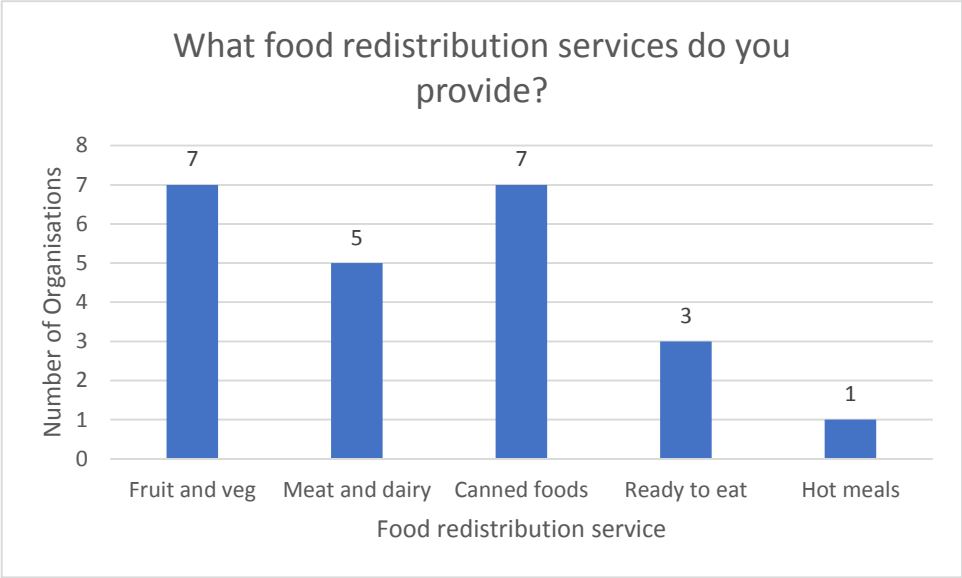

Figure VI.I: Redistribution services provided by surveyed FRO.

This provides an overview of the food redistribution services which the respondents provide. Most of the organisations provide redistribution services of fruit and vegetables and canned goods. In the case of fruit and vegetables this is due to the large volume of produce and the short shelf life (Gram-Hanssen, *et al.,* 2016), which means this is one of the most common food types they receive. For canned produce this is due to the long shelf life and stronger packaging, meaning it is easier to redistribute. Understanding the different services the surveyed organisations provide is important to placing their views on food safety in the correct context as food safety concerns and risks vary depending on the service provided. For example, there is a much higher food safety risk with preparing hot meals than canned and preserved food. This higher risk is evident from the smaller number of organisations which provide the risker services (ready to eat and hot meals).

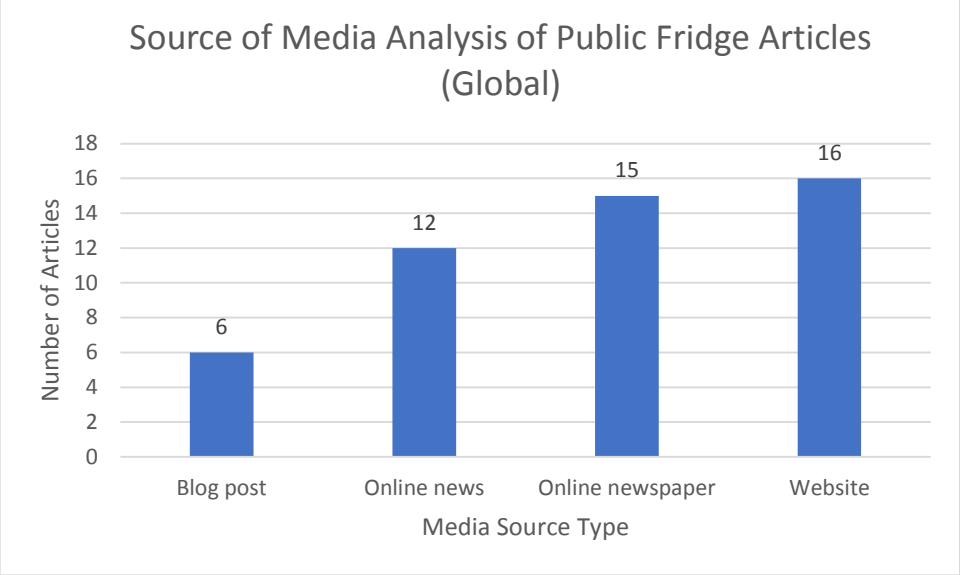

Figure IV.III: Media source of public fridge articles in media analysis.

Analysis of media source for the articles used in the MA shows the influences of different types of media and how they are covering the emerging trend of PFs (Tewksbury and Althaus, 2000). Traditional media sources such as online newspapers accounted for 15 of the articles, while online-only articles in online news, websites and blog posts accounted for 34. This also shows the differing ways in which the public are informed about PFs, where online news and newspapers (27) were generally more factual and offered more balanced views than blog posts (6) which were mainly opinion pieces (Carpenter, 2008). The use of scientific and factual information (risk-based assessments of food safety) is an important consideration in media communication (Brossard, 2013).

Coverage in traditional media provides a balanced viewpoint, combining facts and awareness about food waste, with opinions on the opening of PFs (Banning and Sweetser, 2007), while blog posts may be more opinion-led (Carpenter, 2008), highlighting the necessity for initiatives such as PFs. The informal nature of blog posts allowed for a wider range of fridges to be covered, as they required less investigative journalism (Gamon, *et al.,* 2008). The use of online media is also encouraged by the rise in the use of social media by NPO to raise awareness of their causes (Briones, *et al.,* 2011).

Reader interaction also forms a major part of online media use, particularly blogs (Singer and Ashman, 2009). To enrich further MA on this topic, comments on posts and articles could be analysed for further evidence of public perception of PFs.

Appendix VII – European media analysis – results and discussion

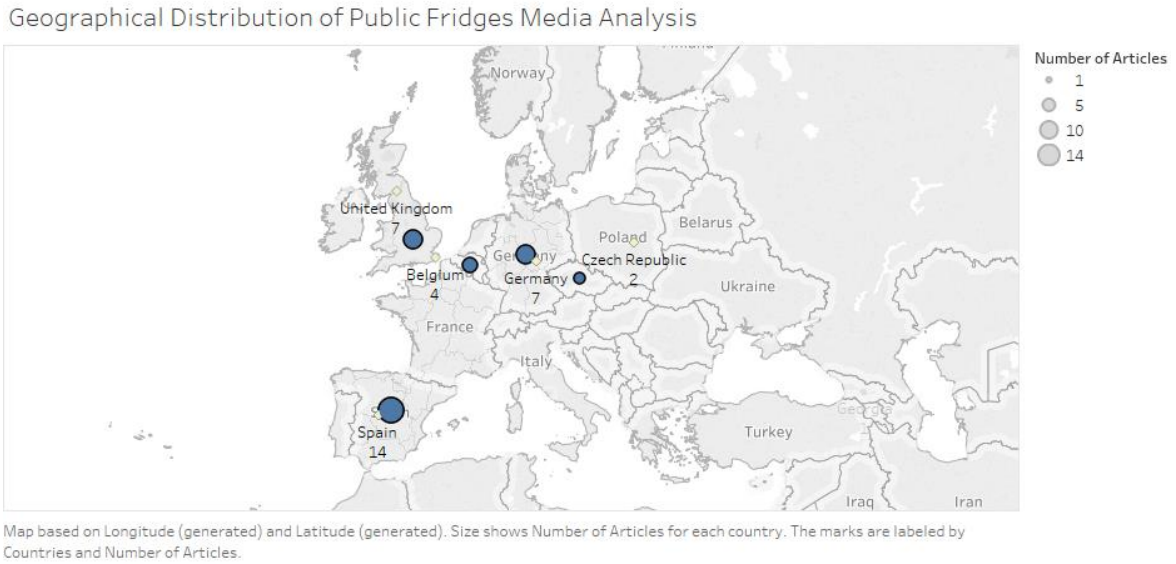

Figure VII.I: Geographical distribution of European public fridge articles in media analysis. Marks are labelled with the country and number of articles about fridges in that country. Size indicates the number of articles about each country.

Within Europe, the majority of the articles are still related to Spain, with 14 of the 34 being associated with the country. There is also a lot of media coverage of German (7) and English (7) fridges, with 4 for Belgium and 2 for the Czech Republic. The media coverage of PFs is focussed on central Europe, with none in southern (bar Spain), northern or eastern Europe.

The high percentage of articles about PFs in Europe shows the high prevalence of them in the continent (Zurek, 2016). This could be due to a variety of reasons such as awareness of issues such as food waste and poverty from the EU (Secondi, *et al.,* 2015). Obviously, due to the high number of fridges in Europe, this may signal that food safety legislation is less of a block to the establishment of fridges in the continent (Zurek, 2016), or just a higher demand and push for the establishment of initiatives such as this. The difficultly in applying food safety regulation to this emerging form of food sharing may also mean that many fridges are operating in an unregulated manner.

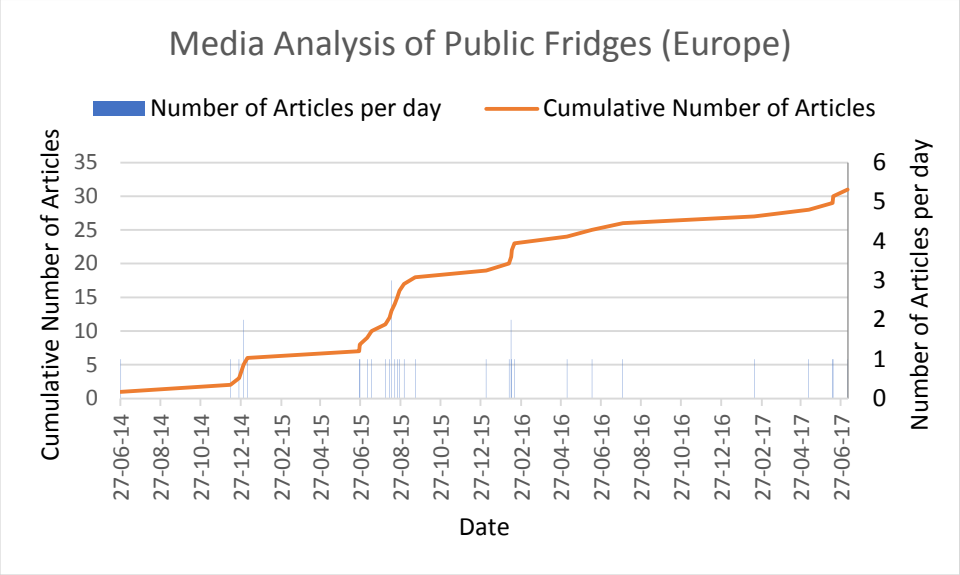

Figure VII.II: Temporal distribution of European public fridge articles in media analysis. This shows the number of posts per day (blue bar chart, right axis) and cumulative number of posts (orange line graph, left axis), indicating a staggered rise in social media coverage of public fridges over recent years.

The trend graph for the total number of articles about PFs in Europe shows a more pronounced trend than the global graph because a larger proportion of the articles are about Europe. The increase for coverage of the Spanish fridge (14) is much more pronounced, as well as that of the opening of the Belgian and health concerns of the German. This more clearly shows the major impact which the Spanish fridge has on the total number of articles, accounting for 41% of the articles about Europe.

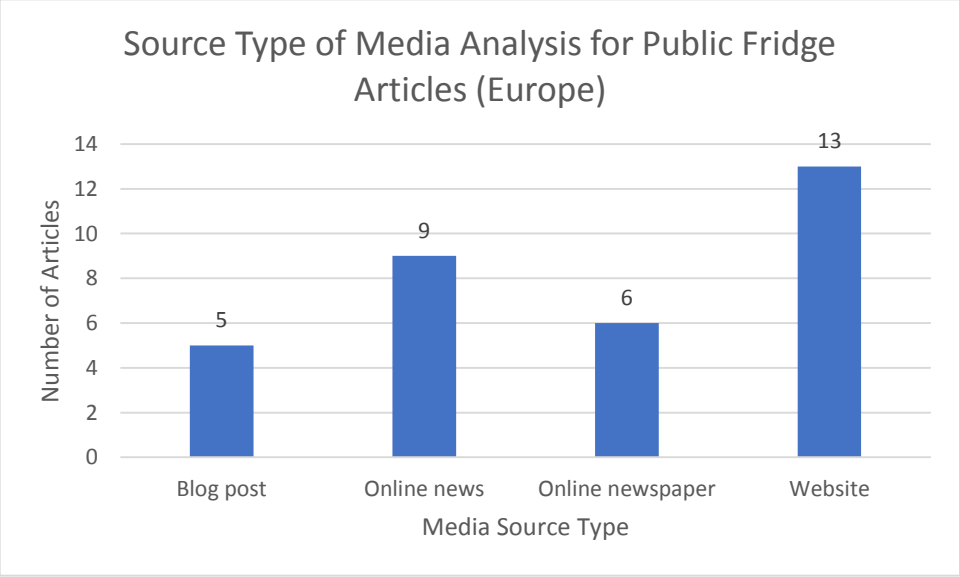

Figure VII.III: Media source of European public fridge articles in media analysis.

The sources of media for the European articles shows that there are more blog posts, online news and website articles about European PFs, while more of the online newspaper articles are about global fridges. This is because traditional media articles tend to cover a wider range of global issues (Tewksbury and Althaus, 2000).

Appendix VIII – Extended media content analysis – themes

Sentiment analysis provides an overview of how a topic is portrayed in media and the subjectivity and polarity of the opinions stated (Taboada, *et al.,* 2011; Godbole, *et al.,* 2007). Globally, most of the articles portrayed PFs in a positive manner, with 58% having a clearly positive viewpoint on the operation of PFs. Positive topics included the framing of the fridges as having a positive social impact through helping those in poverty and the positive environmental impact through the reduction in food waste, as well as the success of the original fridges in inspiring others in other countries. 6 of the articles painted the operation of the fridges in a negative light. These mainly related to the closure of the German fridges due to health concerns, highlighting the risks to public safety which improper use can pose (Zurek, 2016). 25% of articles had no significant sentiment.

The overall majority of the articles had a positive sentiment towards the operation of PFs. The high percentage of primary definers (organiser 56%, volunteer 13%) skews the sentiment of the articles as they focus on the positive impacts of the project (Pang and Lee, 2008). Primary definers are the main people which are spoken to and have an input into an article, and set the limit for the discussion by contributing to the framing of the issue (Harcup, 2003). The high level of positivity about PFs in the media suggests that the fridges which are covered are only the successful ones. It is important to remember that MA is not an exhaustive method and only provides an analysis of PFs in the media. Those which are not covered may be failures and have legitimate food safety concerns. For this reason, a MA forms part of a trend analysis and is not an absolute analysis method (Berger, 2013). Another point this raises is if PFs are so successful, why are they not more widespread? These articles only provide a superficial overview of PFs and how they function, but not difficulties such as the regulatory process or food safety issues.

There were only 2 articles (4%) which were balanced and had both major positive and negative points. These show a critical analysis of PFs and a comparison of the benefits (food waste reduction) and the potential hazards (food safety). While critical analyses such as these are common in the literature (Chies, 2017; Zurek, 2016), they lack in the media.

The vast majority of articles speak to the organiser for the fridge (56%) as they have an intimate knowledge on many aspects of the operation, including how food is donated and how food safety is managed. Interviews with city and food safety officials provide an important insight into the regulatory frameworks under which these fridges must operate and let us know that these fridges are safe and adhere to the appropriate rules (Chies, 2017).

The most commonly occurring theme in these articles is food waste, which appears in 70%, with most stating that they save food which would have otherwise gone to waste. Several articles also state global or national food waste statistics, to highlight the importance of, and need for these fridges as a part of the fight against food waste. Most fridges state food waste reduction as their main aim, similar to other food redistribution initiatives (Tielens and Candel 2014). This ties in with wasting being the 4th most frequent term.

The topic of ICT-mediated food sharing is also common in these articles, with many noting the presence (14 sources, 29%) and lack of it (5 sources, 10%) in different initiatives. ICT features heavily in the German network of PFs, operated by Foodsharing.de (Chies, 2017). Collaborations between PFs and traditional food redistribution apps (OLIO, etc.) are discussed in the English articles, as well as the use of online petitions, websites and social media. The more traditional approach of not using technology is also discussed with the Spanish fridges as they want to be open to everyone, even those which are not computer literate. This shows ICT as a possible augmentation to the traditional forms of food sharing, but also highlighting that it is not necessary.

Social media also has a major role to play in the operation of PFs, both raising awareness and the building of a community and network (Lovejoy and Saxton, 2012). As demonstrated in Appendix IV, PF initiatives use a variety of social media platforms, but Facebook is the dominant platform used by non-profits to raise awareness (Waters, *et al.,* 2009). This is due to the wide reach of the platform, the combination of visual and long-form text pieces (Kaplan and Haenlein, 2010) and the high prevalence of risk communication issues, particularly with food safety (Wu, 2015). In the emerging trend of PFs, ICT and social media will clearly play a very important role.

Liability, both public and business, is a very important topic when discussing PFs (12 articles, 25%). This MA shows a variety of different ways which initiatives have dealt with the issues, from Foodsharing.de consulting legal experts (Chies, 2017), to the Spanish fridge seeking exemptions from public liability laws (Parikh and Fagan, 2015). The question of liability is also difficult in the PF sector as many fridge operations see themselves as different from formal food businesses and believe that they operate outside of food safety regulations, so they cannot be liable for the issue (Chies, 2017). More general articles also highlight the weariness of food businesses to donate leftover food to PFs due to the issue of liability. Specific guidelines and interpretation of food safety regulations in food redistribution will lead to proper recognition of this sector as a form of food business, addressing legal issues.

Assessing traditional laws and regulations through the lens of the sharing economy will require creative approaches (Kassen and Orsi, 2012). The blurred lines between individuals, organisations,

objectives and activities make the application of traditional laws more difficult (Kassen and Orsi, 2012), and highlight the need for correct interpretation to remove all weariness in this new and emerging sector.

Food security (11 sources, 23%) occurs much less frequently than food waste (70%). This is because the main objective of fridges is the reduction of food waste, and solving the problem of food poverty is merely a co-benefit (Riches, 2002). This shift away from a proclamation of food security as a major topic in food redistribution has occurred due to the concerns raised about the failure of this initiative to reduce food poverty (Barrett, 2002). Several studies have found that there are very few links between increased redistribution of food waste and decreased food insecurity (Tielens and Candel 2014). Studies suggest that further research is necessary in this area, on a case-by-case basis (Tielens and Candel 2014). A further distinction between the aims of FRO and distancing from food insecurity reduction is necessary moving forward (Midgely, 2014).